



# PRAMS PERSPECTIVES

A Pregnancy Risk Assessment Monitoring System Report V.4 No.1

## Preterm Birth in Utah

### Introduction

The preterm birth rate, defined as births that occur prior to 37 completed weeks' gestation is increasing in Utah as it is in the United States. The Healthy People 2010 goal is that no more than 7.6% of deliveries should occur before 37 weeks' gestation. In Utah during 2002 the preterm birth rate was 9.5% (n=4,662). This rate reflects an almost 42% increase in the rate since 1991(6.7%, n=2,412). Despite improving outcomes, prematurity still represents the leading cause of perinatal death in otherwise normal newborns and also represents a major cause of suboptimum long-term outcomes. During 2002, almost 80% of Utah infants who died during the neonatal period were born prematurely. According to an American College of Obstetricians and Gynecologists practice bulletin,

### 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 weighted 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 represent all live births to Utah residents from 1999 through 2001. A total of 6966 mothers were selected to participate in the project and 5156 mothers responded for a response rate of 74%. Survey results were weighted for non-response so that analyses could be generalized to the entire population of Utah women delivering live births.

disabilities in mental/psychomotor development, neuromotor function or sensory and communication function were present in about one half of a large cohort of survivors of extreme prematurity at 30 months of corrected age and approximately one quarter met the criteria for severe disability.<sup>1</sup>

Risk factors that are commonly associated with preterm birth include the history of a prior preterm birth, maternal smoking, young maternal age, lower socio-economic levels, non-white race and the presence of a birth defect. Racial differences in preterm birth that persist even when controlling for socioeconomic and educational variables, may be associated with differences on average inmaternal body size, customs, behaviors, access to services, age distribution, exposure to racism and discrimination and neighborhood level factors.<sup>2</sup>

Prior preterm birth is frequently cited as the strongest predictor for a subsequent preterm delivery. Adams et al carried out a large population-based study and found that recurrence of preterm delivery contributed to a notable portion of all preterm deliveries, especially at the shortest gestations. They found that the rate of preterm delivery in the second pregnancy increased as the length of the first pregnancy decreased.<sup>3</sup> These findings were replicated by Bloom et al; although, they found that the recurrence of preterm delivery was not statistically significant in women who had delivered twins preterm in their previous pregnancy.<sup>4</sup>

Being overweight and/or obese has also been linked to a higher risk of preterm delivery. In a large population-based cohort study, Beaten et al found that obese and overweight women were at increased risk for delivery at or before 32 weeks' gestation and that these women had a significantly increased risk for preeclampsia, eclampsia and gestational diabetes.<sup>5</sup> Other studies have linked being underweight to an increased risk of preterm delivery. In a case-control study, Spinollo et al found that the risk of preterm delivery increased with each successive decrease in prepregnant body mass index (BMI) and that the highest risk for preterm birth was among women with low prepregnancy BMI and low weight gains per week during pregnancy.<sup>6</sup> Another recently published study analyzed mother-infant pairs data from a large national representative survey to calculate the rate of pregnancy weight gain and found similarly that there were strong associations between low pregnancy weight gain and increased risk for preterm delivery, particularly among women who were underweight or average weight before pregnancy.<sup>7</sup>

The heterogeneity of preterm births makes it an especially difficult issue to study. Categorizing preterm births according to their clinical presentation: either indicated (medically induced due to complications) or spontaneous (idiopathic preterm births) may more clearly identify risk factors associated with these two very diverse etiologies. Medical indications relate to complications such as severe maternal hypertension, abruptio placenta or endangered fetal well-being such as intrauterine growth retardation or non-reassuring fetal status. With improved antepartum assessment and neonatal intensive care technologies the prevailing practice is to deliver these pregnancies to facilitate better outcomes for mother and infant or both, despite the infant's premature gestational age. There are also instances of iatrogenic prematurity, when a woman with incorrect dating is electively induced before 37 weeks.<sup>8</sup> This analysis will attempt to identify significant factors associated with both indicated and spontaneous preterm births in Utah during 1999-2001.

## **Methodology**

For this report, women who delivered live born infants less than 37 weeks of gestation were classified into two groups: indicated preterm delivery and spontaneous preterm delivery. Using linked Utah birth certificate and Utah PRAMS preterm birth data from 1999-2001 women were categorized as having either an "indicated" or a "spontaneous" preterm birth. Indicated deliveries were identified from birth certificate data and included in this category if any of the following factors were noted:

- Maternal risk factors (pre-existing diabetes, gestational diabetes, pregnancy associated hypertension, chronic hypertension, eclampsia, incompetent cervix, Rh sensitization, oligohydramnios/polyhydramnios, renal disease, uterine bleeding, or Rubella) (51.3%)
- Induction - both elective and therapeutic (33.3%)
- Complications of labor and delivery (placenta previa, placental abruption, cord prolapse, or fetal distress) (27.2%)
- Any congenital anomaly of the child (13.7%)
- Elective cesarean section (cesarean section with no defined maternal risks or congenital anomalies) (13.6%)

The percentages for conditions within the indicated category are not mutually exclusive. Women who did not meet the criteria detailed above for the indicated category were placed in the spontaneous category. All multiple gestations were excluded from the analysis. Data were analyzed using Chi-squared tests to identify significant contributors to preterm delivery in Utah.

## **Preterm Delivery in Utah**

Because this study excludes preterm births due to multiple gestations, the preterm delivery rate in Utah for 1999 - 2001 for singleton births in this analysis was 7.9% (approximately 10,800 births). When deliveries were classified into the defined categories, the preterm delivery cohort consisted of 53% indicated and 47% spontaneous deliveries. The overall infant mortality rate for the preterm delivery group was 6.6% (approximately 375 deaths). Of these deaths, 82.8% occurred in the indicated delivery group.

## Indicated Preterm Delivery

Overall, 5,700 women delivered a preterm infant in the indicated category. The mean gestational age for this group at delivery was 33.8 weeks. Table 1 shows the proportion of preterm delivery across various maternal characteristics. Significantly higher rates of preterm delivery were noted in the indicated category among women who:

- Were aged 20 – 24
- Had less than a high school education
- Were other than white race
- Made less than \$15,000 per year
- Had an income less than 100% of the federal poverty level
- Were enrolled with WIC during their pregnancy
- Had Medicaid as either a prenatal or delivery payer
- Had no insurance before pregnancy
- Experienced financial stress during their pregnancy
- Smoked in the last trimester of their pregnancy
- Had a previous preterm infant

**Table 1. Percentage of Preterm Birth Among Indicated Deliveries By Selected Maternal Characteristics, 1999 – 2001 Utah PRAMS Data.**

Characteristics	Percentage of Preterm Births		P-Value
	Among Indicated Deliveries	95% Confidence Interval	
<b>Indicated Preterm Delivery Rate</b>	8.6%	± 1.1%	
<b>Maternal Age</b>			<0.05
≤ 17	4.0%	± 3.1%	
18 - 19	8.0%	± 4.5%	
20 - 24	11.7%	± 2.6%	
25 - 29	7.5%	± 1.7%	
30 - 34	7.0%	± 2.1%	
35 - 39	8.2%	± 2.9%	
40 +	8.3%	± 6.8%	
<b>Education Level</b>			<0.05
Less than High School	12.7%	± 4.6%	
Completed High School	9.9%	± 2.0%	
Some College	7.3%	± 1.7%	
College Graduate	6.7%	± 1.9%	
<b>Race</b>			<0.05
White	8.6%	± 1.1%	
Other than White	11.2%	± 2.1%	
<b>Marital Status</b>			NS
Married	8.3%	± 1.1%	
Unmarried	10.4%	± 3.2%	
<b>Ethnicity</b>			NS
Hispanic	12.5%	± 4.5%	
Non-Hispanic	8.2%	± 1.1%	

**Table 1. Percentage of Preterm Birth Among Indicated Deliveries By Selected Maternal Characteristics, 1999 – 2001 Utah PRAMS Data, *continued***

<b>Characteristics</b>	<b>Percentage of Preterm Births</b>		<b>P-Value</b>
	<b>Among Indicated Deliveries</b>	<b>95% Confidence Interval</b>	
<b>Annual Household Income</b>			<0.05
< \$15,000	11.2%	± 3.1%	
\$15,000 - 35,000	8.7%	± 1.8%	
\$35,000 - 50,000	7.3%	± 2.2%	
> \$50,000	6.4%	± 1.7%	
<b>FPL</b>			<0.05
<100%	11.8%	± 3.3%	
101 - 133%	6.0%	± 2.4%	
134 - 199%	9.5%	± 2.6%	
200%+	7.1%	± 1.3%	
<b>Enrolled in WIC During Pregnancy</b>			<0.05
Yes	11.9%	± 2.8%	
No	7.5%	± 1.1%	
<b>Prenatal Care (PNC) Payer</b>			<0.01
Private/Group Insurance	7.2%	± 1.1%	
Medicaid	12.4%	± 3.2%	
Other/Self Pay	9.8%	± 4.8%	
<b>Delivery Payer</b>			<0.01
Private/Group Insurance	7.3%	± 1.1%	
Medicaid	12.5%	± 2.9%	
Other/Self Pay	8.5%	± 6.6%	
<b>Smoked last 3 months of pregnancy</b>			<0.01
Yes	18.6%	± 7.0%	
No	8.1%	± 1.1%	
<b>Previous Premature Birth</b>			<0.001
Yes	25.8%	± 7.7%	
No	6.0%	± 1.3%	
<b>Insurance Before Pregnancy<sup>1</sup></b>			<0.01
Yes	7.5%	± 1.0%	
No	12.3%	± 3.0%	
<b>Medicaid Before Pregnancy</b>			NS
Yes	14.8%	± 8.2%	
No	8.3%	± 1.1%	
<b>Fertility Drug Use</b>			NS
Yes	12.7%	± 5.7%	
No	7.9%	± 1.4%	
<b>Prepregnancy Body Mass Index</b>			NS
Underweight	8.4%	± 2.2%	
Normal	8.4%	± 1.6%	
Overweight	9.3%	± 3.7%	
Obese	8.0%	± 2.3%	
<b>Financial Stress<sup>2</sup></b>			<0.05
Yes	9.8%	± 1.6%	
No	7.2%	± 1.5%	

<sup>1</sup> Women were asked not to include Medicaid when answering this question

<sup>2</sup> Includes mother or partner losing job, moving, or having a lot of bills that couldn't be paid

## Spontaneous Preterm Delivery

Overall, 5,100 women delivered a preterm infant in the spontaneous category during the study period. The mean gestational age for this group at delivery was 34.5 weeks. Table 2 shows the proportion of preterm delivery across various maternal characteristics. Significantly higher rates of preterm delivery were noted in the spontaneous category among women who:

- Had some college education
- Had a previous preterm infant
- Used fertility drugs to conceive the pregnancy (analysis does not include other types of fertility treatments)
- Had a BMI categorized as either underweight or overweight

Premature rupture of membranes was reported in 12.5% of the spontaneous deliveries.

**Table 2. Percentage of Preterm Birth Among Spontaneous Deliveries By Selected Maternal Characteristics, 1999 – 2001 Utah PRAMS Data.**

<b>Characteristics</b>	<b>Percentage of Preterm Births Among Spontaneous Deliveries</b>	<b>95% Confidence Interval</b>	<b>P-Value</b>
<b>Spontaneous Preterm Delivery Rate</b>	7.2%	± 1.1%	
<b>Maternal Age</b>			NS
≤ 17	11.7%	± 8.0%	
18 - 19	6.9%	± 3.7%	
20 - 24	6.4%	± 1.8%	
25 - 29	7.6%	± 2.0%	
30 - 34	7.6%	± 2.7%	
35 - 39	6.6%	± 3.8%	
40 +	6.6%	± 7.2%	
<b>Education Level</b>			<0.01
Less than High School	8.6%	± 3.0%	
Completed High School	7.1%	± 1.8%	
Some College	9.3%	± 2.5%	
College Graduate	4.3%	± 1.6%	
<b>Race</b>			NS
White	7.3%	± 1.1%	
Other than White	7.2%	± 1.5%	
<b>Marital Status</b>			NS
Married	6.7%	± 1.2%	
Unmarried	9.2%	± 2.9%	
<b>Ethnicity</b>			NS
Hispanic	8.5%	± 3.5%	
Non-Hispanic	6.9%	± 1.1%	
<b>Annual Household Income</b>			NS
< \$15,000	8.9%	± 2.6%	
\$15,000 - 35,000	6.3%	± 1.7%	
\$35,000 - 50,000	5.3%	± 2.1%	
> \$50,000	8.4%	± 2.7%	

**Table 2. Percentage of Preterm Birth Among Spontaneous Deliveries By Selected Maternal Characteristics, 1999 – 2001 Utah PRAMS Data, *continued***

Characteristics	Percentage of Preterm Births Among Spontaneous Deliveries		95% Confidence Interval	P-Value
<b>FPL</b>				NS
<100%	9.2%	± 2.7%		
101 - 133%	5.5%	± 2.8%		
134 - 199%	6.2%	± 2.2%		
200%+	6.8%	± 1.6%		
<b>Enrolled in WIC During Pregnancy</b>				NS
Yes	8.4%	± 2.2%		
No	6.7%	± 1.2%		
<b>Prenatal Care (PNC) Payer</b>				NS
Private/Group Insurance	7.1%	± 1.4%		
Medicaid	7.9%	± 2.3%		
Other/Self Pay	6.1%	± 2.9%		
<b>Delivery Payer</b>				NS
Private/Group Insurance	7.1%	± 1.4%		
Medicaid	8.2%	± 2.0%		
Other/Self Pay	4.0%	± 2.9%		
<b>Smoked last 3 months of pregnancy</b>				NS
Yes	7.2%	± 3.4%		
No	7.2%	± 1.1%		
<b>Previous Premature Birth</b>				<0.001
Yes	25.2%	± 7.6%		
No	5.6%	± 1.4%		
<b>Insurance Before Pregnancy<sup>1</sup></b>				NS
Yes	6.6%	± 1.2%		
No	8.7%	± 2.3%		
<b>Medicaid Before Pregnancy</b>				NS
Yes	7.6%	± 4.7%		
No	7.2%	± 1.1%		
<b>Fertility Drug Use</b>				<0.05
Yes	15.9%	± 9.0%		
No	6.0%	± 1.3%		
<b>Pre-Pregnancy Body Mass Index</b>				<0.05
Underweight	9.6%	± 2.7%		
Normal	6.0%	± 1.4%		
Overweight	10.0%	± 5.0%		
Obese	5.5%	± 2.3%		
<b>Financial Stress<sup>2</sup></b>				NS
Yes	7.5%	± 1.4%		
No	6.8%	± 1.7%		
<sup>1</sup> Women were asked not to include Medicaid when answering this question				
<sup>2</sup> Includes mother or partner losing job, moving, or having a lot of bills that couldn't be paid				

## Discussion/Recommendations

The increasing rate of preterm births has been partially attributed to an increase in the rate of multiple births due to successful infertility treatments. During 2002 in Utah, approximately 17% of infants born preterm resulted from multiple pregnancies. Although it is not known what percent of these births were related to artificial reproductive technology (ART), ART is the dominant cause of the increasing rate of multiple pregnancy in the U.S.<sup>9</sup> Multiple gestation preterm births were not included in this analysis as they are less modifiable preterm births. However, one important recommendation that may impact reducing preterm births related to multiple gestations is for providers offering assisted reproductive technology to adhere to the minimum standards for assisted reproductive technologies published by the American Society for Reproductive Medicine.<sup>10</sup>

Our analysis discovered that the largest percentage of singleton preterm births that occurred during the study period was in the indicated category. While many of the risk factors that contributed significantly to this category of preterm births cannot be modified (previous preterm birth, age, education, income, etc.) others may respond to targeted interventions such as smoking cessation efforts for women of reproductive ages. Since all of the births in the indicated category had a medical complication of some sort, interventions to improve preconceptional health in women of reproductive ages must be emphasized. These interventions could include public education campaigns about the importance of optimal health prior to conception, pregnancy spacing and planning, and health care provider practices that include screening all women of reproductive ages for chronic and acute health conditions that could affect their future pregnancies. Preconceptional care is especially important for women who have known chronic diseases such as diabetes and hypertension. As almost 83% of the preterm infant mortality that occurred during the study period was among births to women in the indicated category, preconceptional health of women of reproductive health must be a priority concern.

Our analysis categorized 47% of preterm births into the spontaneous category. These deliveries occurred spontaneously and women in this category had no identifiable contributing medical risk factors. However, as previously noted, over 12% of these women had preterm premature rupture of their membranes (PPROM). Previous preterm birth was again the strongest indicator among this group of women. This group of women's demographic characteristics resembled the Utah population as a whole. The only other indicators that were significantly related to spontaneous preterm births in this study were having a prepregnancy body mass index (BMI) categorized as underweight or overweight and using fertility drugs to become pregnant. Prepregnancy BMI is certainly a factor that is amenable to change through public education strategies and improved preconceptional counseling. Fertility drug use must be addressed on an individual woman/physician level, assuring that providers adhere to standards for assisted reproductive technologies.

This analysis demonstrates that a large proportion of preterm births that occurred in Utah during the study period can be attributed to either multiple gestations or to medical interventions that were necessary to save the life of either mother or her infant or improve chances of a good pregnancy outcome. The causes for the spontaneous preterm continue to perplex researchers. There are a few promising studies currently underway looking at the treatment of periodontal disease during pregnancy and the use of progesterone prophylaxis in women with a history of spontaneous preterm birth in a previous pregnancy or a multiple gestation in the current pregnancy. In the meantime, improved preconceptional care and counseling may be one strategy to reverse the increasing trend of preterm births.

### Authors:

Lois Bloebaum, BSN, Manager, Reproductive Health Program

Laurie Baksh, MPH, PRAMS Data Manager

Joanne Barley, BS, PRAMS Operations Manager

Peter Barnard, CNM, MS, Perinatal Mortality Review Coordinator

Nan Streeter, MS, RN, Director, Bureau of Maternal Child Health

Michael Varner, MD, Professor, Maternal Fetal Medicine, University of Utah

Yvette LaCoursiere, MD, MPH, Obstetrics and Gynecology, University of Utah

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Reproductive Health Program  
Utah Department of Health  
P.O. Box 142001  
Salt Lake City, Utah 84114-2001

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