

# Focus on Pre-Pregnancy Obesity

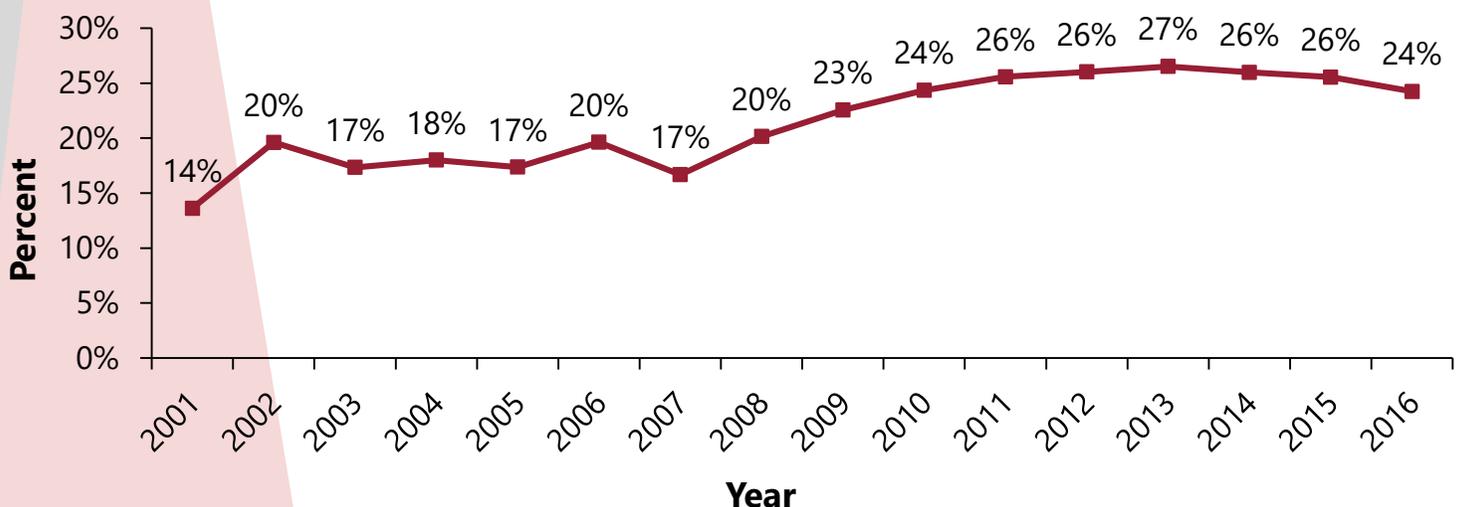
## Among Maryland Women Giving Birth 2001-2016

### Introduction

A mother's pre-pregnancy body mass index (BMI) can have an effect on the health of both the mother and the infant. The American College of Obstetricians and Gynecologists (ACOG) reports that pre-pregnancy obesity (BMI equal to or greater than 30 kg/m<sup>2</sup>) can put a mother at risk for numerous morbidities, including gestational diabetes and pre-eclampsia, and can increase the risk of needing a Cesarean section (C-section) at delivery.<sup>1</sup> ACOG also reports that infants born to mothers with pre-pregnancy obesity are at a greater risk of health problems including miscarriage, neural tube defects and other congenital anomalies, high birth weight, preterm birth, and stillbirth.<sup>1,2</sup> ACOG has released guidelines for weight gain during pregnancy based on the mother's pre-pregnancy BMI, suggesting that mothers with pre-pregnancy obesity gain less weight during pregnancy than mothers with a normal BMI.<sup>3</sup>

This data brief uses information from the Maryland Pregnancy Risk Assessment Monitoring System (PRAMS) survey to understand the relationships between pre-pregnancy obesity and multiple demographic, behavioral, and health characteristics, as well as associated birth outcomes. The Maryland PRAMS survey includes questions about maternal weight gain, preconception health factors, behavioral health risk factors such as smoking and alcohol consumption, and other health characteristics such as pre-existing conditions like diabetes and hypertension. The analysis was limited to Maryland women who participated in the PRAMS survey from 2001-2016. Maternal pre-pregnancy BMI was calculated using the birth certificate pre-pregnancy height and weight, or the PRAMS height and weight if birth certificate information was not available. Mothers with a pre-pregnancy BMI equal to or greater than 30 kg/m<sup>2</sup> were considered obese.

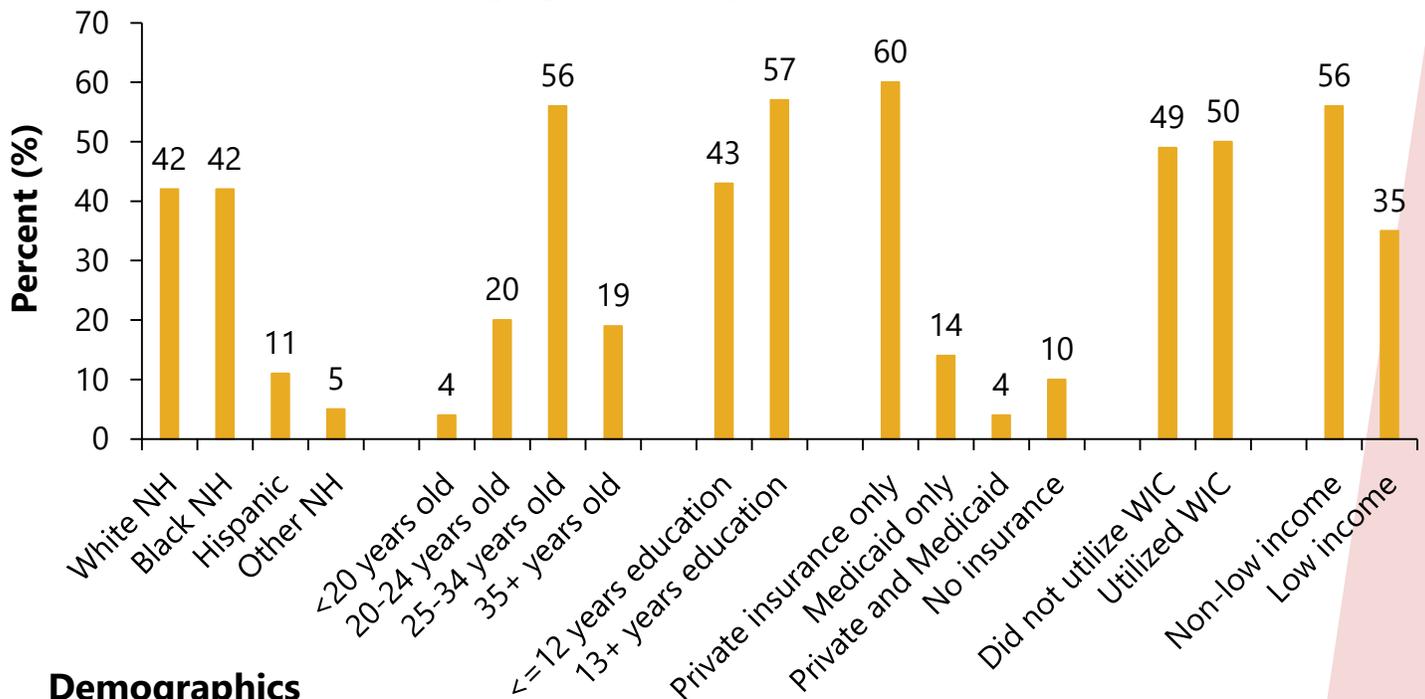
**Figure 1: Percentage of Recent Mothers with Pre-Pregnancy Obesity, Maryland, 2001-2016**



## Pre-Pregnancy Obesity Change Over Time

Figure 1 shows the yearly percentages of pre-pregnancy obesity among Maryland women who gave birth from 2001-2016. The percentage of mothers with pre-pregnancy obesity increased by 78 percent, from 14 percent in 2001, to 24 percent in 2016.

**Figure 2: Percent of women with pre-pregnancy obesity by select demographics, Maryland, 2001-2016**



## Demographics

Figure 2 shows the demographic and socioeconomic characteristics of recent mothers who were obese. The majority of mothers who were obese were non-Hispanic (NH) White (42 percent) and NH Black (42 percent), 25-34 years old (56 percent), had 13 or more years of education (57 percent), had only private insurance to pay for their prenatal care (60 percent), were recipients of Women, Infants, and Children (WIC) services (50 percent), and did not have a low yearly income (<\$25,000 for years 2001-2011, <\$26,001 for years 2012-2015, <\$24,001 for 2016) (56 percent).

## Maternal Health and Delivery Factors

Multiple maternal health and delivery factors were examined to determine their relationship with pre-pregnancy obesity (Table 1). Statistical models that controlled for race, age, education, insurance, and WIC utilization were used to determine if there was a statistically significant difference between mothers who were obese and those who were not. Obese mothers were significantly more likely to smoke in the 3 months prior to pregnancy (AOR 1.2, 95 percent confidence interval [CI] 1.0-1.3) and have preconception health problems such as diabetes (AOR 2.0, CI 1.5-2.7), high blood pressure (AOR 2.7, CI 2.2-3.3), asthma (AOR 1.6, CI 1.4-1.9), and depression (AOR 1.3, CI 1.1-1.6). Mothers with pre-pregnancy obesity were significantly more likely to have had a previous Cesarean section (AOR 2.2, CI 1.4-3.3), and more frequently reported that a health care worker discussed maintaining a healthy weight (AOR 4.6, CI 3.0-7.2) with them.

During pregnancy, mothers with pre-pregnancy obesity were significantly more likely to report below normal gestational weight gain (AOR 2.0, CI 1.7-2.3), gestational diabetes (AOR 3.1, CI 2.6-3.7), gestational hypertension (AOR 2.7, CI 2.3-3.1), and severe nausea, vomiting, or dehydration (AOR 1.2, CI 1.0-1.4).

During delivery, mothers with pre-pregnancy obesity had higher rates of a first C-section (AOR 1.6, CI 1.5-1.8) and a repeat C-section (AOR 1.9, CI 1.6-2.1) compared to non-obese mothers. Significantly more mothers with pre-pregnancy obesity reported needing a C-section because the baby was too big (AOR 2.0, CI 1.3-2.9).

**Table 1: Maternal health and delivery factors of recent mothers by pre-pregnancy obesity, Maryland, 2001-2016**

	Not Obese* (weighted n=793,026)		Obese (weighted n=220,234)		Adjusted Odds Ratio	
	%	(95% CI)	%	(95% CI)	AOR	(95% CI)
<b>Total</b>	<b>76</b>	<b>(75 - 76)</b>	<b>21</b>	<b>(20 - 22)</b>		
<b>Preconception Health</b>						
Smoked during the 3 months prior to pregnancy	17	(16 - 18)	20	(18 - 21)	1.2	(1.0 - 1.3)
Diabetes (phases 5, 6, 7, 8)	2	(1 - 2)	4	(3 - 4)	2.0	(1.5 - 2.7)
High blood pressure (phases 5, 6, 7, 8)	3	(2 - 3)	8	(7 - 9)	2.7	(2.2 - 3.3)
Asthma (phases 5, 6, 7, 8)	8	(7 - 8)	13	(12 - 15)	1.6	(1.4 - 1.9)
Depression (phases 6, 7, 8)	9	(8 - 10)	12	(10 - 14)	1.3	(1.1 - 1.6)
Previous C-section (phase 8)	14	(12 - 17)	28	(21 - 34)	2.2	(1.4 - 3.3)
Health care worker discussed maintaining healthy weight (phase 8)	21	(18 - 24)	43	(36 - 49)	4.7	(3.0 - 7.2)
<b>Maternal Morbidities during Pregnancy</b>						
Below normal gestational weight gain	20	(19 - 20)	24	(22 - 25)	2.0	(1.7 - 2.3)
Gestational diabetes	3	(3 - 3)	9	(8 - 10)	3.1	(2.6 - 3.7)
Gestational hypertension	4	(4 - 5)	12	(11 - 13)	2.7	(2.3 - 3.1)
Severe nausea, vomiting, or dehydration (phases 4, 5, and 6)	26	(25 - 28)	32	(30 - 34)	1.2	(1.0 - 1.4)
<b>Delivery</b>						
First C-section	19	(18 - 20)	27	(26 - 29)	1.6	(1.5 - 1.8)
Repeat C-section	10	(9 - 10)	18	(16 - 19)	1.9	(1.6 - 2.1)
C-section because baby was too big (phases 6 and 8)	3	(3 - 4)	9	(7 - 11)	2.0	(1.3 - 2.9)

CI: Confidence Interval

Columns may not add up to 100 percent due to missing data

\*Reference Group

All factors have statistically significant difference between obese and not obese when compared to reference group and controlling for the following demographic factors: race, age, education, insurance, WIC utilization

**Table 2: Infant outcomes of recent mothers by pre-pregnancy obesity, Maryland, 2001-2016**

	Not Obese* (weighted n=793,026)		Obese (weighted n=220,234)		Adjusted Odds Ratio	
	%	(95% CI)	%	(95% CI)	AOR	(95% CI)
<b>Total</b>	<b>76</b>	<b>(75 - 76)</b>	<b>21</b>	<b>(20 - 22)</b>		
<b>Gestational Age</b>						
Preterm (<37 weeks)	9	(9 - 10)	11	(10 - 12)	1.2	(1.1 - 1.3)
Extremely preterm (<28 weeks)	0.7	(0.6 - 0.7)	1.2	(1.1 - 1.3)	1.5	(1.3 - 1.5)
Very preterm (28-31 weeks)	0.9	(0.8 - 0.9)	1.2	(1.0 - 1.3)	1.3	(1.1 - 1.5)
Late preterm (32-36 weeks)	8	(7 - 8)	9	(8 - 10)	1.2	(1.0 - 1.3)
<b>Birth Weight</b>						
Extremely low (<1000 grams)	0.7	(0.6 - 0.7)	1.3	(1.1 - 1.4)	1.6	(1.4 - 1.8)
Very low (1000-1499 grams)	0.7	(0.6 - 0.7)	0.9	(0.8 - 1.0)	1.3	(1.1 - 1.5)
High (4000+ grams)	8	(7 - 8)	10	(9 - 12)	1.5	(1.3 - 1.7)
<b>Length of Hospital Stay</b>						
Three to five days	34	(33 - 35)	43	(42 - 45)	1.5	(1.4 - 1.7)
Six or more days	7	(6 - 7)	8	(7 - 9)	1.3	(1.2 - 1.5)
Still in hospital	0.2	(0.2 - 0.2)	0.4	(0.2 - 0.5)	1.5	(1.0 - 2.3)
<b>Other</b>						
Small for gestational age	10	(9 - 10)	9	(8 - 10)	0.7	(0.5 - 0.9)
Large for gestational age (2010-2016)	9	(8 - 10)	15	(13 - 17)	1.8	(1.5 - 2.1)
Infant admitted to NICU (phases 4, 5, 6, 7)	12	(11 - 13)	15	(14 - 16)	1.2	(1.1 - 1.4)

CI: Confidence Interval NICU: Neonatal Intensive Care Unit  
Columns may not add up to 100 percent due to missing data

\*Reference Group

All factors have statistically significant difference between obese and not obese when compared to reference group and controlling for the following demographic factors: race, age, education, insurance, WIC utilization

## Infant Outcomes

Table 2 shows the significant infant outcomes for infants born to mothers with pre-pregnancy obesity. Infants born to mothers with pre-pregnancy obesity were significantly more likely to be born preterm (<37 weeks gestation, AOR 1.2, CI 1.1-1.3), extremely preterm (<28 weeks gestation, AOR 1.5, CI 1.3-1.5), very preterm (28-31 weeks gestation, AOR 1.3, CI 1.1-1.5), or late preterm (32-36 weeks gestation, AOR 1.2, CI 1.0-1.3). They were also significantly more likely to be extremely low birth weight (weighing <1000 grams, AOR 1.6, CI 1.4-1.8), very low birth weight (weighing 1000-1499 grams, AOR 1.3, CI 1.1-1.5), or high birth weight (weighing 4000+ grams, AOR 1.5, CI 1.3-1.7).

Overall, these infants were significantly less likely to be born small for gestational age (AOR 0.7, CI 0.5-0.9), and significantly more likely to be born large for gestational age (AOR 1.8, CI 1.5-2.1), than their counterparts born to mothers without pre-pregnancy obesity. The length of hospital stay after birth was significantly longer for infants born to mothers with pre-pregnancy obesity, with significantly more infants staying in the hospital three to five days (AOR 1.5, CI 1.4-1.7), six or more days (AOR 1.3, CI 1.2-1.5), or still in the hospital at the time of the survey (AOR 1.5, CI 1.0-2.3). Infants born to mothers with pre-pregnancy obesity were more likely to be admitted to the NICU (AOR 1.2, CI 1.1-1.4).



## Conclusion

More than one in five Maryland mothers who gave birth from 2001-2016 had pre-pregnancy obesity. Pre-pregnancy obesity occurred at the highest percentage among mothers who were non-Hispanic White and NH Black, 25-34 years old, had 13 or more years of education, had only private insurance to pay for their prenatal care, and did not have a low yearly income (<\$25,000 for years 2001-2011, <\$26,001 for years 2012-2015, <\$24,001 for 2016).

Many maternal and preconception health factors were examined in relation to pre-pregnancy obesity, and after controlling for demographics, numerous health factors including diabetes, high blood pressure, asthma, and depression were significantly associated with pre-pregnancy obesity. Maternal morbidities including inadequate gestational weight gain, gestational diabetes, gestational hypertension or preeclampsia, severe nausea, vomiting, and dehydration, and Cesarean sections were significantly associated with pre-pregnancy obesity, as well.

Infants born to mothers with pre-pregnancy obesity were significantly more likely to have adverse birth outcomes, including preterm birth, extremely low, very low and high birth weight, large for gestational age, and spending more time in the hospital and admission to the NICU.

In light of the increased prevalence of pre-pregnancy obesity, it is important to understand factors that may be associated with an increased risk of obesity, as well as the subsequent risks of obesity to the mother and baby. Doing so will help identify at-risk women and inform interventions, with the long-term effects of reductions in maternal morbidities and adverse birth outcomes.

## PRAMS Methodology

Data included in this report were collected through the Pregnancy Risk Assessment Monitoring System (PRAMS), a surveillance system established by the Centers for Disease Control and Prevention (CDC) to obtain information about maternal behaviors and experiences that may be associated with adverse pregnancy outcomes.

In Maryland, the collection of PRAMS data is a collaborative effort of the Maryland Department of Health and the CDC. Each month, a sample of approximately 200 Maryland women who have recently delivered live born infants are surveyed by mail or by telephone, and responses are weighted to make the results representative of all Maryland births.

This report is based on the responses of 23,207 Maryland mothers who delivered live born infants between January 1, 2001, and December 31, 2016 and were surveyed two to six months after delivery.

## Limitations of Report

PRAMS data are retrospective and therefore subject to recall bias. It is also based on the mother's perception of events and may not be completely accurate.

Although estimates for the associations between obesity and the outcomes are adjusted for demographics, it is possible that characteristics not collected by the survey may explain some of the associations seen in this report.

## References

1. American College of Obstetricians and Gynecologists. FAQ 182 Obesity and Pregnancy. American College of Obstetricians and Gynecologists 2016.  
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