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# Association between Prepregnancy Obesity and Adverse Birth Outcomes among Mississippi Women

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## Abstract

**Background:** Prepregnancy obesity is associated with increased risk of adverse maternal and neonatal outcomes, including preterm birth and cesarean delivery. However, limited evidence exists from Mississippi-specific populations despite the state's high burden of obesity and adverse birth outcomes.

**Objective:** This study examined the association between prepregnancy obesity and adverse birth outcomes, including cesarean delivery and preterm birth, among Mississippi women.

**Methods:** We conducted a cross-sectional study using data from the Mississippi Pregnancy Risk Assessment Monitoring System, 2016–2022. The exposure was prepregnancy obesity (BMI ≥30.0 kg/m$^2$), and the outcomes were cesarean delivery and preterm birth. Multivariable logistic regression analyses estimated the crude ratios (ORs) and adjusted odds ratios (AORs) with 95% confidence intervals (CIs), adjusting for covariates.

**Results:** This study showed that among Mississippi women with live births (7,016), 51.6% were primarily White, and 53.4% were unmarried. About 57.3% had higher school education, 42.0% earned ≤$20,000 annually, and 77.5% had insurance before pregnancy. There was a statistically significant association between prepregnancy obesity and cesarean delivery in all the models. Mississippi women with prepregnancy obesity had higher odds of cesarean delivery (AOR = 2.09; 95% CI: 1.86 – 2.42) compared to women without obesity, after adjusting for covariates.

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Author Contributions

Conceptualization, E.O.; methodology, E.O.; software, E.O.; validation, E.O., V.LM, A.B., J.L., M.S., and M.P; formal analysis, E.O., and V.L.M.; data curation, E.O.; writing—original draft preparation, E.O.; writing—review and editing, E.O., V.LM, A.B., J.L., M.S., and M.P.; visualization, E.O.; supervision, V.LM, A.B., J.L., M.S., and M.P. All authors have read and agreed to the published version of the manuscript.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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Although prepregnancy obesity was associated with preterm birth in the unadjusted analyses (OR = 1.29; 95% CI: 1.11 – 1.51), but the association was not statistically significant after adjusting for covariates (AOR = 1.10; 95% CI: 0.93 – 1.31).

**Conclusion:** Prepregnancy obesity is an independent predictor of cesarean delivery among women in Mississippi. These findings may inform public health practitioners and policymakers in developing interventions that promote preconception weight screening and obesity prevention.

### Keywords

Adverse Pregnancy Outcomes; Cesarean Delivery; Maternal Health; Prepregnancy Obesity; Preterm Birth; PRAMS; Mississippi

## 1. Introduction

Obesity has emerged as one of the most significant public health challenges in the United States and disproportionately affects women of reproductive age [1]. Prepregnancy obesity, commonly defined as a body mass index (BMI) ≥ 30 kg/m$^2$ before conception, has increased substantially over the past several decades and is recognized as an important modifiable risk factor for adverse maternal and infant health outcomes [1] [2]. According to the Centers for Disease Control and Prevention (CDC), approximately 41.9% of U.S. adults had obesity during 2017 – 2020, with the highest prevalence observed among non-Hispanic Black adults and populations residing in the southern United States [3]. The rising prevalence of obesity among women entering pregnancy poses considerable challenges to maternal and child health and contributes substantially to healthcare expenditures and long-term morbidity [3].

Prepregnancy obesity has been associated with a wide range of adverse maternal and neonatal outcomes. Previous studies reported that women with prepregnancy obesity are at increased risk of gestational diabetes mellitus, gestational hypertension, preeclampsia, labor complications, cesarean delivery, postpartum hemorrhage, and maternal mortality [4]-[6]. Maternal obesity also adversely influences fetal growth and placental function and has been linked to several unfavorable birth outcomes, including preterm birth, macrosomia, congenital anomalies, stillbirth, neonatal intensive care unit admission, and infant mortality [4] [5] [7]. These adverse outcomes have significant implications not only for maternal and infant health during the perinatal period but also for long-term health trajectories, increasing the risk of obesity, metabolic disorders, and cardiovascular diseases among offspring later in life [8].

Among adverse birth outcomes, preterm birth and cesarean delivery remain major public health concerns in the United States, particularly in Mississippi. Preterm birth, defined as delivery before 37 completed weeks of gestation, is the leading cause of neonatal morbidity and mortality globally and is associated with respiratory distress syndrome, neurodevelopmental impairment, visual and hearing deficits, and chronic health conditions extending into adulthood [9] [10]. Similarly, although cesarean delivery is often a life-saving intervention when medically indicated, cesarean birth is associated with increased risks of maternal infection, hemorrhage, thromboembolic complications, prolonged hospitalization, and adverse outcomes in subsequent pregnancies [11]. Previous studies have shown

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that women with obesity are more likely to undergo cesarean delivery due to obesity-related complications such as fetal macrosomia, dysfunctional labor, and pregnancy-related hypertensive disorders [5] [12]. Mississippi bears a disproportionate burden of obesity and poor maternal and infant health outcomes relative to many other states in the United States. In 2024, approximately 42.2% of women of childbearing age in Mississippi were classified as obese, exceeding national estimates [13]. Mississippi also consistently reports among the highest rates of preterm birth in the nation. According to the March of Dimes, 15.0% of live births in Mississippi in 2024 were preterm, and 37.9% were delivered by cesarean section [13] [14]. Furthermore, substantial racial and socioeconomic disparities persist, with Black women experiencing disproportionately higher rates of obesity, preterm birth, and adverse maternal outcomes compared with White women [14] [15]. These disparities are influenced by multiple social determinants of health, including poverty, limited access to healthcare, structural inequities, and chronic stress, indicating the need for targeted public health interventions [15].

Although associations between maternal obesity and adverse pregnancy outcomes are well established in the literature, much of the existing evidence is derived from nationally representative or non-state-specific populations, which may limit its applicability in Mississippi [5] [6] [12]. Population-based studies specifically examining the relationship between prepregnancy obesity and adverse birth outcomes among women in Mississippi remain limited. Given the state's persistently high prevalence of obesity and adverse birth outcomes, a clearer understanding of the impact of prepregnancy obesity on maternal and infant health is essential to inform targeted interventions and evidence-based maternal health policies.

Therefore, this study examines the association between prepregnancy obesity and adverse birth outcomes among Mississippi women with recent live births using data from the Pregnancy Risk Assessment Monitoring System (PRAMS), 2016–2022. So, the study assesses whether prepregnancy obesity is associated with higher odds of preterm birth and cesarean delivery after adjusting for key maternal sociodemographic characteristics. Findings from this study may inform preconception counseling and targeted maternal health interventions to reduce obesity-related risks and improve birth outcomes among women in Mississippi.

## 2. Materials and Methods

### 2.1. Study Design & Study Population

This study was part of a larger research project. We conducted a cross-sectional secondary analysis of quantitative data from the Mississippi PRAMS Phase 8 dataset (2016–2022). The Pregnancy Risk Assessment Monitoring System (PRAMS) is a surveillance project of the Centers for Disease Control and Prevention (CDC) in collaboration with state health departments. PRAMS collects state-specific, population-based data on maternal attitudes, behaviors, and experiences before, during, and shortly after pregnancy among women who recently had a live birth.

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The study population comprises Mississippi resident women of reproductive age (18 – 44 years) who gave birth between 2016 and 2022 and completed the PRAMS survey. This study included women with and without prepregnancy obesity, with obesity defined as a body mass index (BMI) of ≥30 kg/m$^2$, in accordance with CDC guidelines.

Participants were eligible for inclusion if they were Mississippi residents who delivered a live singleton infant, had a recorded prepregnancy BMI, and completed the PRAMS Phase 8 questionnaire. Participants were subsequently classified as having prepregnancy obesity (BMI ≥ 30 kg/m$^2$) or no prepregnancy obesity (BMI < 30 kg/m$^2$). Women with multiple gestations (e.g., twins, triplets, or higher-order births) or reported preexisting diabetes or hypertension were excluded.

For each birth outcome, analyses were conducted among participants with available information on that outcome. Participants with missing values for variables included in a given regression model were excluded from that analysis. Consequently, the analytic sample size varied across outcomes and regression models based on the availability of the required variables.

## 2.2. Measures

The independent variable in this study was maternal obesity, defined as prepregnancy obesity. Prepregnancy body mass index (BMI) was calculated using self-reported PRAMS variables MAT_HTFT (height in feet), MAT_HTIN (height in inches), and MAT_PRWT (prepregnancy weight), as described in the PRAMS codebook. Height was converted to meters and weight to kilograms, and BMI was calculated as weight in kilograms divided by height in meters squared (kg/m$^2$). Prepregnancy obesity was defined as a BMI ≥ 30 kg/m$^2$, whereas participants with a BMI < 30 kg/m$^2$ were classified as non-obese.

Cesarean delivery was identified using the PRAMS variable DEL6HOW (Delivery-method) and categorized as a binary outcome (cesarean delivery vs. vaginal delivery). Gestational age was obtained from the PRAMS variable GEST_WK_NAPHSIS (Clinical estimate of gestational age). Preterm birth was defined as delivery before 37 completed weeks of gestation and categorized as a binary outcome (preterm vs. term). BMI was categorized according to the Centers for Disease Control and Prevention classification criteria. Women with a BMI ≥ 30 kg/m$^2$ were classified as obese, while women with a BMI < 30 kg/m$^2$ were classified as non-obese. Prepregnancy obesity was operationalized as a binary variable (obese vs. non-obese [reference group]). The primary outcomes were adverse birth outcomes, including preterm birth and cesarean delivery. Each outcome was operationalized as a binary variable (Yes/No), indicating the presence or absence of the complication. The covariates were selected based on prior literature and their relevance to adverse birth outcomes. They included maternal age, race, marital status, educational attainment, household income, smoking before pregnancy, exercise before pregnancy, and insurance status.

## 2.3. Statistical Analysis

Descriptive statistics were used to summarize the characteristics of the study population, the prevalence of prepregnancy obesity, and the distribution of adverse birth outcomes.

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Frequencies and percentages were calculated as appropriate. Bivariate analyses were conducted to examine the associations between covariates and the two birth outcomes, cesarean delivery and preterm birth. Multivariable logistic regression models were used to assess the association between prepregnancy obesity and each adverse birth outcome, adjusting for potential covariates. Adjusted odds ratios (AORs) and 95% confidence intervals (CIs) were calculated.

**Data Analysis:** All statistical analyses were conducted using SAS version 9.4. Prior to analysis, Mississippi PRAMS datasets from 2016 through 2022 were merged to create a pooled cross-sectional analytic dataset. To account for multi-year pooling of independent cross-sectional samples, the survey (sampling) weights were adjusted by dividing the original sampling weight by seven (the number of survey years combined) to produce an average annual weight. Pooling PRAMS data across multiple years enabled a combined analysis of data from 2016 to 2022, accounting for the complex survey design and applying appropriate sample weights. Then, the dataset was prepared to account for the complex survey design by incorporating the sampling weight (WTANAL) and stratification variable (STRATUMC). SAS survey procedures were used to appropriately adjust for weighting and stratification. Weighted descriptive statistics were generated using PROC SURVEYFREQ to summarize the demographic characteristics of the study population. Weighted cross-tabulations were used to describe the distribution and weighted prevalence of cesarean delivery and preterm birth across maternal characteristics. Rao-Scott chi-square tests were used to assess differences in the distribution of each adverse pregnancy outcome across categories of maternal characteristics. Logistic regression analyses were performed using PROCSURVEYLOGISTIC to estimate odds ratios and 95% confidence intervals (CIs) for the association between prepregnancy obesity and adverse birth outcomes, including preterm birth and cesarean delivery.

Unadjusted models were first estimated to assess crude associations between prepregnancy obesity and adverse birth outcomes. Subsequently, multivariable logistic regression models were fitted to control for potential confounders. Three models were specified: Model 1 was unadjusted; Model 2 was adjusted for maternal age and race; and Model 3 was further adjusted for maternal age, race, marital status, education, income level, insurance status, smoking, and exercise. Odds ratios (ORs) and adjusted odds ratios (AORs) with corresponding 95% confidence intervals (CIs) were reported to quantify the associations between prepregnancy obesity and adverse birth outcomes among Mississippi women of reproductive age. Statistical significance was determined using a two-sided alpha level of 0.05, and associations were considered statistically significant if the p-value was <0.05 and the 95% confidence interval did not include 1.0.

## 2.4. Ethical Considerations

This study used secondary, de-identified data from the Mississippi Pregnancy Risk Assessment Monitoring System (PRAMS). No direct contact with participants or identifiable personal information was involved. The study was reviewed and approved by the Jackson State University Institutional Review Board and did not require informed consent from individual participants.

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# 3. Results

## 3.1. Sociodemographic and Adverse Birth Outcome Characteristics of the Study Population

This study comprised 7016 participants, which, when weighted using the complex design, totals 33,734 and represents the average annual population of Mississippi women, accounting for those who may have been undersampled or oversampled during the survey. Table 1 summarizes the sociodemographic and adverse birth outcomes characteristics of Mississippi women with recent live births who participated in and completed the PRAMS survey from 2016 to 2022. Most (32.4%) women aged 25 – 29 years represent the largest age group, followed closely by those aged ≥30 years (31.1%). Women aged 20 – 24 years accounted for 28.1% of the population, while adolescents aged <20 years comprised a smaller proportion of the sample (8.4%). Regarding race, White women represented just over half (51.6%) of the study population, Black women accounted for 44.9%, while other races accounted for 6.4%. More than half (53.4%) of the women were not married at the time of pregnancy, while 46.6% were married. Educational attainment varied widely. Approximately 12.1% of women had less than a high school education, and 30.6% had a high school education. However, a notable proportion, over half (57.3%) of the women had a higher level of education than high school. A large proportion of women reported low household income, with 42.0% earning ≤$20,000 annually. Approximately 24.4% earned between $20,001 and $40,000, while 21.5% earned $60,000 or more. Regarding insurance, most women (77.5%) reportedly had insurance before pregnancy, while 22.5% did not. The majority (91.2%) of the women reported not smoking before pregnancy; however, 8.8% reported smoking prior to pregnancy. Approximately 34.5% of women reported exercising before pregnancy, whereas 65.5% did not.

Regarding adverse birth outcomes, 39.1% reported prepregnancy obesity, while 60.9% were not obese prior to pregnancy. In terms of delivery method, vaginal delivery was the most common birth method, occurring in 62.7% of women, while 37.3% had cesarean delivery. Preterm birth (<37 weeks) occurred in 13.0% of women during pregnancy, while 87.0% delivered at term.

## 3.2. Maternal Characteristics by Adverse Birth Outcome among Mississippi Women

### 3.2.1. Prevalence of Preterm Birth by Maternal Characteristics among Mississippi Women:

Among Mississippi women with recent live births, the overall weighted prevalence of preterm birth was 13.0% (95% CI: 12.2% - 13.8%), Table 2. Preterm birth prevalence was significantly higher among women with prepregnancy obesity (14.7%) than among those without obesity (11.8%; $p = 0.001$). Significant differences in preterm birth prevalence were also observed by maternal education ($p = 0.036$), race ($p < 0.001$), marital status ($p < 0.001$), and household income ($p < 0.001$). Preterm birth prevalence was highest among women with a high school education (14.4%), Black women (16.7%), unmarried women (14.5%), and women with annual household income ≤$20,000 (15.4%).

In contrast, preterm birth prevalence did not differ significantly by maternal age ($p = 0.154$), insurance status ($p = 0.142$), smoking before pregnancy ($p = 0.293$), or prepregnancy

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exercise (p = 0.500). Among women who reported prepregnancy exercise ≥3 days per week, the prevalence of preterm birth was 13.1%, compared with 12.5% among those who did not engage in prepregnancy exercise.

#### 3.2.2. Prevalence of Cesarean Delivery by Maternal Characteristics among Mississippi Women:

The weighted prevalence of cesarean delivery among Mississippi women with recent live births was 37.3%. The prevalence varied significantly by several maternal characteristics (Table 3). Women with prepregnancy obesity had a substantially higher prevalence of cesarean delivery than women who were not obese (48.5% vs. 30.1%; p < 0.001).

Cesarean delivery prevalence also differed significantly by maternal age, marital status, and education. The prevalence increased with age, from 20.4% among women younger than 20 years to 43.6% among women aged ≥30 years (p < 0.001). Married women had a higher prevalence of cesarean delivery than unmarried women (39.5% vs. 35.4%; p = 0.011). Similarly, cesarean delivery prevalence increased with educational attainment, from 29.7% among women with less than a high school education to 39.8% among those with more than a high school education (p < 0.001).

No statistically significant differences in the prevalence of cesarean delivery were observed by maternal race (p = 0.206), annual household income (p = 0.361), insurance status before pregnancy (p = 0.707), smoking before pregnancy (p = 0.498), or prepregnancy exercise (p = 0.566). The prevalence of cesarean delivery was 37.9% among women who exercised before pregnancy compared with 37.0% among women who did not exercise.

### 3.3. Odds of Adverse Birth Outcomes and Prepregnancy Obesity among Mississippi Women, PRAMS 2016–2022

Table 4 presents the association between prepregnancy obesity and cesarean delivery among Mississippi women who participated in PRAMS from 2016 to 2022. In the unadjusted model (Model 1), women with prepregnancy obesity had more than twice the odds of delivering by cesarean section compared with women who were not obese prior to pregnancy (OR = 2.18; 95% CI: 1.91 – 2.50). After adjustment for maternal age and race (Model 2), the association remained statistically significant, with obese women having 2.08 times higher odds of cesarean delivery (AOR = 2.08; 95% CI: 1.80 – 2.40). In the fully adjusted model (Model 3), which controlled for covariates including sociodemographic factors (maternal age, race, marital status, education, income, and insurance) and behavioral factors (smoking and exercise), prepregnancy obesity remained independently associated with cesarean delivery (AOR = 2.09; 95% CI: 1.86 – 2.42).

Table 5 presents the odds of preterm birth (<37 weeks of gestation) in relation to prepregnancy obesity among Mississippi women participating in PRAMS from 2016 to 2022. In the unadjusted model (Model 1), women with prepregnancy obesity had 29% higher odds of preterm birth compared with women without obesity (OR = 1.29; 95% CI: 1.11 – 1.51). After adjustment for maternal age and race (Model 2), the association was attenuated and no longer statistically significant (AOR = 1.14; 95% CI: 0.97 – 1.34). After further adjustment for covariates, including maternal age, race, marital status, education,

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household income, insurance status, smoking, and exercise before pregnancy (Model 3), the association remained non-significant (AOR = 1.10; 95% CI: 0.93 – 1.31).

## 4. Discussion

The study population experienced a substantial burden of socioeconomic and maternal health risk factors. Prepregnancy obesity affected approximately 39% of women, while cesarean delivery and preterm birth occurred in more than one-third and approximately 13% of births, respectively. Nearly half of the women reported annual household incomes below $20,000, and a substantial proportion reported limited prepregnancy exercise, showing the importance of addressing socioeconomic conditions and modifiable maternal health behaviors in preconception care [16]-[25].

The weighted prevalence of cesarean delivery differed significantly by maternal age, marital status, educational attainment, and prepregnancy obesity. The higher prevalence among women aged ≥30 years is consistent with evidence linking advanced maternal age to increased cesarean delivery, potentially due to greater risk of pregnancy complications and labor-related indications [26]-[28]. Differences by marital status and education may reflect underlying differences in maternal characteristics, healthcare utilization, and social circumstances [29]-[31]. The substantially higher prevalence of cesarean delivery among women with prepregnancy obesity is consistent with previous evidence linking maternal obesity to cesarean birth [5] [6] [12] [32].

The weighted prevalence of preterm birth differed significantly by maternal race, marital status, educational attainment, household income, and prepregnancy obesity. The higher prevalence among Black women is consistent with persistent racial disparities in preterm birth in the United States, which are largely attributed to social, structural, and environmental factors rather than race itself [14] [16] [33]. Differences by marital status, education, and household income may similarly reflect disparities in social support, economic resources, healthcare access, and psychosocial stress [16] [34]. Women with prepregnancy obesity also had a higher prevalence of preterm birth, consistent with previous evidence linking maternal obesity with preterm delivery [5] [6] [12].

### 4.1. Association between Prepregnancy Obesity and Cesarean Delivery among Mississippi Women

This study found a strong and consistent association between prepregnancy obesity and cesarean delivery among Mississippi women with recent live births. Women with prepregnancy obesity had more than twice the odds of cesarean delivery compared with women without obesity, and this association remained statistically significant after adjustment for maternal age, race, sociodemographic characteristics, and behavioral factors. The persistence of the association across the regression models indicates that prepregnancy obesity was independently associated with cesarean delivery in this population. These findings are consistent with previous studies showing that maternal obesity is associated with an increased likelihood of cesarean delivery [5] [6] [35] [36].

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Marchi *et al.* [5] and Vats *et al.* [6] reported significantly greater risks of cesarean delivery among women with prepregnancy obesity, while Rubens *et al.* [35], using a large U.S. population-based dataset, found approximately 70% higher odds of cesarean delivery among women with obesity. Similarly, Zhang *et al.* [36] reported increased odds of cesarean delivery among women with overweight or obesity. The consistency of these findings across different populations and study designs supports the association observed in the present study.

Although the mechanisms underlying this association were not examined in the present study, several biological and obstetric pathways may contribute to the increased likelihood of cesarean delivery among women with prepregnancy obesity. Maternal obesity has been associated with pregnancy complications, including gestational diabetes and hypertensive disorders, as well as labor-related factors such as prolonged labor, less successful cervical ripening, and increased need for labor induction and augmentation, which may increase the likelihood of operative delivery [36] [37]. Therefore, the observed association may reflect, in part, the greater occurrence of obesity-related pregnancy and intrapartum complications among women with prepregnancy obesity.

These findings show the importance of addressing obesity before conception as part of comprehensive maternal healthcare. Preconception counseling, weight management, and evidence-based lifestyle interventions may help optimize maternal health and reduce obesity-related pregnancy complications, including the risk of cesarean delivery [38]-[40].

### 4.2. Association between Prepregnancy Obesity and Preterm Birth among Mississippi Women

We found that prepregnancy obesity was associated with increased odds of preterm birth in the unadjusted analysis; however, the association was no longer statistically significant after adjustment for maternal age, race, and other sociodemographic and behavioral characteristics. These findings suggest that maternal demographic, socioeconomic, and behavioral characteristics may partly account for the crude association observed between prepregnancy obesity and preterm birth.

The attenuation of the association after adjustment is consistent with the multifactorial etiology of preterm birth, reflecting a complex interplay among biological, behavioral, and social determinants of health [41]. Maternal socioeconomic disadvantage, smoking, healthcare access, and environmental conditions have been associated with preterm birth and may contribute to the risk inequalities [41] [42]. Racial disparities in preterm birth may likewise reflect broader social and structural conditions rather than race itself [33]. These factors may be particularly relevant in Mississippi, where racial and socioeconomic disparities in maternal health remain substantial.

Our findings differ from several previous studies reporting an independent association between prepregnancy obesity and preterm birth. Marchi *et al.* [5] and Vats *et al.* [6] found that maternal obesity was associated with an elevated risk of preterm birth. More recently, Cornish *et al.* [43], using data from nearly 29 million pregnancies, found that higher maternal prepregnancy BMI was associated with increased risk of overall and medically

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indicated preterm birth after adjustment, although the associations varied by preterm birth phenotype and parity. Differences in study populations, outcome definitions, covariate adjustment, and regional characteristics may partly explain the discrepancy between these findings and those of the present study.

Although prepregnancy obesity was not independently associated with preterm birth after adjustment, the findings show the importance of considering maternal sociodemographic and behavioral characteristics when examining the risk of preterm birth. Strategies to reduce preterm birth in Mississippi should therefore extend beyond obesity prevention and incorporate approaches that address social determinants of health, improve access to quality preconception and prenatal care, reduce tobacco use, and promote maternal health equity [33] [41] [42].

## 5. Conclusion

This study examined the association between prepregnancy obesity and adverse birth outcomes among Mississippi women using PRAMS data from 2016 to 2022. Among Mississippi women, prepregnancy obesity was highly prevalent and was significantly associated with increased odds of cesarean delivery after adjusting for covariates, indicating an independent association between prepregnancy obesity and cesarean delivery. However, there was no association between prepregnancy obesity and preterm birth among Mississippi women with recent live births. Marked sociodemographic disparities were observed, with a higher prevalence of prepregnancy obesity among older, Black, unmarried women and those with lower household income, indicating important social and structural disparities in maternal health. These findings indicate the need for targeted, equity-focused preconception and prenatal interventions.

## 6. Study Implications

This study provides important implications for maternal and public health practice in Mississippi. The observed association between prepregnancy obesity and cesarean delivery indicates the need for strengthened care during preconception, which includes routine screening for obesity and early identification of women at elevated risk for pregnancy complications. Integrating weight management counseling and preventive services into primary care and reproductive health settings may help reduce obesity-related adverse birth outcomes.

The identified sociodemographic disparities suggest that interventions should be equity-focused and tailored to populations disproportionately affected by prepregnancy obesity, particularly among older women, Black women, unmarried women, and those with lower household income. Addressing these disparities requires not only individual-level behavioral interventions but also broader structural strategies to improve access to healthy foods, safe environments for physical activity, and affordable healthcare services. At the policy level, these findings support the development of state-level maternal health initiatives tailored to Mississippi women, prioritizing preconception health promotion and obesity prevention as key strategies to improve pregnancy outcomes. Therefore, this study shows the importance

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of early, targeted, and multi-level interventions to reduce the burden of prepregnancy obesity and improve maternal and infant health outcomes in Mississippi.

## 7. Strengths and Limitations

A key strength of this study is the use of PRAMS data, a large, population-based surveillance system with robust weighting procedures that enhance the generalizability of findings to women with recent live births in Mississippi. Using multiple years of data (2016–2022) improves statistical power and yields more stable estimates. PRAMS data also provide important state-level surveillance, helping to characterize Mississippi's burden of maternal obesity and the associated risk of adverse birth outcomes. Additionally, the study accounted for the complex survey design and adjusted for relevant sociodemographic and health-related covariates, strengthening the validity of the observed associations. However, this study has some limitations. The cross-sectional design limits the ability to establish causality between prepregnancy obesity and adverse birth outcomes. Self-reported data on prepregnancy weight and height may introduce recall or reporting bias, potentially affecting BMI classification. In addition, Information on parity and prior cesarean delivery was not available in the analytic dataset and, therefore, could not be included in the regression analysis. Because these factors may influence the likelihood of cesarean delivery, their potential confounding effects could not be assessed.

## 8. Future Directions

Further research should explore the mechanisms linking prepregnancy obesity to adverse birth outcomes, including biological, behavioral, and healthcare-related factors. Also, longitudinal studies are needed to better establish the temporal relationships and causal mechanisms between prepregnancy obesity and adverse birth outcomes. Finally, future work should evaluate the effectiveness of targeted preconception and prenatal interventions aimed at reducing obesity prevalence and improving maternal and infant health outcomes, particularly among disproportionately affected populations.

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**Table 1.**

Characteristics of the study population, PRAMS 2016–2022.

| Characteristics | n[a] | N[b] | %[c] | 95% CI |
|---|---|---|---|---|
| **Age (Years)** | | | | |
| <20 | 620 | 2824 | 8.4 | 7.5 – 9.3 |
| 20 – 24 | 1948 | 9489 | 28.1 | 26.7 – 29.6 |
| 25 – 29 | 2159 | 10,923 | 32.4 | 30.9 – 33.9 |
| ≥30 | 2289 | 10,498 | 31.1 | 29.7 – 32.6 |
| **Educational level** | | | | |
| <High school | 905 | 4072 | 12.1 | 11.0 – 13.2 |
| High school | 2150 | 10,301 | 30.6 | 29.1 – 32.1 |
| >High school | 3942 | 19,285 | 57.3 | 55.7 – 58.9 |
| **Race** | | | | |
| White | 3134 | 17,391 | 51.6 | 50.0 – 53.2 |
| Black | 3545 | 14,179 | 44.9 | 40.5 – 43.6 |
| Other race | 337 | 2164 | 6.4 | 5.6 – 7.3 |
| **Marital status** | | | | |
| Married | 2890 | 15,711 | 46.6 | 45.0 – 48.2 |
| Not married | 4123 | 18,020 | 53.4 | 51.8 – 55.0 |
| **Annual household income, $** | | | | |
| ≤20,000 | 3082 | 13,164 | 42.0 | 40.4 – 43.7 |
| >20,000 to ≤40,000 | 1558 | 7632 | 24.4 | 22.9 – 25.8 |
| >40,000 to ≤60,000 | 687 | 3793 | 12.1 | 11.0 – 13.2 |
| >60,000 | 1154 | 6727 | 21.5 | 20.1 – 22.9 |
| **Insurance status before pregnancy** | | | | |
| Uninsured | 1553 | 7581 | 22.5 | 21.2 – 23.9 |
| Insured | 5453 | 26,128 | 77.5 | 76.2 – 78.9 |
| **Smoking before pregnancy** | | | | |
| No | 6265 | 30,750 | 91.2 | 90.4 – 92.1 |
| Yes | 742 | 2955 | 8.8 | 7.9 – 9.6 |
| **Prepregnancy exercise** | | | | |
| Yes | 2293 | 11,574 | 34.5 | 32.9 – 36.0 |
| No | 4685 | 21,997 | 65.5 | 63.9 – 67.1 |
| **Prepregnancy obesity** | | | | |
| Yes | 2747 | 13,183 | 39.1 | 37.5 – 40.6 |
| No | 4269 | 20,551 | 60.9 | 59.4 – 62.5 |
| **Delivery method** | | | | |
| Vaginal | 3716 | 20,441 | 62.7 | 61.1 – 64.2 |
| Caesarean section | 3081 | 12,184 | 37.3 | 35.8 – 38.9 |
| **Preterm birth** | | | | |
| Yes | 2740 | 4372 | 13.0 | 12.2 – 13.8 |

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| Characteristics | n[a] | N[b] | %[c] | 95% CI |
|---|---|---|---|---|
| No | 4268 | 29,332 | 87.0 | 86.2 – 87.8 |

**Note:** n[a] = Unweighted number; N[b] = Weighted number; %[c] = Weighted percentage; CI = Confidence Interval; PRAMS Pregnancy Risk Assessment Monitoring System.

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**Table 2.**

Prevalence of preterm birth by maternal characteristics among Mississippi women, PRAMS 2016–2022.

| | Preterm Birth | | | |
|---|---|---|---|---|
| **Maternal characteristics** | **n[a]** | **N[b]** | **%[c] (95% CI)** | **p-value** |
| **Prepregnancy obesity** | | | | **0.001** |
| Not obese | 1572 | 4238 | 11.8 (10.9 – 12.8) | |
| Obese | 1149 | 2736 | 14.7 (13.3 – 16.3) | |
| **Maternal age at delivery** | | | | 0.154 |
| <20 years | 244 | 618 | 11.0 (8.9 – 13.4) | |
| 20 – 24 years | 771 | 1946 | 13.1 (11.6 – 14.8) | |
| 25 – 29 years | 801 | 2157 | 12.3 (10.9 – 13.9) | |
| ≥30 years | 924 | 2287 | 14.1 (12.7 – 15.7) | |
| **Maternal education** | | | | **0.036** |
| <High school | 364 | 902 | 14.0 (11.6 – 16.7) | |
| High school | 905 | 2149 | 14.4 (12.8 – 16.0) | |
| >High school | 1462 | 3941 | 12.0 (11.0 – 13.1) | |
| **Maternal race** | | | | **<0.001** |
| White | 993 | 3130 | 10.3 (9.3 – 11.5) | |
| Black | 1653 | 3541 | 16.7 (15.4 – 18.1) | |
| Other races | 94 | 337 | 9.5 (6.7 – 13.3) | |
| **Marital status** | | | | **<0.001** |
| Not married | 1767 | 4117 | 14.5 (13.4 – 15.7) | |
| Married | 972 | 2890 | 11.2 (10.1 – 12.5) | |
| **Annual household income$** | | | | **<0.001** |
| ≤20,000 | 1359 | 3077 | 15.4 (14.0 – 16.8) | |
| >20,000 - ≤40,000 | 597 | 1556 | 12.8 (11.2 – 14.6) | |
| >40,000 - $60,000 | 234 | 686 | 11.6 (9.4 – 14.3) | |
| ≥$60,000 | 346 | 1154 | 9.8 (8.1 – 11.8) | |
| **Insurance status before pregnancy** | | | | 0.142 |
| Uninsured | 571 | 1549 | 11.8 (10.2 – 13.6) | |
| Insured | 2162 | 5449 | 13.3 (12.4 – 14.3) | |
| **Smoking before pregnancy** | | | | 0.293 |
| No | 2422 | 6261 | 12.8 (12.0 – 13.7) | |
| Yes | 310 | 732 | 14.3 (11.8 – 17.1) | |
| **Prepregnancy exercise** | | | | 0.500 |
| No | 1868 | 4679 | 13.1 (12.2 – 14.2) | |
| Yes | 855 | 2291 | 12.5 (11.1 – 14.1) | |

**Note:** n[a] = Unweighted number of women who reported gestational hypertension/preeclampsia; N[b] = the total unweighted number of women in each maternal characteristic category; %[c] = Percentage; CI = Confidence interval of the survey-weighted; p-value = <0.05; PRAMS Pregnancy Risk Assessment Monitoring System.

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**Table 3.**

Prevalence of cesarean delivery by maternal characteristics among Mississippi women, PRAMS 2016–2022.

| | Cesarean Delivery | | | |
|---|---|---|---|---|
| **Maternal characteristic** | **n[a]** | **N[b]** | **%[c] (95% CI)** | **p-value** |
| **Prepregnancy obesity** | | | | **<0.001** |
| Not obese | 1588 | 4102 | 30.1 (28.3 – 32.0) | |
| Obese | 1476 | 2656 | 48.5 (46.0 – 51.1) | |
| **Maternal age at delivery** | | | | **<0.001** |
| <20 years | 167 | 593 | 20.4 (16.2 – 25.2) | |
| 20 – 24 years | 766 | 1886 | 31.6 (28.9 – 34.5) | |
| 25 – 29 years | 992 | 2099 | 40.6 (37.8 – 43.5) | |
| ≥30 years | 1156 | 2219 | 43.6 (40.9 – 46.3) | |
| **Maternal education** | | | | **<0.001** |
| <High school | 328 | 861 | 29.7 (25.6 – 34.2) | |
| High school | 913 | 2069 | 35.6 (32.8 – 38.5) | |
| >High school | 1836 | 3850 | 39.8 (37.8 – 41.9) | |
| **Maternal race** | | | | 0.206 |
| White | 1351 | 3067 | 37.0 (34.8 – 39.2) | |
| Black | 1606 | 3405 | 38.5 (36.2 – 40.9) | |
| Other races | 124 | 325 | 32.6 (26.6 – 39.2) | |
| **Marital status** | | | | **0.011** |
| Not married | 1746 | 3969 | 35.4 (33.4 – 37.6) | |
| Married | 1335 | 2825 | 39.5 (37.2 – 41.8) | |
| **Annual household income, $** | | | | 0.361 |
| ≤20,000 | 1356 | 3042 | 35.7 (33.3 – 38.2) | |
| >20,000 - ≤40,000 | 730 | 1543 | 38.2 (35.0 – 41.5) | |
| >40,000 - ≤60,000 | 319 | 679 | 39.5 (34.8 – 44.4) | |
| ≥60,000 | 514 | 1134 | 38.6 (35.2 – 42.1) | |
| **Insurance status before pregnancy** | | | | 0.707 |
| Uninsured | 669 | 1506 | 36.8 (33.6 – 40.1) | |
| Insured | 2409 | 5281 | 37.5 (35.8 – 39.3) | |
| **Smoking before pregnancy** | | | | 0.498 |
| No | 2744 | 6066 | 37.1 (35.5 – 38.8) | |
| Yes | 329 | 714 | 39.0 (34.0 – 44.1) | |
| **Prepregnancy exercise** | | | | 0.566 |
| Yes | 1018 | 2217 | 37.9 (35.3 – 40.6) | |
| No | 2044 | 4543 | 37.0 (35.1 – 38.9) | |

**Note**: n[a] = Unweighted number of women who reported gestational hypertension/preeclampsia; N[b] = the total unweighted number of women in each maternal characteristic category; %[c] = Percentage; CI = Confidence interval of the survey-weighted; p-value = <0.05; PRAMS Pregnancy Risk Assessment Monitoring System.

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**Table 4.**

Odds of cesarean delivery and prepregnancy obesity among Mississippi women, PRAMS 2016–2022.

| Characteristic | | Model 1 | Model 2 | Model 3 |
|---|---|---|---|---|
| **Outcome** | **Prepregnancy obesity** | **OR[a] (95% CI)** | **AOR[b] (95% CI)** | **AOR[c] (95% CI)** |
| **Cesarean delivery** | Non-obese | 1.00 (Reference) | 1.00 (Reference) | 1.00 (Reference) |
| | Obese | 2.18 (1.91 – 2.50) | 2.08 (1.80 – 2.40) | 2.09 (1.86 – 2.42) |
| | Unweighted (n) | 6758 | 6758 | 6331 |
| | Weighted (N) | 32,467 | 32,467 | 30,571 |

**Note:** AOR: adjusted odds ratio; PRAMS, Pregnancy Risk Assessment Monitoring System; CI: confidence interval; OR: odds ratio;

[a] unadjusted;

[b] adjusted for age, race;

[c] adjusted for age, race, marital status, education, income, insurance, smoking, exercise. Non-obese (BMI <30 kg/m$^2$) was the reference category; obese was defined as BMI ≥30 kg/m$^2$. Analytic sample sizes vary across models because participants with missing values for variables included in a given model were excluded from that analysis.

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**Table 5.**

Odds of preterm birth and prepregnancy obesity among Mississippi women, PRAMS 2016–2022.

| Characteristic | | Model 1 | Model 2 | Model 3 |
|---|---|---|---|---|
| **Outcome** | **Prepregnancy obesity** | **OR[a] (95% CI)** | **AOR[b] (95% CI)** | **AOR[c] (95% CI)** |
| **Preterm birth (<37 weeks of gestation)** | Non-obese | 1.00 (Reference) | 1.00 (Reference) | 1.00 (Reference) |
| | Obese | 1.29 (1.11 – 1.51) | 1.14 (0.97 – 1.34) | 1.10 (0.93 – 1.31) |
| | Unweighted (n) | 6974 | 6974 | 6411 |
| | Weighted (N) | 33,549 | 33,549 | 31,020 |

Note: AOR: adjusted odds ratio; PRAMS, Pregnancy Risk Assessment Monitoring System; CI: confidence interval; OR: odds ratio;

[a] unadjusted;

[b] adjusted for age, race;

[c] adjusted for age, race, marital status, education, income, insurance, smoking, exercise. Non-obese (BMI <30 kg/m$^2$) was the reference category; obese was defined as BMI ≥30 kg/m$^2$. Analytic sample sizes vary across models because participants with missing values for variables included in a given model were excluded from that analysis.