

# PRAMISGRAM

OKLAHOMA PREGNANCY RISK ASSESSMENT MONITORING SYSTEM VOL 10 NO 2 FALL 2006

## Maternal Overweight and Obesity

### Introduction:

In recent years, increasing attention has been paid to the role of overweight and obesity in health and illness. In most studies, Body Mass Index (BMI) is used to approximate a person's body fat percentage because it can be obtained with a minimal amount of time, resources and staff training. BMI is calculated using only height and weight (kg/m<sup>2</sup>). Pre-pregnancy BMI is divided into the following categories: Underweight (<19.8), Normal (19.8-25.9), Overweight (26-28.9), and Obese (29+). From 1996 to 2003, the proportion of women in Oklahoma who were overweight and obese prior to pregnancy increased 43.1% and 15.3%, respectively<sup>1</sup>.

A mother's pre-pregnancy BMI can dramatically impact the outcome of a pregnancy for both mother and infant. Maternal complications include an increased likelihood of cesarean section, induced labor, gestational diabetes, hypertension, pre-eclampsia, thromboembolic disorders, and placental defects.<sup>2,3</sup> High BMI ( $\geq 26$ ) also increases the likelihood of delivery-related complications including premature birth, low Apgar scores, and shoulder dystocia.<sup>3,4</sup> In addition, the incidence of birth defects is up to 37.5% higher in women with a BMI of 30 or higher; the majority of these are neural tube defects (such as spina bifida) and heart defects.<sup>2,5,6</sup> In obese women (BMI  $\geq 30$ ), perinatal infant death rates (between 28th week of pregnancy and 7 days after birth) are also elevated to 2.5-3.4 times that of those born to mothers of normal weight.<sup>4</sup>

Healthcare for overweight and obese women can be more resource intensive than care for women with normal BMIs. Due to the potential for complications, hospital prenatal care costs for women with BMIs over 26 are roughly five times that of women of normal weight.<sup>4</sup> In addition, infants of obese women are up to 3.5 times more likely to be admitted to a neonatal intensive care unit (NICU). Altogether, obese women spend 4-5 days longer in the hospital over the course of an entire pregnancy than do women of normal weight.<sup>2,4</sup>

This PRAMISgram will explore the issue of maternal weight and its relationship to maternal morbidity and will offer recommendations to address overweight and obesity in Oklahoma.

### In Oklahoma

- One third of all Oklahoma mothers were classified as either overweight (BMI 26-28.9) or obese (BMI 29 or greater) prior to pregnancy.
- Prior to pregnancy, almost 13% of women were overweight and 20% were obese.
- Those most likely to be obese were women who were American Indian; 25-29 years of age; and/or married.
- Obese women were more likely to experience high blood pressure or edema, high blood sugar and cesarean sections than women in the normal weight category.

### Methods:

In this descriptive analysis, PRAMS data for survey years 2000 through 2003 were examined. Pre-pregnancy body mass index (BMI) was calculated as weight in kilograms divided by the square of height in meters. Women in the study were classified according to the Institute of Medicine's guidelines for pre-pregnant women as: normal weight (BMI 19.8 to 25.9), overweight (BMI 26.0 to 28.9), and obese (BMI  $\geq 29.0$ ).<sup>7</sup> Women determined to be underweight (BMI < 19.8) were excluded from the study.

The PRAMS questionnaire contains items designed to obtain information on maternal complications during pregnancy. Complications included: premature labor; high blood pressure or water retention (edema); vaginal bleeding; problems with the placenta; nausea, vomiting or dehydration; diabetes; and premature rupture of membranes. Premature labor is described as labor pains more than three weeks before the projected delivery date. High blood pressure includes the conditions for preeclampsia or toxemia. Problems with the placenta include those such as abruptio placentae and placenta previa. Premature rupture of membranes (PROM) is characterized by water breaking more than three

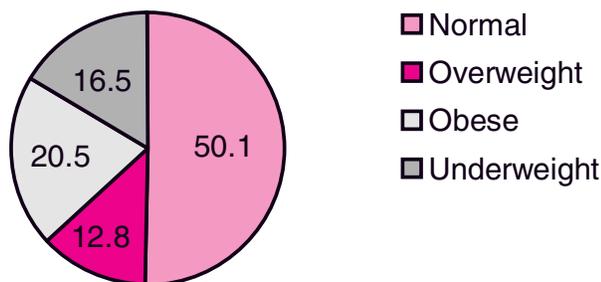
weeks before the pregnancy due date. For each item, women reported whether or not they experienced the complication during their pregnancy (coded as Yes/No). Outcome variables examined in this analysis include low birth weight (<2,500 grams), preterm delivery (<37 weeks gestation), and method of delivery.

The analysis includes a general description of maternal characteristics for the BMI groups. The prevalence and 95% confidence intervals (CI) for each pregnancy complication and outcome are computed for each BMI category. The chi-square statistic was used to determine important associations using a significance level of  $p < 0.05$ .

## Results:

Overall, by BMI category, 50.1% (n=3413) of births were to women described as normal weight, 12.8% (n=938) were to women described as overweight, and 20.5% (n=1794) were to women described as obese (See Figure 1). Underweight women (16.5% of the births) were not included in this analysis.

**Figure 1: Pre-pregnancy BMI for Oklahoma Women: Oklahoma PRAMS 2000-2003**



Maternal demographics by category of pre-pregnancy body mass index are displayed in Table 1. Hispanic women (19.0%) were significantly more likely to be overweight than were non-Hispanic women (12.3%). Women who were American Indian; aged 25-29; and/or married had the highest rates of obesity. American Indian women (28.0%) were significantly more likely to be obese than were white women (20.1%). Teen women (10.6%) were significantly less likely to experience obesity than were all other age groups. There was a significant difference between the young adults

**Table 1. Pre-pregnancy Body Mass Index (BMI) by Maternal Characteristics: Oklahoma PRAMS, 2000-2003**

Characteristic	Normal (19.8-25.9) [n=3413]		Overweight (26.0-28.9) [n=938]		Obese (≥ 29.0) [n=1794]	
	%	95%CI	%	95%CI	%	95%CI
<b>Overall<sup>1</sup></b>	50.1	48.3, 52.0	12.8	11.7, 14.1	20.5	19.1, 22.0
<b>Maternal Race</b>						
White	50.5	48.4, 52.6	12.5	11.2, 14.0	20.1	18.5, 21.7
African Am.	51.5	45.2, 57.7	16.6	12.4, 21.8	19.2	14.8, 24.7
Am. Indian	46.1	40.3, 52.1	11.6	8.3, 15.9	28.0	23.2, 33.4
<b>Maternal Age</b>						
<20	48.6	43.7, 53.6	12.0	9.1, 15.6	10.6	8.0, 14.0
20-24	49.9	46.6, 53.2	12.6	10.6, 14.9	19.8	17.3, 22.5
25-29	49.0	45.5, 52.5	11.8	9.8, 14.3	25.5	22.7, 28.6
≥30	52.5	49.0, 55.9	14.7	12.4, 17.4	21.8	19.1, 24.7
<b>Maternal Education<sup>2</sup></b>						
<HS	46.7	41.4, 52.2	13.5	10.2, 17.6	19.4	15.5, 24.1
HS	48.3	45.0, 51.6	13.4	11.3, 15.9	20.3	17.9, 23.1
>HS	53.2	50.4, 55.9	12.5	10.7, 14.4	18.0	16.0, 20.2
<b>Marital Status</b>						
Married	50.6	48.3, 53.0	12.9	11.5, 14.6	24.0	22.1, 26.0
Other	49.2	46.2, 52.3	12.8	10.9, 14.9	15.6	13.6, 17.9
<b>Ethnicity</b>						
Hispanic	46.1	39.5, 52.9	19.0	14.2, 24.9	19.8	15.1, 25.5
Non-Hispanic	50.5	48.6, 52.4	12.3	11.1, 13.6	20.5	19.1, 22.1

<sup>1</sup>Includes other or unknown races.

<sup>2</sup>Excludes women <20 years of age.

(ages 20-24, 19.8%) and those in their late twenties (ages 25-29, 25.5%). Nearly 1 in 4 (24%) married women were found to be obese. This is significantly higher than non-married women (15.6%). No differences were observed in the rate of obesity for either maternal education or ethnicity.

Some variability in the presence of morbidity conditions was found by BMI category (Table 2). Those women who were classified as overweight or obese were far more likely to report high blood pressure or water retention. Roughly one-third of the women in these BMI categories reported having these conditions. This compares to 19.7% of normal weight women. The prevalence of diabetes was higher in both the overweight (9.9%) and the obese categories (15.6%), compared to normal weight mothers (7%); the difference between normal and obese women was statistically significant. There appeared to be a direct relationship between BMI and the presence of diabetes. An observed difference was seen between overweight and obese women, however it was not statistically significant. Overweight women (2.9%) experienced premature rupture of membranes at a rate notably lower than either normal weight (6.1%) or obese (6.0%) women. Obese women had the highest rates for premature labor; vaginal bleeding; and nausea, vomiting, or dehydration yet the differences were statistically negligible. No significant difference was found in length of hospital stay (data not shown).

The Pregnancy Risk Assessment Monitoring System (PRAMS) is an ongoing, population-based study designed to collect information about maternal behaviors and experiences before, during and after pregnancy. On a monthly basis, PRAMS samples between 200 and 250 recent mothers from the Oklahoma live birth registry. Mothers are sent as many as three mail questionnaires seeking their participation, with follow-up phone interviews for non-respondents. A systematic stratified sampling design is used to yield sample sizes sufficient to generate population estimates for groups considered at risk for adverse pregnancy outcomes. Information included in the birth registry is used to develop analysis weights that adjust for probability of selection and non-response. Initially, 9,736 mothers, in 2000-2003, were sampled and sent the survey. Of these, 7,680 responded yielding a response of 78.9 percent. There were 7,288 mothers (95%) with a valid response for the computed body mass index (BMI).

**Table 2. Selected Morbidity Conditions by Pre-pregnancy Body Mass Index (BMI): Oklahoma PRAMS, 2000-2003**

	Normal (19.8-25.9) [n=3413]		Overweight (26.0-28.9) [n=938]		Obese (≥ 29.0) [n=1794]	
	%	95%CI	%	95%CI	%	95%CI
	<b>Presence of Morbidity Conditions</b>					
Premature labor	33.5	31.1, 36.0	30.8	26.3, 35.8	33.8	30.2, 37.6
High blood pressure or water retention†	19.7	17.7, 21.9	32.3	27.6, 37.2	34.2	30.6, 38.0
Vaginal bleeding	15.4	13.7, 17.4	15.0	11.8, 19.0	17.7	15.0, 20.8
Problems w/placenta	6.7	5.5, 8.0	5.9	3.9, 8.8	6.7	5.1, 8.9
Nausea, vomiting, or dehydration	30.3	27.9, 32.7	31.7	27.1, 36.7	34.8	31.1, 38.7
High blood sugar (diabetes)†	7.3	6.0, 8.8	9.9	7.3, 13.3	15.6	13.0, 18.6
Premature rupture of membranes‡	6.1	5.1, 7.2	2.9	2.0, 4.2	6.0	4.4, 7.9

†P<0.0001, ‡P=0.0002

Considerable variation exists in the rate of pregnancy outcomes by BMI category (Table 3). Vaginal delivery was far more common in normal weight (76.1%) and overweight women (70.3%) than in obese women (57.7%). Obese women were also significantly more likely to have a cesarean delivery than were normal weight women (21.7% vs. 13.3%). Likewise, repeat cesarean deliveries occurred at the highest rate in the obese BMI category (18.1%). This is significantly higher than the normal weight BMI group, which had a rate of 9%. No significant differences were found in the rate of low birth weight delivery by BMI group. Overweight women (5.4%) had a rate of preterm delivery appreciably lower than either the normal weight (8.7%) or obese (10.0%) women. Normal weight and obese women were not significantly different in the rate of preterm birth.

**Table 3. Selected Pregnancy Outcomes by Pre-pregnancy Body Mass Index (BMI): Oklahoma PRAMS, 2000-2003**

Outcome	Normal (19.8-25.9) [n=3413]		Overweight (26.0-28.9) [n=938]		Obese (≥ 29.0) [n=1794]	
	%	95%CI	%	95%CI	%	95%CI
	<b>Delivery method</b>					
Vaginal†	76.1	73.8, 78.2	70.3	65.5, 74.8	57.7	53.7, 61.6
Cesarean†	13.3	11.7, 15.1	16.0	12.7, 20.0	21.7	18.7, 25.0
Repeat Cesarean†	9.0	7.6, 10.7	12.0	9.2, 15.7	18.1	15.3, 21.4
VBAC‡	1.2	0.7, 1.9	1.1	0.5, 2.8	2.2	1.3, 3.9
<b>Low birth weight</b>						
<2,500 gms	6.5	6.2, 6.9	6.1	5.3, 6.9	7.1	6.4, 7.8
<b>Preterm</b>						
<37 weeks gestation‡	8.7	7.6, 9.9	5.4	4.2, 6.9	10.0	8.2, 12.2

†P<0.0001, ‡P=0.0002

‡Vaginal birth after cesarean

## Discussion:

In Oklahoma, one third of women were overweight or obese before they became pregnant. According to PRAMS data, the most common maternal risks associated with overweight and obesity were delivery by cesarean section (C-section), having high blood sugar and having high blood pressure and/or edema. Oklahoma data indicate being overweight (BMI 26-28.9) may be associated with better outcomes for some conditions (low birth weight, premature rupture of membrane, and preterm delivery). However, these data are not consistent with published literature from current research studies.<sup>3,4</sup>

Twenty-two percent of Oklahoma women who were obese delivered by cesarean section compared to only 13% of normal weight women. C-sections are associated with longer hospital stays and increased risks of infection, scarring, hernias, hemorrhage and the need for transfusions, pulmonary embolism, and complications from anesthesia.<sup>8</sup>

One in four overweight or obese women reported high blood sugar at some time during their pregnancy. The PRAMS survey did not differentiate between preexisting and gestational diabetes. Those women with preexisting diabetes have a higher risk of spontaneous abortions, stillbirths, and delivering infants with congenital malformations (accounting for 40-50% of perinatal infant deaths).<sup>9</sup> Mothers who have gestational diabetes have a fifty percent chance of it recurring with a subsequent pregnancy and a 20-50% chance of developing Type II diabetes later in life.<sup>9</sup> Additionally, there are increased risks for hypertensive disorders during pregnancy and increased risks of traumatic delivery or cesarean births due to large for gestational age infants. Infants exposed to diabetes in utero are more likely to develop Type II diabetes and to be obese as adolescents and adults.<sup>9</sup>

High BMI, in Oklahoma, is also associated with development of high blood pressure (including pregnancy induced hypertension and preeclampsia). Maternal risk factors associated with preeclampsia include increased risk for developing pulmonary edema, placental abruption, deterioration of hepatic and renal function, oligohydramnios, increased risk for fetal intolerance to labor resulting in cesarean delivery, and death. The treatment for severe preeclampsia is delivery, thus putting the infant at risk for low birth weight, small for gestational age, prematurity, and death.<sup>8,10</sup>

Several limitations for this study exist. The analysis examined variables independently and did not control for covariates. Adjusting for covariates may moderate these relationships. Variables such as height, weight and maternal morbidity are self-reported and subject to recall and social desirability bias. Differences exist between the self-re-

ported conditions in this paper and documented morbidities from Oklahoma birth certificate records. The self-reported conditions listed here (high blood sugar, high blood pressure) have a much higher incidence than what is reported by clinicians on the birth record. While some of that is explained by the broad definitions given in the PRAMS survey, some discrepancy may be due to an over-reporting of symptoms by mothers in PRAMS and an underreporting of conditions on the birth certificate. Recent research indicates that use of BMI to determine obesity and overweight status may be problematic itself, however at this time it remains the easiest and most cost effective tool available.

## Recommendations:

- All women in Oklahoma should be at a healthy weight prior to pregnancy to minimize health risks for themselves and their infants.
- Every health visit for a woman of childbearing age should be viewed as a preconception health visit by all providers and as an opportunity to discuss healthy eating and physical activity.
- Increase public and private health insurance coverage for women with low incomes to improve access to preventative women's health, preconception and interconception (between pregnancies) care.
- Every woman leaving a family planning visit should know her BMI and its impact on her health.
- For those women who are experiencing a transition from high school to college or to the work environment, encourage ways to develop or continue healthy eating and physical activities to avoid unnecessary weight gain.
- Promote breastfeeding for postpartum weight loss, the prevention of type II diabetes for mother and child and to decrease the child's risk of obesity as an adult.<sup>11</sup>
- Support breastfeeding mothers in the workplace through the Breastfeeding Friendly Worksite Recognition Project to promote long-term, exclusive breastfeeding.
- Partner with existing programs, such as WIC, Smart Start, and Children First to reach families with very young children to ensure that healthy eating and lifestyle behaviors begin at birth.
- Become involved with your local Turning Point Council to identify ways to help increase health and physical activity in your community.
- Advocate for healthier communities that are designed with physical activity in mind (bike paths, sidewalks, parks and playgrounds).

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