

# EXERCISE AND PREGNANCY OUTCOME AMONG URBAN, LOW-INCOME, BLACK WOMEN

Few studies have focused on the association between maternal exercise and outcomes of pregnancy among low-income, Black women. The analysis reported here examines the associations between exercise before and during pregnancy and pregnancy outcomes of preterm birth and low birth weight among a sample of urban, low-income, Black women. Women ( $N=922$ ) were enrolled in this prospective cohort study during their first prenatal visit at five hospital-based prenatal clinics located in Baltimore City, Maryland, from 1993 to 1995. A questionnaire was used to ask women about their participation in strenuous and nonstrenuous exercise before and during pregnancy. Nearly two thirds of the women reported participating in exercise during pregnancy; most women participated in nonstrenuous exercise (56%). The risks of both low birth weight (12.2%) and preterm birth (13.7%) were not significantly different whether women reported exercising or not, either before or during pregnancy. For women who were considered high risk because of chronic diseases or previous poor pregnancy outcome, stratified analysis indicated no significant difference in preterm birth or low birth weight between those who exercised and those who did not. Our analysis failed to identify any association between exercise and pregnancy outcomes among low-income, urban, Black women. (*Ethn Dis.* 2006;16:933–937)

**Key Words:** Exercise, Low Birth Weight, Pregnancy, Preterm Birth

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From the Department of Health Education and Promotion, East Carolina University (STO), Department of Family Medicine (JG), Department of Obstetrics and Gynecology (ERN), Brody School of Medicine, East Carolina University, Greenville; Sanford Institute of Public Policy Studies, Duke University, Durham (SAJ), North Carolina; Division of Reproductive Health, Centers for Disease Control and Prevention, Atlanta, Georgia (CBP).

Address correspondence to Suezanne T. Orr, PhD; Department of Health Education and Promotion; East Carolina University; Christenbury 200; Greenville, NC 27858; 252-328-2526; 252-328-1285 (fax); orrs@ecu.edu

Suezanne T. Orr, PhD; Sherman A. James, PhD; Joseph Garry, MD; Cheryl B. Prince, PhD; Edward R. Newton, MD

## INTRODUCTION

Preterm birth (length of gestation of  $<37$  weeks) and low birth weight (weight at birth  $\leq 2500$  g) continue to be public health problems in the United States.<sup>1</sup> These outcomes are largely responsible for the high rate of infant mortality (deaths during the first year of life) in the United States, as well as substantial physical, developmental, and behavioral morbidity in infancy and childhood and high healthcare and social costs. Particularly notable is the long-standing and poorly understood excess risk of preterm birth and low birth weight among Black as compared with White women.<sup>2</sup> Black women have approximately double the risk of these outcomes compared with their White counterparts, and this difference cannot be adequately explained by demographic, socioeconomic, or clinical factors.<sup>2</sup> This discrepancy has prompted a search for other factors that might help to explain the racial disparity in low birth weight and preterm birth.

One factor of interest is exercise during pregnancy. The association between exercise and pregnancy outcome has been a source of debate, although most recent studies have suggested few harmful effects of exercise during pregnancy.<sup>3–6</sup> Unanswered questions remain, however, about associations between maternal exercise and adverse pregnancy outcomes, especially among Black women. Most of the relevant research has focused on White women.<sup>6,7</sup> One study of primarily Black women suggested that physical activity increased the risk of adverse pregnancy outcomes,<sup>8</sup> but this study evaluated standing, stair climbing, and other daily activities, rather than exercise for fitness.

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Moreover, much of the previous research omitted high-risk pregnant women, such as those with chronic health conditions or previous poor pregnancy outcomes.<sup>9,10</sup> We do not know how often and with what intensity high-risk women exercise during pregnancy and what effect exercise has on pregnancy outcomes.

This study was a prospective investigation of the associations between exercise before and during pregnancy and pregnancy outcomes in a sample of Black women. All women seeking prenatal care at several sites were enrolled in the study, including those with previous poor pregnancy outcomes or chronic health conditions that would make them high risk. The inclusion of this diverse group of Black women allowed us to evaluate associations between exercise with pregnancy outcomes in a heterogeneous clinical sample, not unlike the patient population seen in many urban prenatal clinics.

## METHODS

Women were enrolled in this prospective cohort study at five hospital-based prenatal clinics located in Baltimore, Maryland. The study was approved by the institutional review board of the Johns Hopkins University School of Hygiene and Public Health. Women were recruited at the time of their first prenatal visit, from 1993 to 1995. They were eligible for the project if they were Black and age  $\geq 18$  years.

A trained research assistant approached eligible women, requested their participation, and obtained written informed consent. Fewer than 5% of eligible women declined to participate in the research. At the first prenatal visit, women completed a questionnaire, which assessed demographic information (eg, education, marital status, and age), exercise participation before and during pregnancy, and behavioral factors (eg, cigarette smoking and alcohol use).

At the conclusion of each pregnancy, two trained and experienced research assistants abstracted the clinical records of each woman enrolled in the study. Obstetric, delivery, and nursery records were reviewed to obtain data on pregnancy outcomes. The pregnancy outcomes of interest were gestational age (according to the "best obstetric estimate" obtained from a combination of date of last normal menstrual period, fundal height, sonogram, and the date the first fetal heartbeat was heard with a stethoscope) and birth weight (obtained from delivery room records—each baby was weighed soon after birth in the delivery room). Data were also abstracted from medical records about clinical covariates, including chronic diseases (eg, hypertension and diabetes) and previous poor pregnancy outcomes (ie, prior preterm or low birth weight birth, stillbirth, or fetal death).

Exercise was assessed by using the study questionnaire. Women were asked about their participation in strenuous and nonstrenuous exercise before and

during pregnancy with questions developed by James et al for use in the Pitt County (NC) Study.<sup>11</sup> Strenuous exercise was defined to the women as "exercise which makes you sweat and breathe hard even when the weather is not hot." The questionnaire cited running and biking as examples of strenuous exercise. Nonstrenuous exercise was defined to the women as "exercise which does not make you sweat and breathe hard even when the weather is not hot." Gardening and walking were listed on the questionnaire as examples of nonstrenuous exercise.

During the two years of recruitment, 1163 women were enrolled in the study. Of these, 241 women were eventually excluded for various reasons, such as the woman was lost to followup ( $n=60$ ), the hospitals could not locate the medical record ( $n=25$ ), the patient moved from the area ( $n=17$ ), or the patient had a therapeutic abortion ( $n=29$ ), stillbirth, or miscarriage ( $n=60$ ). After these exclusions, the final sample for analysis consisted of 922 women.

Univariate and bivariate descriptive statistics were used to evaluate the data. Bivariate associations between exercise and outcomes of pregnancy were assessed for statistical significance by using the chi-square statistic. In addition, the unadjusted bivariate odds ratios and 95% confidence intervals were computed. We also analyzed associations between the type of exercise (strenuous vs nonstrenuous) and pregnancy outcome. Stratified analyses were conducted to assess the relationship between exercise with outcome among those with and without chronic diseases and previous poor outcome. Multiple logistic regression models were developed (separately) for preterm birth and low birth weight (with each dependent variable as a dichotomy), with demographic, behavioral, and clinical covariates associated with preterm birth or low birth weight at  $P<.20$ . The exercise variables were added to these models to obtain adjusted odds ratios and 95% confidence intervals. Separate mod-

els were developed for exercise participation before and during pregnancy (as yes/no dichotomies). In addition, interaction terms were added (separately) to the models to evaluate interactions between exercise during pregnancy and previous poor pregnancy outcome and chronic diseases.

## RESULTS

The demographic and clinical characteristics of the 922 women enrolled in the study are shown in Table 1. Approximately three-quarters of the women were ages 20 years or older; 72% had completed at least a high school education; 36.4% were employed outside of the home; 85.9% were Medicaid recipients; and 27.5% were married or living with a man who was like a husband to them. Twenty-nine percent of the women had a chronic disease (eg, diabetes, hypertension); 19.5% experienced poor weight gain during pregnancy (less than 21 pounds); and 32.1% had had a previous poor pregnancy outcome. Overall, 12.2% of the infants born to women in the sample were low birth weight, and 13.7% were preterm.

Approximately one quarter (25.5%) of the women reported that they did not engage in exercise before pregnancy (Table 2). In addition, 43.8% of the women participated in nonstrenuous exercise only, 8.1% engaged in strenuous exercise only, and 22.5% engaged in both strenuous and nonstrenuous exercise before pregnancy. During pregnancy, slightly over one-third (35.9%) of the women did not engage in exercise at all, 56.1% engaged only in nonstrenuous exercise, 2.1% participated only in strenuous exercise, and 6% of the women participated in both strenuous and nonstrenuous exercise during pregnancy.

Approximately three fourths of the women did not change their exercise habits from before pregnancy to during pregnancy. A statistically significant association was found between exercise

**Table 1. Demographic and clinical characteristics of the sample**

Maternal Characteristic	<i>n</i>	(%)
Age (years)		
18–19	225	24.4
≥20	697	75.6
Education		
Less than high school	255	27.7
High school or more	664	72.3
Employment		
Unemployed	576	63.6
Employed	330	36.4
Insurance		
None	101	11.0
Medical assistance	792	85.9
Private insurance	29	3.1
Marital status		
Single	665	72.5
Married/living with	252	27.5
Abruptio placentae		
No	904	98.6
Yes	13	1.4
Bleeding during pregnancy		
No	870	94.9
Yes	47	5.1
Chronic disease		
No	645	70.8
Yes	266	29.2
Diabetes		
No	904	98.6
Yes	13	1.4
Hospitalization during pregnancy		
No	836	90.8
Yes	85	9.2
Hypertension		
No	891	96.6
Yes	31	3.4
Initiation of prenatal care		
1st, 2nd trimester	770	84.7
3rd trimester	139	15.3
Pre-pregnancy body mass		
Upper 90%	705	89.9
Lower 10%	80	10.2
Poor weight gain (<21 lbs)		
No	704	80.5
Yes	170	19.5
Previous poor pregnancy outcome		
No	626	67.9
Yes	296	32.1
Preeclampsia		
No	876	95.5
Yes	41	4.5

**Table 2. Exercise participation before and during pregnancy**

Maternal Exercise Participation	Before Pregnancy		During Pregnancy	
	No.	%	No.	%
None	234	25.5	330	35.9
Non-strenuous only	402	43.8	516	56.1
Strenuous only	74	8.1	19	2.1
Both strenuous and non-strenuous	207	22.5	55	6.0

participation before pregnancy and exercise during pregnancy ( $P<.001$ ).

Overall, maternal exercise participation before pregnancy or during pregnancy was not associated with the occurrence of either preterm birth or low birth weight. That is, the risk of both low birth weight and preterm birth was not significantly different whether women reported exercising or not, either before or during pregnancy, as shown in Table 3. This finding was true for both unadjusted (bivariate) and adjusted (logistic regression) analyses. Moreover, we found no significant differences in the proportions of women with low birth weight or preterm birth among types of exercise (ie, strenuous, nonstrenuous, both) before and during pregnancy in bivariate analyses. Finally, change in exercise participation from before pregnancy to during pregnancy (ie, changed from non-exerciser to exerciser or changed from exerciser to non-exerciser) was also not associated with an increased risk of low birth weight or preterm birth.

Separate logistic regression models were developed for low birth weight (yes, no) and preterm birth (yes, no). Variables were selected for inclusion if they were associated with low birth weight or preterm birth at  $P<.20$ . The variables included in the final logistic regression models were alcohol use, drug use, first or second trimester bleeding, chronic diseases, previous poor pregnancy outcome, and smoking. (Abruptio placentae and preeclampsia were omitted from the models, despite their significant associations with low birth weight and preterm birth, because the number of women

experiencing these complications was small and the regression coefficients were unstable. Hospitalization during pregnancy and poor weight gain were also omitted because of their overlap with the outcomes of interest.) The exercise (exposure) variables were added to the models, in one model as participation in exercise prior to pregnancy (yes, no) and in a separate model for participation in exercise during pregnancy (yes, no). For all logistic regression models, participation in exercise either before or during pregnancy was not associated with increased risk of low birth weight or preterm birth.

Finally, stratified analyses indicated no significant interaction between exercise participation with chronic diseases or between exercise participation with previous poor outcome. The percentages of women with poor outcomes were not significantly different for those within homogeneous strata of these variables (eg, with chronic diseases) who did or did not exercise. In addition, multiple logistic regression analysis indicated that the interactions of chronic disease with exercise during pregnancy and previous poor outcome with exercise during pregnancy were not associated with either preterm birth or low birth weight. No significant difference was found in the percentages of women who participated in exercise between those with and without chronic diseases and with and without previous poor outcomes.

## DISCUSSION

In this population of women at presumably increased risk of poor

**Table 3. Exercise participation prior to and during pregnancy by pregnancy outcome**

	Low Birth Weight	Odds Ratio	95% CI	Preterm Birth	Odds Ratio	95% CI
Exercise Before Pregnancy						
No	12.4			14.1		
Yes	12.0	.97	.62–1.52	13.5	.95	.62–1.46
Exercise During Pregnancy						
No	11.2			14.2		
Yes	12.7	1.15	.76–1.76	13.4	.93	.63–1.38
Totals	12.2			13.7		

CI=confidence interval.

pregnancy outcomes (ie, low income and Black), exercise participation was not associated with preterm birth or low birth weight. To our knowledge, this is one of the few prospective studies of a population of low-income, urban, Black, pregnant women that has assessed the associations between maternal exercise and pregnancy outcomes. Although these findings must be replicated, in each analysis that we conducted, we failed to reject the null hypothesis.

Most of the women in the sample did not participate in strenuous exercise (alone or in combination with nonstrenuous exercise), particularly during pregnancy. Our results are mainly applicable to women who participate in nonstrenuous exercise during pregnancy. Although more research on this topic is indicated, among low-income urban Black women, participation in exercise during pregnancy appears to be quite common; nearly two thirds of women reported that they exercised. This level of exercise participation is similar to that reported for other samples of young Black women.<sup>12,13</sup> In addition, an analysis of data from the 2000 Behavioral Risk Factor Surveillance System indicated that ≈55% of pregnant, Black women participated in leisure-time physical activity,<sup>14</sup> which is similar to the percentage who participated in nonstrenuous exercise in our study.

One strength of our study is that we did not exclude women with chronic diseases such as hypertension or diabetes

or those with previous preterm or low birth weight births. Even among women with chronic diseases or previous poor outcomes, exercise during pregnancy was not associated with either preterm birth or low birth weight. The percentage of women with chronic diseases who exercised was not significantly different from the percentage of healthy women who exercised. Few studies have evaluated exercise among pregnant, low-income, Black women with chronic diseases, and these findings suggest that many of them engage in nonstrenuous exercise during pregnancy.

The assessment of physical activity employed for this study was focused on exercise “for fun and fitness.” We did not include an assessment of other types of physical activity among the women, such as standing for work or climbing stairs. Other studies have reported associations between physical exertion from work-related activities, standing, and other

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*Even among women with chronic diseases or previous poor outcomes, exercise during pregnancy was not associated with either preterm birth or low birth weight.*

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purposeful activities and pregnancy outcome.<sup>8,15</sup> Future research would be enhanced by inclusion of assessment of both fitness-related and other sources of physical activity among pregnant women.<sup>16</sup> The associations between physical activity and pregnancy outcomes might differ for women who engage in purposeful physical activity at work or home as compared with those who engage in physical activity for fun and fitness. Therefore, a next step in studies of physical activity during pregnancy might be to separate physical activity by its purpose (eg, fun and fitness, work, childcare) as well as intensity.

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#### AUTHOR CONTRIBUTIONS

*Design concept of study:* Orr, James, Prince

*Acquisition of data:* Orr, James, Prince

*Data analysis interpretation:* Orr, James, Garry, Prince, Newton

*Manuscript draft:* Orr, James, Garry, Prince, Newton

*Statistical expertise:* Orr, James, Prince

*Acquisition of funding:* Orr, James

*Administrative, technical, or material assistance:* Orr, James, Garry, Prince, Newton

*Supervision:* Orr, James, Prince