

The Association between Exercise in the Last Trimester of Pregnancy and Low Infant Birthweight among Rhode Island Mothers, 2016–2018

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INTRODUCTION

Approximately 8% of infants born in the United States are low birthweight (<2,500 grams).¹ Being low birthweight can cause short-term respiratory and gastrointestinal ailments and long-term intellectual deficits.² Mothers who are Black, young, low-income, and use substances are most at risk for having a low birthweight infant.³

Half of the US pregnant population faces excessive gestational weight gain, correlated with gestational diabetes, preeclampsia, and C-sections.⁴ The American College of Obstetrics and Gynecology (ACOG) recommends light to moderate exercise, 150 minutes per week, for pregnant women. White women most commonly meet the recommended prenatal physical activity levels.⁵ A physically active pregnancy may be associated with positive epigenetic cardio-metabolic markers in offspring,^{6,7} but data is otherwise scarce regarding the effect of physical activity on infant health.⁸ The purpose of this study is to examine the association between maternal physical activity during the last three months of pregnancy and low infant birthweight in mothers who gave birth in Rhode Island between 2016–2018. We hypothesize that an active lifestyle in the last trimester will be associated with less low infant birthweight.

METHODS

We analyzed data from the 2016–2018 Rhode Island Pregnancy Risk Assessment Monitoring System (RI PRAMS) dataset. As a collaborative surveillance project of the Centers for Disease Control and Prevention (CDC) and the Rhode Island Department of Health, RI PRAMS collects state-specific, population-based data on maternal behaviors and experiences before, during, and after pregnancy. Mothers delivering low birthweight infants are oversampled to gain adequate data on this high-risk population. The data are weighted to represent the RI PRAMS population.⁹

The RI PRAMS dataset included 3,350 women who recently gave birth in the state of Rhode Island. Respondents eligible for this study included all those with valid response for the exposure (exercise in the last trimester) and the outcome (low infant birthweight). There were zero missing subjects for the outcome, as data was derived from birth certificates. The operational definition of the outcome split infants into low birth weight (<2,500 g) or normal birth weight (≥2,500 g). Exercise in the last three months of pregnancy is operationalized as self-report of whether or not the

mother participated in weekly physical activity in the last three months of pregnancy, with two categories grouped into “No” (less than 1 day per week) and “Yes” (including “1 to 2 days per week”, “3 to 4 days per week”, or “5+ days per week”). We excluded 252 individuals who were marked as “dk” (Don’t Know), “blank”, “missing”, and “told not to exercise”. In total, 252/3350 or 7.5% of the eligible population did not have valid information, leaving an analytic sample of 3,098 new mothers.

Among possible covariates, maternal age, race/ethnicity, maternal education, household income, and marital status were demographic variables of interest. Other common covariates such as parity were screened out because of a lack of association in preliminary data. Maternal age was operationalized into “<20”, “20–29”, and “>29 years old”. Maternal Race/Ethnicity included “White, Non-Hispanic”; “Black, Non-Hispanic”; “Other, Non-Hispanic”, and “Hispanic”. Annual income was stratified into “Less than \$24,000”, “24,001 to \$48,000”, “48,001 to 85,000” and “Greater than \$85,000”. Years of maternal education were split into “Less than”, “Equal to”, and “Greater than” 12 years. Marital status was self-reported as “Married” or “Unmarried”.

We identified smoking in the last three months of pregnancy and maternal BMI as confounders in this study. Based on the literature, we hypothesized that women who are smokers or have higher body mass index (BMI) are less likely to exercise in the last three months of pregnancy.^{10,11} Smoking in the last three months of pregnancy was reported as “Yes” or “No”. Maternal BMI was a pre-calculated variable derived from height and weight, split into “Underweight” (>18.5), “Normal Weight” (18.5–25), “Overweight” (25–30), and “Obese” (>30).

We used Stata Version 16.0 for all statistical analyses.¹² To describe our data, we determined unweighted frequencies and weighted percentages for low infant birthweight, as well as confounders and demographic characteristics by physical activity status. We used bivariate analysis of the dichotomous exposure variable using complex survey design and weighting for proper representation. We then conducted a logistic regression to model the outcome variable by each covariate. After assessing each covariate, our final model included maternal age, maternal race/ethnicity, income, education level, marital status, smoking status, and BMI, which were correlated with birth weight in the literature and our data.

RESULTS

Overall, 59.9% of Rhode Island women who delivered a live infant between 2016 and 2018 reported exercising in the last three months of pregnancy (Table 1). The prevalence of low birthweight is higher among mothers who did not exercise during pregnancy (7%) compared to those who exercised (6%), p -value=0.02.

The maternal exercise rates varied by sub-population. Compared to mothers who exercised, those who did not exercise were more likely to be obese (29%, p <0.01), Hispanic (29%, p <0.01), or over age 30 (56%, p <0.05). Income,

education, marital status, and smoking status showed no significant differences in exercise status.

Among new mothers in Rhode Island, adjusting for maternal age, maternal race/ethnicity, income in the last year, years of maternal education, marital status, smoking, and maternal BMI (Table 2), those who reported exercising in the last three months of pregnancy have 1.25 (95% CI: 1.08, 1.44) the odds of having a healthy weight infant compared to those who did not exercise in the last three months of pregnancy.

Table 1. Characteristics of postpartum women in Rhode Island by exercise in last trimester of pregnancy, 2016–2018 RI PRAMS

Characteristics	Did not exercise, Weighted % 42% (n=1,344)	Exercised, Weighted % 58% (n=1,754)
Maternal Age*		
<20	3%	5%
20–29	41%	43%
>29	56%	52%
Maternal Race/Ethnicity**		
White, Non-Hispanic	53%	60%
Black, Non-Hispanic	6%	5%
Other, Non-Hispanic	12%	11%
Hispanic	29%	24%
Income		
<\$24,000	35%	33%
\$24,001 to \$48,000	20%	20%
\$48,001 to \$85,000	18%	18%
>\$85,001	27%	30%
Years of Maternal Education		
<12	10%	10%
12	20%	20%
>12	70%	71%
Marital Status		
Married	56%	57%
Unmarried	44%	43%
Smoking in Last 3 Months of Pregnancy		
	7%	5%
Maternal Body Mass Index (BMI)**		
Underweight	3%	3%
Normal	40%	51%
Overweight	28%	26%
Obese	29%	20%
Low Infant Birthweight (<2500 g)**		
	7%	6%

*(p <0.05), **(p <0.01)

Table 2. Unadjusted and adjusted odds ratios of healthy infant birth weight among women who have recently given birth in Rhode Island, 2016–2018 RI PRAMS

Characteristics	Unadjusted OR (95% CI)	Adjusted OR (95% CI)
Maternal Exercise in the Last 3 Months of Pregnancy**		
≤1 day per week	1.00 (ref)	1.00 (ref)
>1 day per week	1.27 (1.12, 1.44)	1.25 (1.08, 1.44)
Maternal Age		
<20	0.75 (0.55, 1.02)	0.85 (0.55, 1.31)
20–29	1.00 (ref)	1.00 (ref)
>29	1.11 (0.98, 1.26)	0.98 (0.83, 1.15)
Maternal Race/Ethnicity*		
White, Non-Hispanic	1.00 (ref)	1.00 (ref)
Black, Non-Hispanic	0.38 (0.30, 0.49)	0.40 (0.30, 0.54)
Other, Non-Hispanic	0.72 (0.59, 0.87)	0.73 (0.58, 0.92)
Hispanic	0.71 (0.61, 0.82)	0.84 (0.68, 1.03)
Income		
>24,000	1.00 (ref)	1.00 (ref)
\$24,001 to \$48,000	1.56 (1.29, 1.87)	1.31 (1.05, 1.64)
\$48,001 to \$85,000	1.39 (1.16, 1.67)	0.95 (0.73, 1.22)
>\$85,000	1.78 (1.52, 2.09)	1.03 (0.78, 1.35)
Years of Maternal Education**		
<12	0.70 (0.56, 0.89)	0.67 (0.50, 0.90)
12	1.00 (ref)	1.00 (ref)
>12	1.28 (1.09, 1.49)	1.12 (0.91, 1.39)
Marital Status*		
Married	1.00 (ref)	1.00 (ref)
Unmarried	0.65 (0.58, 0.74)	0.82 (0.69, 0.98)
Smoking in Last 3 Months of Pregnancy**		
No	1.00 (ref)	1.00 (ref)
Yes	0.70 (0.59, 0.83)	0.79 (0.64, 0.97)
Maternal Body Mass Index (BMI)		
Underweight	0.35 (0.25, 0.49)	0.40 (0.27, 0.59)
Normal	1.00 (ref)	1.00 (ref)
Overweight	0.93 (0.80, 1.09)	0.98 (0.82, 1.17)
Obese	0.75 (0.64, 0.88)	0.84 (0.70, 1.01)

*(p <0.05), **(p <0.01)

Women who were Hispanic, had less than 12 years of education, smoked in the last trimester of pregnancy, had a pre-conception BMI <18.5, or who were unmarried had higher odds of having a low birthweight infant ($p < 0.05$).

DISCUSSION

According to 2016–2018 RI PRAMS data, women who exercised in the third trimester have a higher odds of giving birth to a healthy birthweight baby. These findings have the potential to encourage health-seeking behaviors in pregnant women in Rhode Island. By identifying existing disparities in maternal exercise, women can work to seek out resources and support in identifying and overcoming barriers to exercise. Although prenatal exercise rates are moderate in Rhode Island, there are inequities in physical activity and infant birthweight for specific demographic groups: in particular, Hispanic, older, and obese women.^{13,14} Resources to guide mothers to seek out physically active lifestyles at all stages of pregnancy can now be found in online resources, lowering traditional barriers to in-person fitness training and advice. While individual recommendations should be made by physicians, this study provides another reason to recommend physical activity during pregnancy beyond improved maternal health – there is evidence to suspect improvement to infant health.

LIMITATIONS

Due to the size of the state of Rhode Island and the three-year period of data collection, RI PRAMS 2016–2018 had a sample size of 3,350 women. The variables used in this study had relatively few missing individuals, so the results are likely not skewed due to this small sample. Furthermore, RI PRAMS data are based on self-report by the survey respondent and are not verified, so they may be subject to recall bias or bias towards the socially-desirable answer. This may lead to over-reporting of exercise in the last trimester of pregnancy. Certain high-risk populations may be under-represented due to non-response or non-coverage bias. However, RI PRAMS oversamples these high-risk groups, such as infants who are born low birthweight, so as to provide comprehensive data for a relatively small sample size.

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Disclaimer

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