Michigan PRAMS Delivery
Maternal Postpartum Sleep and Partner Support

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Parenting a newborn is one of the most difficult and all-consuming tasks that a person can take on. It is widely assumed that parents of newborns endure months of exhaustion from inadequate sleep. Indeed, postpartum mothers may experience frequent sleep disturbances in order to care for their infants.[1] However there is a lack of population-based data on this topic and much remains unknown.

The National Sleep Foundation recommends that adults get at least seven hours of sleep per night.[2] Those who cannot meet this recommendation may suffer from lack of focus, reduced productivity, negative mood, and safety risks.[3] For postpartum mothers, lack of sleep may have a substantial impact on life with a newborn, sometimes contributing to postpartum depression.[4,5] Mothers may be supported in sleep through their partners. According to the Model of Dynamic Association Between Relationship Functioning and Sleep, having a supportive partner may predict sleep quality.[6]

The Michigan Pregnancy Risk Assessment Monitoring System (MI PRAMS) collected information in 2016-2018 regarding new mothers' average nightly sleep during the 2 to 9 month postpartum period and the degree of support their partners provide in eight relationship domains. This issue examines whether having an unsupportive partner increases risk of inadequate maternal postpartum sleep.

KEY POINTS

- Over 6 in 10 (63.1%) Michigan mothers who had a live birth between 2016 and 2018 **did not meet** the National Sleep Foundation's recommended seven hours of sleep per night during the postpartum period in which they answered the survey.
- Over three quarters (77.3%) of Michigan mothers reported having **very supportive** partners.
- After adjusting for potential contributing factors, mothers with no partner had a 19% greater **risk of inadequate sleep** compared to mothers with very supportive partners. Mothers with unsupportive partners had a 29% greater **risk of inadequate sleep** compared to mothers with very supportive partners.

METHODS

MI PRAMS data from the 2016-2018 birth years were used in this analysis. Responses were collected between 2 to 9 months postpartum, with the majority of responses occurring during the 3 to 5 month postpartum window. The average weighted response rate across these years was 56.3%. Survey responses were aggregated for 2016-2018 and population proportions were generated using 5,565 respondents representing 324,374 mothers of live births. To account for the complex survey design, point estimates and 95% confidence intervals were calculated using SAS version 9.4. The SAS Survey Procedures suite was used to perform significance testing (at the $p<0.05$ level) and run crude frequencies and associations. Adjusted risk ratios for inadequate maternal sleep were modeled using SAS-callable SUDAAN version 11.0.3.

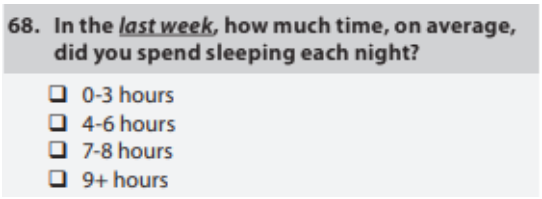
VARIABLES

The dependent variable of average nightly maternal sleep during the 2 to 9 month postpartum period was measured by four response options and dichotomized based on the National Sleep Foundation's recommended seven hours of sleep per night. Less than seven hours of sleep per night was labeled as inadequate sleep. Respondents were asked on average in the last week how much time they spent sleeping each night, shown in Figure 1a.

Partner support was measured as an eight-item scale developed by a previous study regarding partner involvement throughout pregnancy.[7] A response option of yes indicated a supportive partner as seen in Figure 1b. Responses were summarized and categorized yielding groups of women answering yes to 0-2 (unsupportive), 3-5, 6-7, and 8 (very supportive) items. Women with no partner were also included in this analysis.

To broadly capture financial need we constructed a composite "federal services eligibility" variable from several sources. If the birth certificate indicated a mom received WIC food assistance during pregnancy or if Medicaid paid for her prenatal care or delivery, then she was considered eligible. Also, if a mother's reported household income was at or below 195% of the federal poverty level, she was likely eligible for Medicaid and also considered eligible.

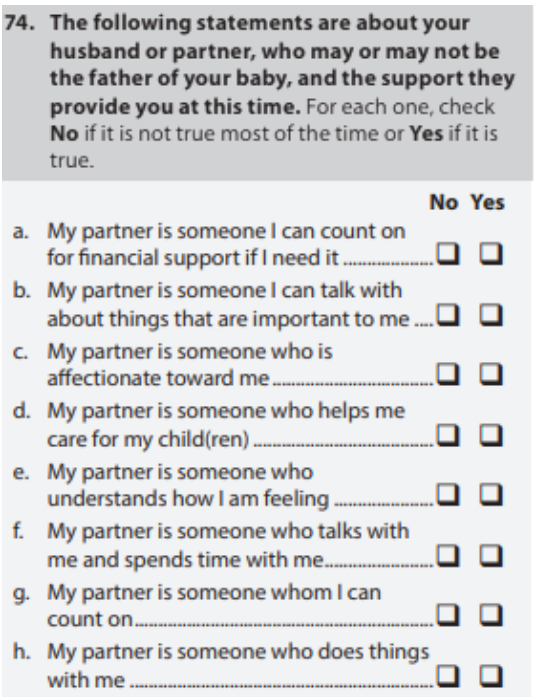
Figure 1a.
PRAMS Question 68, Sleep (2016-2018)



68. In the *last week*, how much time, on average, did you spend sleeping each night?

- ❑ 0-3 hours
- ❑ 4-6 hours
- ❑ 7-8 hours
- ❑ 9+ hours

Figure 1b.
PRAMS Question 74, Partner Support (2016-2018)



74. **The following statements are about your husband or partner, who may or may not be the father of your baby, and the support they provide you at this time.** For each one, check **No** if it is not true most of the time or **Yes** if it is true.

	No	Yes
a. My partner is someone I can count on for financial support if I need it	❑	❑
b. My partner is someone I can talk with about things that are important to me	❑	❑
c. My partner is someone who is affectionate toward me	❑	❑
d. My partner is someone who helps me care for my child(ren)	❑	❑
e. My partner is someone who understands how I am feeling	❑	❑
f. My partner is someone who talks with me and spends time with me	❑	❑
g. My partner is someone whom I can count on	❑	❑
h. My partner is someone who does things with me	❑	❑

Michigan Pregnancy Risk Assessment Monitoring System, MI PRAMS, is a population-based public health surveillance project of the Michigan Department of Health and Human Services and the Centers for Disease Control and Prevention (CDC). Since 1987, Michigan PRAMS has provided data not available from other sources on maternal attitudes and experiences before, during and after pregnancy. The data are used to identify groups of women and infants at high risk for health problems, monitor changes in health status and measure progress towards goals in improving the health of Michigan's mothers and babies.

MATERNAL SLEEP

Table 1 shows the prevalence of average nightly sleep among Michigan mothers delivering a live-born infant during 2016 to 2018. More than six in ten Michigan mothers who had a live birth between 2016 and 2018 did not meet the National Sleep Foundation's recommended seven hours of sleep per night (Table 1; 63.1%, 95% CI: 61.4%-64.8%). In addition, 1 out of every 19 new mothers reported only sleeping a nightly average of 0-3 hours (5.4%, 95% CI: 4.7%-6.1%).

Table 1. Prevalence of Average Nightly Sleep*

Average Time Sleeping	Weighted Percent	95% Confidence Interval
0-3 Hours	5.4	(4.7-6.1)
4-6 Hours	57.7	(56.0-59.5)
7-8 Hours	33.8	(32.2-35.5)
9+ Hours	3.0	(2.5-3.6)

*MI PRAMS 2016-2018 Question #68: In the last week, how much time, on average, did you spend sleeping each night?

PARTNER SUPPORT

Table 2. Prevalence of Partner Support Items**

Partner Support Item	Weighted Percent	95% Confidence Interval
My partner is someone who helps me care for my child(ren)	97.1	(96.5-97.7)
My partner is someone whom I can count on	95.6	(94.9-96.3)
My partner is someone I can talk with about things that are important to me	95.5	(94.8-96.2)
My partner is someone who talks with me and spends time with me	95.1	(94.3-95.8)
My partner is someone who does things with me	95.1	(94.4-95.9)
My partner is someone who is affectionate toward me	94.9	(94.2-95.7)
My partner is someone I can count on for financial support if I need it	93.8	(93.0-94.7)
My partner is someone who understands how I am feeling	89.3	(88.2-90.5)

**MI PRAMS 2016-2018 Question #74: The following statements are about your husband or partner, who may or may not be the father of your baby, and the support they provide you at this time. For each one, check No if it is not true most of the time or Yes if it is true.

Table 2 shows the prevalence of partner support items. Over three quarters of Michigan mothers who had a live birth between 2016 and 2018 had very supportive partners, answering yes to all eight partner support items (Table 3; 77.3%, 95% CI: 75.9%-78.7%). In addition, 2.8% of new mothers had unsupportive partners, answering yes to between zero and two partner support items (Table 3; 95% CI: 2.2%-3.3%). Nearly 1 in 15 new mothers answered they did not have a husband or partner (Table 3; 6.7%, 95% CI: 5.9%-7.4%).

Table 3. Cumulative Partner Support**

Number of Partner Support Items	Weighted Percent	95% Confidence Interval
0-2 Items (unsupportive)	2.8	(2.2-3.3)
3-5 Items	3.4	(2.7-4.0)
6-7 Items	10.0	(8.9-11.0)
8 Items (very supportive)	77.3	(75.9-78.7)
No Partner	6.7	(5.9-7.4)

ASSOCIATION BETWEEN PARTNER SUPPORT AND MATERNAL SLEEP

In the unadjusted model, women with unsupportive partners (0-2 partner support items) had comparable risk of inadequate sleep (Risk Ratio [RR] = 1.04; 95% CI: 0.84-1.27, $p>0.05$) compared to women with very supportive partners. No statistically significant unadjusted risk ratios were observed for mothers reporting any level of partner support, including mothers with no partner.

A logistic regression model was also developed to investigate this association while controlling for potential confounding factors.

Potential confounders considered for the logistic regression model were maternal age, race/ethnicity, maternal education, marital status, eligibility for federal services, previous live births, breastfeeding status, experience of domestic abuse before or during pregnancy, cumulative number of life stressors, unmet basic needs, maternal resilience, adverse childhood experiences, previous diagnosis of anxiety and/or depression, and the number of caretakers for the baby.

Among these, maternal age and number of infant caretakers were not significant confounders and were removed from the model. The remaining potential confounding variables were tested for multicollinearity, but no significant correlations were found. The model was tested for 12 interaction terms, of which one was found to be significant: maternal resilience by adverse childhood experiences. This term was included in the final model.

The logistic regression results are included within Table 4. Compared to risk ratios seen in the unadjusted model, the magnitudes of association achieve statistical significance after controlling for confounding factors. Compared to mothers with very supportive partners, mothers with unsupportive partners had a 29% increase in risk of inadequate sleep (adjusted Risk Ratio [aRR]: 1.29, CI: 1.13-2.47). Mothers with no partner had a 19% increase in risk (aRR: 1.19, CI: 1.08-1.30) compared to mothers with very supportive partners. When partner support was dichotomized at the median of the seven support items, the risk of inadequate sleep for women with less supportive partners was increased compared to women with more supportive partners (aRR: 1.14, CI: 1.05-1.23). A comparison of mothers with unsupportive partners and mothers with no partner was also performed, but no significant results were observed (data not shown). In summary, new mothers who receive little emotional and tangible support from their partners and mothers with no partner are both at increased risk of inadequate sleep compared to mothers with very supportive partners.

Table 4. Association Between Partner Support and Maternal Sleep, MI PRAMS 2016-2018

Partner Support	Adjusted Risk Ratio	95% Confidence Interval
No Partner	1.19	(1.08-1.30)
0-2 Items	1.29	(1.13-1.47)
3-5 Items	1.13	(0.96-1.32)
6-7 Items	1.10	(1.00-1.21)
8 Items	1.00	Reference

STRENGTHS & LIMITATIONS

MI PRAMS mixed-mode data collection methodology provides a population representative view of the interaction between partner support and postpartum sleep among new mothers in Michigan. MI PRAMS uses stratified random sampling to account for differing population densities and sub-group response rates. Persistent yearly unweighted response rates ranging between 50-60% ensure a robust weighted dataset. A consistent methodology incorporating best survey practices allows for comparisons over time and aggregation of data across years. Few mothers skip these survey questions, so the variables included in this analysis have low rates of item missingness. To further minimize response bias, MI PRAMS provides a high level of confidentiality which may encourage mothers to share sensitive information.

As with all population-based cross-sectional surveys, MI PRAMS data may be affected by recall and social desirability biases. Maternal sleep quantity is likely closely related to the sleeping and feeding needs of new infants, so the quantity of sleep postpartum women report may change as infants develop. Since mothers may be 2-9 months postpartum when they complete MI PRAMS, the risk we describe here should be interpreted as average risk over the 2-9 month postpartum period, although the majority of responses occur during the 3-5 month window. As little population-based data are collected on maternal sleep, there may be a need for further questions regarding sleep throughout the postpartum period.

CONCLUSIONS & FUTURE DIRECTIONS

Due to virtually all mothers receiving prenatal and postpartum care, health care providers have an opportunity to address inadequate maternal sleep and reduce its impact on maternal health. Health care providers may counsel women by suggesting partner involvement as a means of supporting maternal sleep. Further analysis of MI PRAMS maternal sleep data along with other maternal behaviors and infant outcomes will establish a more robust base of information on the impact of inadequate sleep on maternal and infant health.

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