

# Does prenatal physical activity modify the association between stress during pregnancy and postpartum depression?

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# Introduction

- Due to the major life transition that accompanies pregnancy, 70% of pregnant women experience at least one stressful life event during their pregnancy.
- Prenatal stress is an important risk factor for postpartum depression.
- Prior studies suggest that physical activity during pregnancy may have protective effects on postpartum depression.
- Yet, it is not clear whether prenatal physical activity modifies the association between prenatal stress and postpartum depression.



# Objectives

- What is the relationship between maternal stress and postpartum depression symptoms?
- Does it differ by prenatal physical activity?



# Methods

## Data:

- South Carolina Pregnancy Risk Assessment Monitoring System (PRAMS) 2009-2011 (Phase 6)

## Exclusion Criteria:

- Women with a history of depression (n=406)
- Multiple pregnancies (n=258)
- Missing information on stressful life event (n=4) and Postpartum depression (n=75)

**Sample Size:** 2455 (unweighted), 134118(weighted)



# Methods

- Exposure:

Maternal stress was defined as mother's reporting of  $\geq 3$  stressful life events out of 13 events occurring in the 12 months before her baby was born

35. This question is about things that may have happened during the 12 months before your new baby was born. For each item, circle Y (Yes) if it happened to you or circle N (No) if it did not. (It may help to look at the calendar when you answer these questions.)

	No	Yes
a. A close family member was very sick and had to go into the hospital . . . . .	N	Y
b. I got separated or divorced from my husband or partner . . . . .	N	Y
c. I moved to a new address . . . . .	N	Y
d. I was homeless . . . . .	N	Y
e. My husband or partner lost his job . . . . .	N	Y
f. I lost my job even though I wanted to go on working. . . . .	N	Y
g. I argued with my husband or partner more than usual. . . . .	N	Y
h. My husband or partner said he didn't want me to be pregnant . . . . .	N	Y
i. I had a lot of bills I couldn't pay. . . . .	N	Y
j. I was in a physical fight . . . . .	N	Y
k. My husband or partner or I went to jail . . . . .	N	Y
l. Someone very close to me had a problem with drinking or drugs . . . . .	N	Y
m. Someone very close to me died . . . . .	N	Y



# Methods

- Effect Modifier:

Mothers were categorized as being physically active if they reported exercising  $\geq 3$  times a week during pregnancy

66. Thinking back to after you found out you were pregnant, did you exercise or play sports at least 3 times a week? (Include walking briskly for 1/2 hour or more, jogging, aerobics, swimming, etc.)

- No → **Go to Question 69**  
 Yes

67. How many months of this pregnancy did you exercise or play sports at least 3 times a week?

Number of months

68. What kind of exercise or sport did you do *most often* during your pregnancy?

**Check one answer**

- Brisk walking  
 Hiking  
 Jogging or running  
 Aerobics or aerobic dancing  
 Other dancing  
 Calisthenics or general exercise  
 Biking  
 Swimming or water exercise  
 Other → Please tell us:



# Methods

- Outcome:

Mothers who scored  $\geq 10$  points on a three-item depression scale were considered depressed

64. Below is a list of feelings and experiences that women sometimes have after childbirth. Read each item to determine how well it describes your feelings and experiences. Then, write on the line the number of the choice that best describes how often you have felt or experienced things this way *since your new baby was born*. Use the scale when answering:

1	2	3	4	5
Never	Rarely	Sometimes	Often	Always

a. I felt down, depressed, or sad. . . .

b. I felt hopeless. . . . .

c. I felt slowed down . . . . .





# Methods

## Other Variables

- Physical Activity Index Score:
  - PAI was used to evaluate the general level of physical activity.
  - PAI was calculated as the product of the number of months with physical activity and MET scores related to the reported activities.
  - Using the 75 percentile PAI of 7.6 as a cut-off value, we further grouped PAI values into three categories: zero, 1-7.6, & >7.6.
- The number of months doing exercise: (0, 1-3, 4-10)
- The type of exercise: Brisk walking vs. other



# Methods

- Potential confounders

maternal age at delivery; race/ethnicity; education; source of payment for delivery; cigarette smoking during pregnancy; gestational diabetes; body mass index (BMI) before pregnancy

- Statistical analysis

Multiple logistic regression models



# Results: Sample Characteristics and Prevalence of Postpartum Depression (PPD) in South Carolina, United states: SC PRAMS 2009-2011.

Characteristics	Total	Postpartum depression		P-value**
	% (N)*	Yes % (N)*	No % (N)*	
<b>Total</b>	100.0 (2455)	10.4(411)	89.6 (2044)	
<b>Maternal Age</b>				
≤19 years	12.5 (302)	12.7 (65)	87.3 (237)	0.44
20-29 years	54.7 (1347)	10.8(235)	89.2(1112)	
≥30 years	32.8 (806)	8.7 (111)	91.3(695)	
<b>Maternal Race</b>				
White	58.3(1223)	9.9(198)	90.1(1025)	0.24
African-American	33.9(1054)	12.3(189)	87.7(865)	
Others	7.8(178)	5.7(24)	94.3(14)	
<b>Maternal education</b>				
Less than high school or high school graduate or GED	42.8(1041)	13.3(207)	86.7(834)	.02
Some college or College graduate	57.2(1406)	8.2(202)	91.8(1204)	
<b>Infant's Gestational Age</b>				
<37 weeks	8.7(1395)	13.7(304)	86.3(1091)	0.14
≥37 weeks	91.3 (1059)	10.1 (107)	89.9(952)	
<b>Smoked During Pregnancy</b>				
No	89.3 (2150)	10.1 (346)	89.9(1804)	0.46
Yes	10.7 (303)	12.5 (65)	87.5 (238)	
<b>Delivery Paid by</b>				
Medicaid	48.6(1280)	14.6(261)	85.4(1019)	.0001
Private	41.6(948)	5.7(112)	94.2(836)	
Self-pay and other insurances	9.8(216)	9.1(37)	90.9(179)	
<b>Gestational Diabetes</b>				
No	94.9 (2331)	10.7 (396)	89.3(1935)	0.08
Yes	5.1 (124)	3.5(15)	96.5(109)	
<b>Pre-pregnancy Body Mass Index</b>				
Underweight (<18.5)	10.8 (283)	14.5 (52)	85.5(231)	0.08
Normal weight (18.5-24.9)	43.0(1019)	8.2 (166)	91.8 (853)	
Overweight (25-29.9)	21.8 (513)	8.7 (83)	91.3(430)	
Obese (≥30)	24.4 (640)	13.8 (110)	86.2(530)	
<b>Infant Deceased at Time of Survey</b>				
No	98.7(2092)	10.0(253)	90.0(1839)	0.0007
Yes	1.3 (212)	38.2 (121)	61.8 (91)	

\*N is the unweighted population

\*\*P-values were from the chi-square tests of independence



# Results: Association between Stressful life events and Physical Activity during pregnancy with post-partum depression symptoms: SC PRAMS 2009-2011

	Total %(N*)	Postpartum depression	Crude Model		Full Model		Reduced Model	
		Yes %	OR†	95% CI	AOR‡	95% CI	AOR‡	95% CI
<i>Stressful event during pregnancy**</i>								
<3	69.6(1651)	7.3	Referent		Referent		Referent	
≥3	30.4(804)	17.4	2.68	(1.72,4.18)	2.23	(1.37,3.63)	2.13	(1.32,3.44)
<i>Physical Activity During Pregnancy***†</i>								
No	65.7(1722)	11.8	Referent		Referent		Referent	
Yes	34.3(733)	7.6	0.61	(0.38,0.99)	0.66	(0.40,1.09)	0.64	(0.39,1.06)
<i>Months Physical Activity During Pregnancy***†</i>								
No exercise (0 months)	67.3(1708)	11.6	Referent		Referent		Referent	
1-3 months	6.4(199)	6.3	0.51	(0.19,1.36)	0.49	(0.18,1.39)	0.48	(0.17,1.37)
4-10 months	26.3 (486)	8.6	0.72	(0.42, 1.22)	0.82	(0.47, 1.43)	0.78	(0.46,1.38)
<i>Type of Physical Activity During Pregnancy***†</i>								
No exercise	74.6(1708)	11.6	Referent		Referent		Referent	
Brisk walking	19.5 (393)	8.7	0.73	(0.39, 1.35)	0.83	(0.44, 1.57)	0.79	(0.42,1.54)
Other exercise	5.9 (107)	4.5	0.35	(0.11, 1.11)	0.44	(0.13, 1.48)	0.48	(0.14,1.55)
<i>Physical Activity Index Score***</i>								
0	66.6(1708)	11.6	Referent		Referent		Referent	
1-7.6	4.07(130)	4.2	0.34	(0.07,1.51)	0.31	(0.07,1.35)	0.31	(0.07,1.35)
7.6+	29.3 (579)	8.5	0.71	(0.43,1.17)	0.80	(0.47,1.35)	0.80	(0.47,1.35)

\* N is the Unweighted Sample (2455)

\*\*Full Model is adjusted for maternal age, race, education, insurance, BMI before pregnancy, smoking during pregnancy, gestational diabetes. Reduced model is adjusted for race, insurance, BMI before pregnancy and gestational diabetes

\*\*\*Full Model is adjusted for maternal age, race, education, insurance, BMI before pregnancy, smoking during pregnancy, gestational diabetes & stressful life events during pregnancy. Reduced model is adjusted for race, insurance, BMI before pregnancy, gestational diabetes, and stressful life events during pregnancy.

† Physical Activity defined as exercising or playing sports at least three times a week.

‡ Other Physical Activity includes: hiking, jogging or running, aerobics or aerobic dancing, other dancing, calisthenics or general exercise, biking, swimming or water exercise, or other specified exercise besides walking.



# Results: Physical activity during pregnancy modifies the relation between stressful life events during pregnancy and Postpartum depression in Women: SC PRAMS 2009-2011

<i>Physical activity during pregnancy</i> <sup>†</sup>	<i>Stressful events during pregnancy (3 or more)</i>	<b>Total</b>	Postpartum depression	Crude Model		Full Model**		Reduced Model**		
				Yes	OR <sup>†</sup>	95% CI	AOR <sup>‡</sup>	95% CI	AOR <sup>‡</sup>	95% CI
No	Absent	47.3(1162)	13.4	Referent		Referent		Referent		
	Present	22.8(560)	26.8	2.84	(1.68,4.79)	2.50	(1.49,4.27)	2.37	(1.39,4.05)	
Yes	Absent	19.9(489)	9.8	0.68	(0.35,1.34)	0.79	(0.39,1.57)	0.75	(0.38,1.50)	
	Present	10.0(244)	23.4	1.55	(0.77,3.15)	1.37	(0.64,2.93)	1.27	(0.60,2.71)	

\* N is the Unweighted Sample (2455)

\*\*Full Model is adjusted for maternal age, race, education, insurance, BMI before pregnancy, smoking during pregnancy, gestational diabetes.

\*\*\*Reduced model is adjusted for race, insurance, BMI before pregnancy and gestational diabetes

† Physical Activity defined as exercising or playing sports at least three times a week. Other Physical Activity includes: hiking, jogging or running, aerobics or aerobic dancing, other dancing, calisthenics or general exercise, biking, swimming or water exercise, or other specified exercise besides walking.

‡Odds Ratio, §Adjusted Odds Ratio



# Discussion

## Strengths:

- State-specific data source for maternal and child health (MCH) issues
- Population-based survey
- Few states included questions on physical activity

## Limitations:

- Recall Bias
- Selection Bias
- Screening tool for postpartum depression was used
- Lack of objective measurement of physical activity



# Discussions

- Maternal stress is a significant risk factor for postpartum depression.
- The results also indicate physical activity might potentially attenuate the harmful effects of prenatal stress on postpartum depression.
- Future studies with a larger sample size, objective measurement (e.g., using accelerometer) of physical activity and standardized assessment of postpartum depression are warranted to verify our findings.
- Promoting physical activity during pregnancy might possibly reduce the incidence of postpartum depression.



Thank You!

Questions?



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