PRAMS PERSPECTIVES

A Pregnancy Risk Assessment Monitoring System Report July, 2005

Maternal Prepregnancy Body Mass Index and Pregnancy Outcomes in Utah

Background

Adult Americans are becoming increasingly overweight, as are Utahans. In 2004, 49.5% of adult Utah women were either overweight or obese (2004 BRFSS data). There has also been a rise in the proportion of Utah women who were overweight or obese prior to becoming pregnant. Utah vital records data show that from 1991 to 2001, the proportion of women who were overweight or obese prior to pregnancy increased from 25.1% in 1991 to 35.2% in 2001.[1] This is of particular concern as women who are not at a healthy weight prior to becoming pregnant are at an increased risk of adverse maternal and infant outcomes.

What is PRAMS?

Data in this newsletter were provided by the Utah Pregnancy Risk Assessment Monitoring System (PRAMS). PRAMS is an ongoing, population-based risk factor surveillance system designed to identify and monitor selected maternal experiences that occur before and during pregnancy and experiences of the child's early infancy. Each month, a sample of approximately 200 women, two to four months postpartum, is selected. The sample is stratified based upon race and birth weight so that inferences and comparisons about these groups can be determined. The results are weighed for sample design and non-response.

PRAMS is intended to help answer questions that birth certificate data alone cannot answer. Data will be used to provide important information that can guide policy and other efforts to improve care and outcomes for pregnant women and infants in Utah. Women were asked questions about prenatal care, breastfeeding, smoking and alcohol use, physical abuse, and early infant care.

The PRAMS data reported here represents all live births to Utah residents from 2000 to 2002. A total of 6921 mothers were selected to participate in the project and 5198 mothers responded for a response rate of 75%. Survey results were weighed for non-response so that analyses could be generalized to the entire population of Utah women delivering live births.

Studies show that obese pregnant women are at increased risk for gestational diabetes, preeclampsia, eclampsia, cesarean section, macrosomia, instrumental delivery, fetal distress, antepartum stillbirth, and early neonatal death.[2,3] Obese women have been found to have longer labors, are more likely to have inadequate contraction patterns during the first stage of labor, and are more likely to receive oxytocin for labor induction and augmentation.[4] Another study found that women whose body mass index (BMI) was greater than 30 were six times more likely to have a cesarean section for cephalopelvic disproportion/failure to progress.[5] Studies also show that women with higher body weight are at increased risk of oral contraceptive failure.[6] In an unpublished analysis of infant deaths due to perinatal conditions from 2001 to 2003, the Utah Department of Health found that women who were obese before becoming pregnant had a significantly higher rate of infant death.

In a recent analysis of ten years of Utah vital records, LaCoursiere found that women who were overweight or obese were at an increased risk of cesarean section at delivery.[1] This held true when controlling for parity, weight gain, preeclampsia, eclampsia, macrosomia, gestational diabetes, and dystocia.

Methodology

For this report, measures of height and prepregnancy weight were self reported. PRAMS respondents were asked "Just before you got pregnant, how much did you weigh?" and "How tall are you without shoes?" Body Mass Index (BMI) was calculated using the formula: (weight in pounds/height in inches^2) X 703.

Four categories of BMI will be used in this report, which adhere to the CDC BMI categories:

Underweight	<18.5
Normal	18.5 – 24.9
Overweight	25.0 – 29.9
Obese	≥30.0

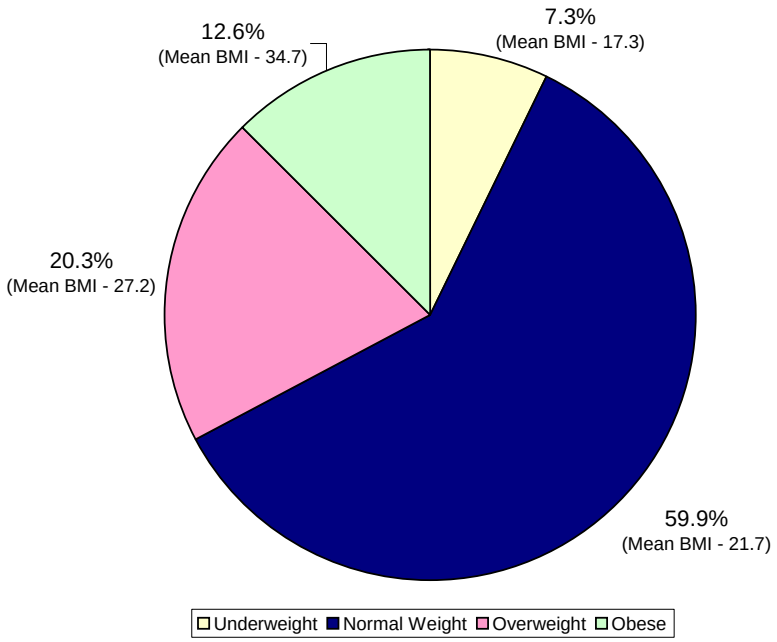
Women with missing BMIs were excluded as well as women who delivered twins or triplets since their risks of developing adverse outcomes are increased. Teen mothers were also excluded as the BMI scales for women younger than 20 differ from adult BMI scales for the weight categories and there is no obese category. See http://www.cdc.gov/nccdphp/dnpa/bmi/bmi-for-age.htm for an explanation of BMI for children and teens.

PRAMS data from 2000 to 2002 were analyzed using chi-square tests and logistic regression modeling to assess how BMI affects pregnancy outcomes. All regression models controlled for maternal age, education, race, ethnicity, marital status, and poverty level unless otherwise specified.

Prepregnancy Body Mass Index in Utah

Figure 1 illustrates the distribution of prepregnancy BMI. More than half of women were of normal weight, 7.3% were underweight, 20.3% were overweight, and 12.6% were obese. The PRAMS numbers correlate with Utah vital records data for the same years.

Figure 1. Prepregnancy Body Mass Index
Utah PRAMS Data, 2000 - 2002



Prepregnancy Body Mass Index and Maternal Characteristics

Table 1 shows the proportion of underweight, overweight, and obese women by maternal characteristics. Each group was compared to the normal BMI group to determine if differences in proportions were statistically significant.

- Underweight women were more likely to be younger, while obese women tended to be older.
- Women who were college graduates had the lowest rates of overweight and obesity.
- Women of races other than white were more likely to be both underweight and obese.
- Primiparous women were more likely to be underweight while multiparous women were more likely to be overweight or obese. Rates of obesity were highest among grand multiparous women.
- Women who smoked in the three months prior to pregnancy were more likely to be underweight.
- Ethnicity or marital status did not appear to significantly affect BMI distribution.

Table 1. Proportion of Births to Underweight, Overweight, and Obese Utah Women by Selected Maternal Characteristics, 2000 – 2002 Utah PRAMS Data.

Characteristics	Percentage Underweight	95% Confidence Interval	P-Value[1]	Percentage Overweight	95% Confidence Interval	P-Value[1]	Percentage Obese	95% Confidence Interval	P-Value[1]
Total Birth Population	7.3%	± 1.0%		20.3%	± 1.5%		12.6%	± 1.2%	
Maternal Age			<0.0001			NS			<0.001
20 - 24	9.3%	± 1.8%		19.6%	± 2.6%		9.0%	± 1.9%	
25 - 29	8.0%	± 1.7%		20.5%	± 2.5%		13.3%	± 2.1%	
30 - 34	4.2%	± 1.5%		19.9%	± 3.5%		15.2%	± 3.0%	
35 - 39	3.0%	± 2.1%		24.3%	± 5.7%		16.3%	± 4.6%	
40 +	5.3%	± 5.4%		14.6%	± 9.2%		18.2%	± 9.9%	
Education Level			<0.05			<0.0001			<0.0001
Less Than High School	7.4%	± 3.4%		21.1%	± 5.6%		14.9%	± 4.8%	
Completed High School	8.8%	± 1.9%		22.9%	± 2.9%		14.3%	± 2.4%	
Some College	6.2%	± 1.6%		21.4%	± 2.7%		14.4%	± 2.3%	
College Graduate	6.9%	± 1.7%		15.7%	± 2.5%		7.7%	± 1.8%	
Race			<0.005			NS			<0.05
White	7.2%	± 1.0%		20.2%	± 1.6%		12.5%	± 1.3%	
Other Than White	9.4%	± 1.5%		21.7%	± 3.7%		14.7%	± 2.0%	
Marital Status			NS			NS			NS
Married	7.1%	± 1.0%		20.2%	± 1.6%		12.5%	± 1.3%	
Unmarried	8.8%	± 3.1%		20.6%	± 4.6%		13.3%	± 3.7%	
Ethnicity			NS			NS			NS
Hispanic	6.5%	± 3.1%		22.7%	± 5.1%		13.7%	± 4.4%	
Non-Hispanic	7.4%	± 1.0%		20.0%	± 1.6%		12.5%	± 1.3%	
Number of Past Live Births			<0.0001			<0.0005			<0.00001
None	9.3%	± 1.9%		16.6%	± 2.4%		8.5%	± 1.8%	
1 to 4	6.5%	± 1.1%		22.0%	± 2.0%		14.3%	± 1.6%	
5 or more	0.0%	± 0.0%		24.5%	± 9.0%		20.1%	± 8.1%	
Birth Interval			NS			<0.005			<0.00001
Less Than 20 Months	6.9%	± 1.9%		21.7%	± 3.2%		15.0%	± 2.7%	
21 to 36 Months	7.3%	± 2.3%		25.2%	± 4.4%		12.0%	± 3.2%	
37 or More Months	6.0%	± 2.3%		19.6%	± 4.0%		14.7%	± 3.6%	
Annual Household Income			NS			<0.005			<0.005
< $15,000	7.6%	± 2.3%		19.2%	± 3.6%		13.1%	± 3.1%	
$15,000 - 35,000	7.7%	± 1.7%		23.7%	± 2.8%		14.2%	± 2.3%	
$35,000 - 50,000	6.0%	± 1.9%		20.3%	± 3.4%		13.9%	± 2.9%	
> $50,000	7.1%	± 1.8%		17.2%	± 2.8%		9.0%	± 2.1%	
FPL			<0.05			<0.005			<0.001
≤100%	8.0%	± 2.3%		22.4%	± 3.7%		13.9%	± 3.0%	
101 - 133%	3.7%	± 1.9%		24.6%	± 5.1%		17.2%	± 4.6%	
134 - 199%	7.9%	± 2.4%		22.6%	± 3.7%		14.9%	± 3.1%	
200%+	7.2%	± 1.3%		18.1%	± 2.0%		10.2%	± 1.6%	
Smoked Three Months Before Pregnancy			<0.005			NS			NS
Yes	11.5%	± 3.4%		20.3%	± 4.6%		14.1%	± 3.8%	
No	6.6%	± 1.0%		20.4%	± 1.6%		12.2%	± 1.3%	
Enrolled in WIC During Pregnancy			NS			NS			<0.005
Yes	6.3%	± 1.8%		21.5%	± 3.2%		16.7%	± 2.9%	
No	7.6%	± 1.1%		19.9%	± 1.8%		11.3%	± 1.4%	

[1] Nomal Body Mass Index as Comparison Group

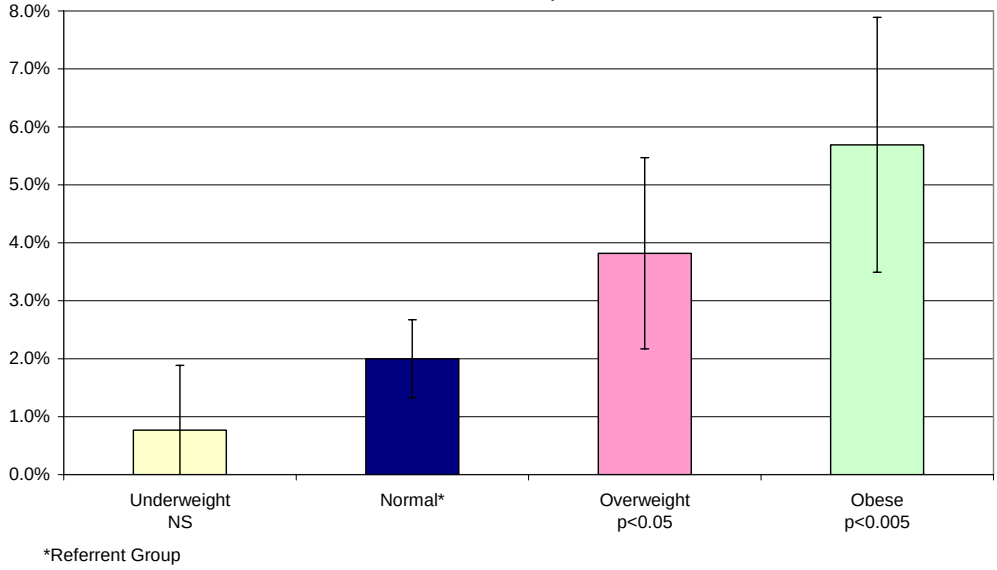
NS = Not Significant

Pregnancy Outcomes by BMI

Maternal Diabetes: Figure 2

Maternal diabetes includes preexisting type I /II diabetes and gestational diabetes. As BMI increases, the incidence of diabetes increases. Compared to normal weight women, women who were overweight or obese had significantly higher rates of diabetes. The rate in obese women was almost three times the rate in normal weight women. Regression analysis showed that women who were overweight or obese had a significantly higher odds of having maternal diabetes; overweight OR=1.9 (1.1, 3.4), obese OR=2.7 (1.6, 4.6).

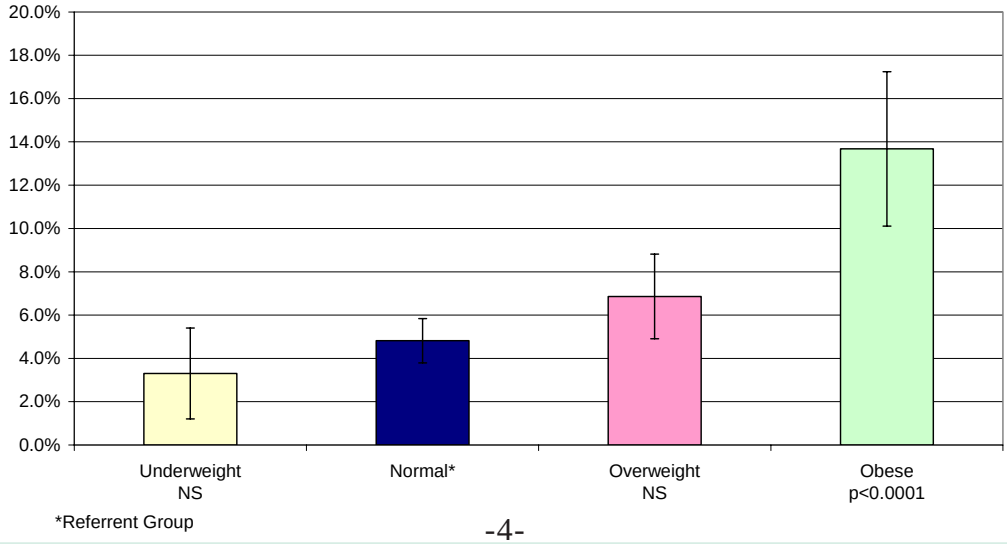
Figure 2. Prevalence of Maternal Diabetes by Prepregnancy Body Mass Index, Utah PRAMS Data, 2000 - 2002



Maternal Hypertension: Figure 3

Maternal hypertension includes chronic or pregnancy associated hypertension and eclampsia. When compared to normal weight women, obese women had significantly higher rates of hypertension. Regression analysis showed that women who were obese had a significantly higher odds of developing pregnancy associated hypertension compared to normal weight women, OR=3.3 (2.3, 4.9).

Figure 3. Prevalence of Maternal Hypertension by Prepregnancy Body Mass Index, Utah PRAMS Data, 2000 - 2002

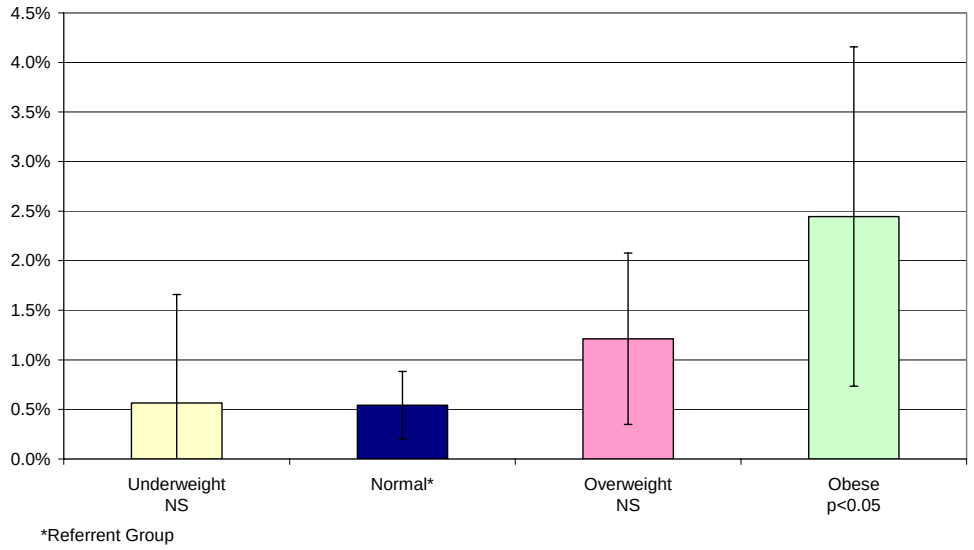


Fetal Macrosomia: Figure 4

Compared to normal weight women, obese women had a significantly higher rate of fetal macrosomia. For this report, macrosomia was defined as a birth weight of 4,500 grams or more. The proportion in normal weight women was 0.5% compared to 2.4% in obese women. Regression analysis showed that when controlling only for diabetes, due to small numbers, women who were obese had a significantly higher odds of having a macrosomic baby, OR=4.2 (1.6, 10.8).

Although obese women in our study population had a higher prevalence of macrosomia, the mean birth weight of term infants for obese women was only 161 grams heavier than term infants born to normal weight women (3,499 grams vs. 3,338 grams).

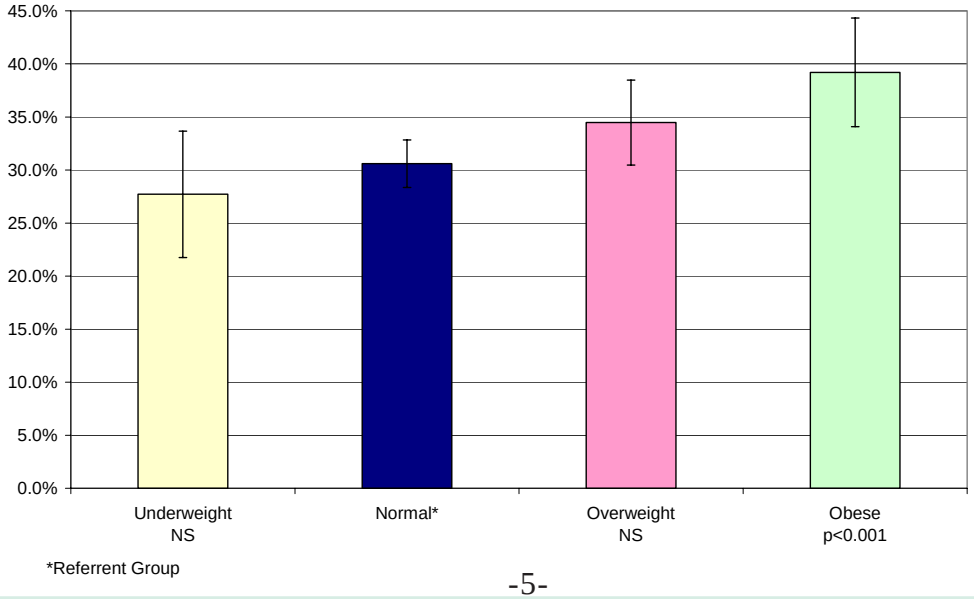
Figure 4. Fetal Macrosomia by Prepregnancy Body Mass Index, Utah PRAMS Data, 2000 - 2002



Labor Induction: Figure 5

Women who were obese had significantly higher rates of induction compared to normal weight women. Regression analysis, adding hypertension and diabetes to the model, showed that both overweight and obese women had increased odds for having their labor induced; overweight OR=1.2 (1.0, 1.5), obese OR=1.5 (1.2, 2.0).

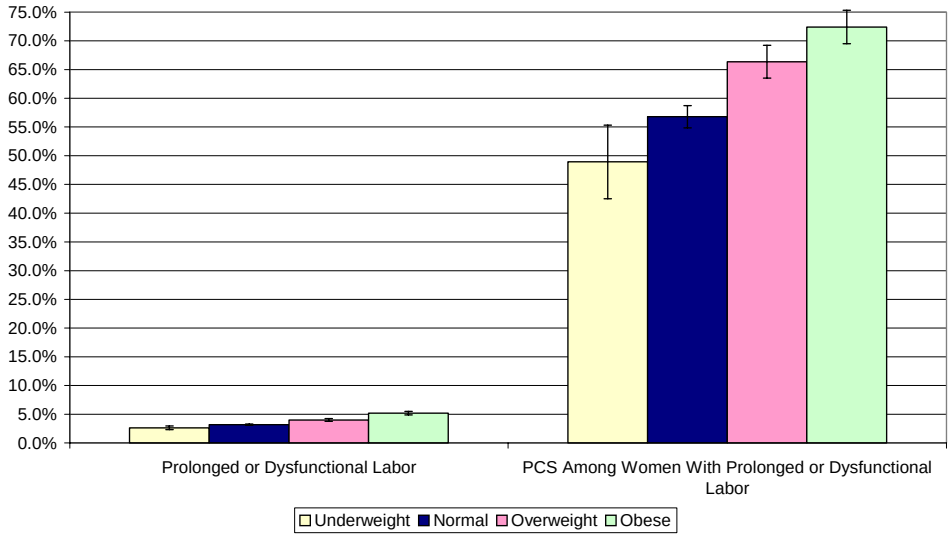
Figure 5. Labor Induction by Maternal Prepregnancy Body Mass Index, Utah PRAMS Data, 2000-2002



Cesarean Section: Figure 6

Since women who have had one cesarean section are most likely to have a repeat cesarean section, this analysis evaluated risks for primary cesarean section (PCS). As many articles state, obese women are at higher risk for cesarean section due to failure to progress or dysfunctional labor. Figure 6 shows PCS rates for women with reported prolonged labor or dysfunctional labor. The National Center for Health Statistics defines prolonged labor as *labor lasting more than 20 hours* and dysfunctional labor as *failure to progress in a normal pattern of labor*. When examining Utah vital records data for 2000 to 2002, a significantly higher rate of prolonged or dysfunctional labor was reported among overweight and obese women. Of women who experienced dysfunctional or prolonged labor, overweight and obese women were significantly more likely to deliver by primary cesarean section than normal weight women.

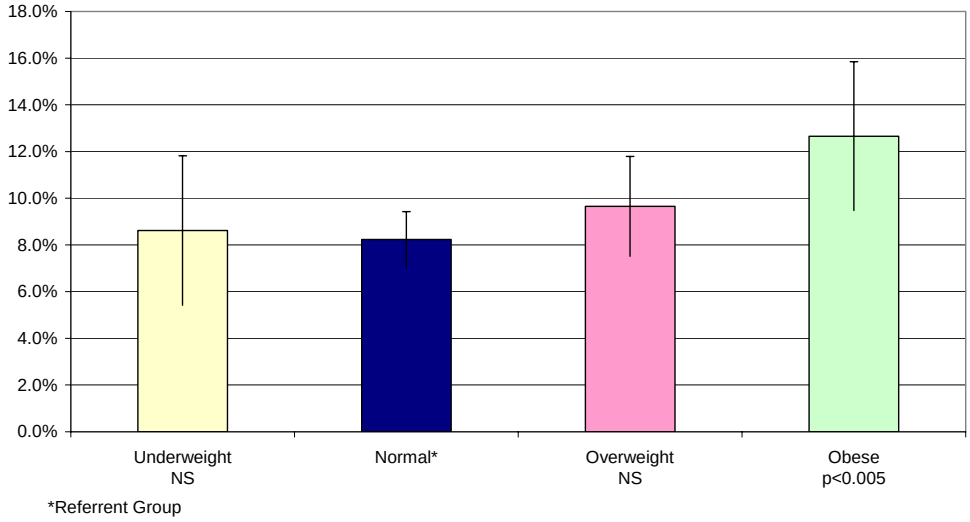
Figure 6. Labor Abnormality and Primary Cesarean Section Rates, Utah Vital Records Data, 2000 - 2002



Infant Admission to NICU: Figure 7

Babies of obese women had a significantly higher rate of admission to the NICU compared to babies of normal weight women. Regression analysis, adding maternal diabetes and hypertension to the model, showed that obese women had significantly higher odds of infant NICU admission, OR=1.4 (1.0, 2.1).

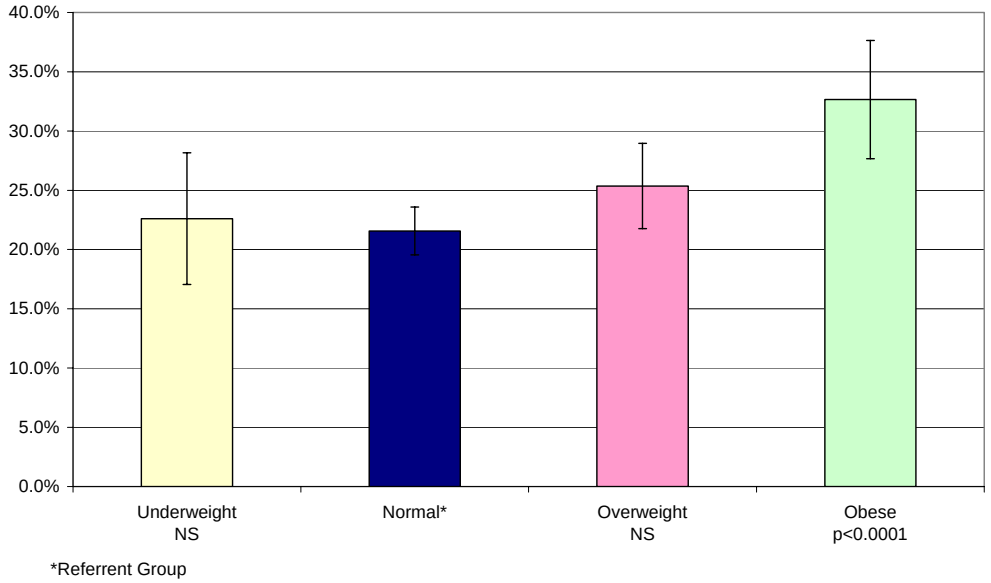
Figure 7. Admission of Infant to ICU by Maternal Prepregnancy Body Mass Index, Utah PRAMS Data, 2000 - 2002



Postpartum Depression: Figure 8

A recent analysis of data from the Third National Health and Nutrition Examination Survey (NHANES) showed that obesity was associated with past month depression in women.[7] Obese PRAMS respondents were significantly more likely to report being depressed in the months after their delivery than normal weight women. Regression analysis showed that obese women had a significantly higher odds of reporting postpartum depression, OR=1.7 (1.3, 2.2).

Figure 8. Postpartum Depression by Prepregnancy Body Mass Index, Utah PRAMS Data, 2000 - 2002



Comments/Recommendations

Since obese women are at increased risk for adverse pregnancy outcomes, it is concerning that the rates of prepregnancy obesity continue to rise in Utah. Body Mass Index should become a recorded measure for all patients, just as other vital signs are documented. It is important for women to be counseled about being at a healthy weight before becoming pregnant. This counseling could be accomplished at routine gynecological, family planning, or family practice visits. Women should be counseled on their weight, if out of the normal range, and should be informed of their increased risks once becoming pregnant if they are at an unhealthy weight.

Health care providers should be aware of nutrition resources and referral options for their patients. For example, PEHP offers rebates to enrollees who lose weight or exercise and contracts with Healthy Utah to provide weight loss information to its enrollees, IHC offers weight loss materials and courses to enrollees and Blue Cross offers 50% payment of enrollment in e-diets.com.

Vahratian et al., in their study of labor progression noted that women with higher body mass had longer labor progression. They indicated that it is critical for practitioners to consider differences in labor progression by BMI before interventions such as induction/augmentation are undertaken.[4] This is also evidenced in our data set with higher rates of prolonged/dysfunctional labor being reported among heavier women and higher rates of primary cesarean section in overweight women for this reason. This difference in labor curves should be considered before progressing to cesarean section in overweight or obese women.

This analysis demonstrates that obese pregnant women are at increased risk for adverse pregnancy outcomes. As weight loss is not encouraged during pregnancy, it is important that weight issues are addressed preconceptionally. Improved prepregnancy counseling is one strategy to reverse the rise in overweight and obesity in Utah.

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Publishing Information

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