PRAMSGRAM

OKLAHOMA PREGNANCY RISK ASSESSMENT MONITORING SYSTEM VOL 13 NO 3 WINTER 2010

Early and Late Preterm Birth in Oklahoma

Introduction:

Preterm birth is the leading cause of death in the first month of life. Every year, approximately 500,000 babies are born preterm in the United States (U.S.), costing more than $26 billion. In 2007, the costs associated with the birth of an infant including in-hospital care, outpatient visits, and prescriptions for mother and baby averaged $15,047 if the baby was born at term compared to $64,713 for a baby born preterm.[1,2] The costs for a healthy baby from birth to his first birthday were $3,325 compared to $32,325 for a preterm baby.[2] Preterm infants face an increased risk of lifelong health consequences such as breathing and feeding problems, cerebral palsy, and learning problems.[1,2]

In Oklahoma, 13.5% of babies (more than 1 in 8) were born preterm in 2007 compared to the national average of 12.7%. The March of Dimes gave Oklahoma an "F" in its 2009 Premature Birth Report Card and Oklahoma was one of only two states whose score worsened from 2008 to 2009.[3] In Oklahoma, as nationally, preterm birth significantly contributes to its infant mortality rate (the number of infant deaths per 1000 live births). Oklahoma ranks 41st in the nation with an infant mortality rate of 8.0 compared to the national average of 6.9.[4]

There are stark racial and ethnic disparities in preterm birth. Nationwide and in Oklahoma, congenital anomalies are the leading cause of infant death for all groups except African Americans, for whom the leading cause is preterm birth.[5] In addition, the rate of preterm birth in African Americans is 1.5 times that of the White population. During 2004-2006 in Oklahoma, preterm birth rates were highest for African Americans (18.3%), followed by Native American (13.2%), Asian (13.0%), White (12.8%), and Hispanics (11.7%). Oklahoma statistics mirror national statistics of 18.3%, 14.1%, 12.1%, 11.6%, and 10.7% respectively.[4,5]

A birth is considered preterm if it occurs prior to 37 completed weeks of gestation. Infants born between 34 weeks and 0 days and 36 weeks and 6 days are considered late preterm deliveries. Infants born prior to 34 weeks gestation are considered early preterm deliveries.

In Oklahoma:

- Women in Oklahoma most likely to have an early preterm infant were African American, had 9-11 years of education, were less than 20 or 35 and older, unmarried, and or had lower (less than $19,999) or higher annual incomes ($50,000+).
- Almost 1 in 4 births to women with a history of preterm labor were early or late preterm (8.91% and 13.13% respectively), supporting national data indicating a history of preterm labor was a strong predictor of preterm delivery.
- Women receiving intermediate or adequate levels of prenatal care (PNC) were less likely to deliver preterm than women who had inadequate, adequate plus, or no PNC.

The Healthy People 2010 goal is to reduce preterm births to no more than 7.6% of live births and early preterm births to no more than 1.1% of live births. Efforts to prevent preterm birth have been frustrated by a continued increase in the preterm birth rate.[6,7] The increase in preterm births over the last decade is primarily due to medically indicated and late preterm births. The rise in multiple births from the increased use of assisted reproductive technology, and increases in cesarean sections and inductions of labor for preterm and term infants have contributed to this increase. In 2006, 1 in 11 babies (9.1% of live births) was late preterm in the United States.[5] Late preterm births make up 71% of all preterm births.[4,5]

In nearly 49% of preterm births, the cause is unknown.[8,9] Researchers have identified some risk factors, but health professionals still cannot predict which women will deliver too early. The most consistently identified risk factors include: previous preterm birth; multifetal pregnancy; abnormal uterus and/or cervix; and/or maternal race. Other possible risk factors include: late or no prenatal care; substance use/abuse; domestic violence; lack of social support; stress; exposure to some medications and chemicals; chronic health conditions (i.e., obesity, high blood pressure, diabetes); transmitted maternal infections; and short spacing between pregnancies (less than 6-9 months between birth and the next pregnancy).[1,8-13]

Methods:

This study used data from the Pregnancy Risk Assessment Monitoring System (PRAMS) for the survey years 2004, 2005, 2006 and 2007. For this period, 7,757 Oklahoma mothers were sent the PRAMS survey shortly after the birth of their child. Of these mothers, 5,760 completed the questionnaire, yielding an unweighted overall response rate of 74.3%. A detailed explanation of PRAMS methodology has been well-documented elsewhere.[14]

To determine gestational age of the infants, birth certificate data were used by calculating gestation from the last menstrual period (LMP) of the mother reported on the birth certificate record. Maternal Body Mass Index (BMI) calculations use the most current Institute of Medicine standards for pre-pregnant women.[15]

The Kotelchuck Index was used to calculate prenatal care adequacy. The Kotelchuck Index, also known as Adequacy of Prenatal Care Utilization Index (APNCU) is a two-factor index that utilizes two independent and distinct dimensions: Adequacy of Initiation of Prenatal Care and Adequacy of Received Services. The month in which care is initiated is grouped not by trimester, but into four adequacy groupings. The expected number of visits is based on the ACOG standard and is shown as the ratio of actual visits to recommended number of visits.[16]

Three multivariate logistic regression analyses were conducted among mothers having singleton births to assess the associations between maternal demographic and health covariates with the probability of delivering an infant at <34 weeks, 34-36 weeks, and 37+ weeks gestation. Covariates considered for the models were maternal race, age, education, smoking during the last three months of pregnancy, insurance status, previous premature infant, adequacy of prenatal care, and induction of labor.

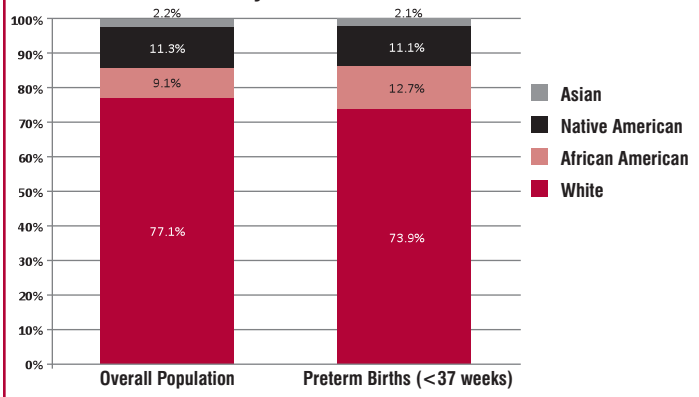
Due to the PRAMS stratified weighted sample, SUDAAN 9.0.1 was used to perform the statistical analysis. For the descriptive analysis, variables were examined using percentages and confidence intervals. Variables were considered statistically significant at $p<0.05$.

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.

Results:

When reviewing data for all live births in Oklahoma for 2004-2007, the disparities in preterm birth are apparent (Figure 1). Although comprising only 9.1% of the birth population, African American women comprised almost 13% of the preterm deliveries.

Figure 1: Percentage of Oklahoma Live Births by Race 2004-2007



Source: Oklahoma State Department of Health, Vital Records

Late preterm infants comprised 69.9% of the preterm infant births. Women in Oklahoma most likely to have an early preterm infant (less than 34 weeks gestation) were African American, women with 9-11 years of education, unmarried women, women with lower incomes (less than $19,999 annually) and women with higher annual incomes ($50,000 or more). Native American women were at a somewhat higher risk for late preterm births, although the difference was not statistically significant (Table 1). Ethnicity was not found to be significantly different across the groups (data not shown).

Women who were underweight were marginally more likely to have an early preterm infant, compared to normal weight women. Experiencing abuse before or during pregnancy was not a significant predictor of risk for early or late preterm deliveries (Table 2). Having a history of preterm labor was a strong predictor of both early and late preterm delivery; almost one in four births to women with a history of preterm labor were either early or late preterm (8.91% and 13.13% respectively). First trimester prenatal care was not significantly associated with preterm delivery, but women without prenatal care (PNC) were almost twice as likely to have a late preterm infant (10.54% compared to 5.93% and 6.64% of women with PNC regardless of trimester it began). Women receiving an intermediate or adequate level of PNC were less likely to deliver preterm compared to women who had inadequate PNC, no PNC or adequate plus PNC. The risk for both early and late preterm was highest for women in the "no PNC" and "Adequate plus" groups. Adequate plus is often comprised of the highest risk maternity clients.

Table 1: Maternal Demographics for Early, Late and Term Infants, OK PRAMS 2004-2007.

Demographic	Early Preterm <34 Weeks %	Early Preterm <34 Weeks 95% CI	Late Preterm 34-36 Weeks %	Late Preterm 34-36 Weeks 95% CI	Full Term Infants ≥ 37 Weeks %	Full Term Infants ≥ 37 Weeks 95% CI	Chi Square
Overall	2.81	2.59, 3.05	6.52	5.79, 7.33	90.67	89.85, 91.44	
Maternal Race							
White	2.63	2.38, 2.91	6.44	5.63, 7.37	90.92	89.98, 91.79	0.000
Black	5.53	4.32, 7.06	6.32	4.52, 8.77	88.15	85.30, 90.50	
Native Am.	2.10	1.75, 2.51	7.75	5.39, 11.02	90.15	86.97, 92.62	
Age							
<20	3.26	2.81, 3.77	6.19	4.46, 8.52	90.55	88.24, 92.45	0.1528
20-24	2.71	2.32, 3.16	6.51	5.27, 8.03	90.78	89.23, 92.12	
25-29	2.5	2.01, 3.11	7.28	5.88, 8.98	90.22	88.46, 91.73	
30-34	2.94	2.36, 3.68	5.35	3.98, 7.15	91.71	89.84, 93.26	
35+	3.85	2.98, 4.97	6.89	4.62, 10.14	89.26	86.01, 91.83	
Education							
<9 years	2.58	1.95, 3.41	5.49	2.97, 9.92	91.93	87.75, 94.77	0.0006
9-11 years	3.77	3.03, 4.69	7.06	5.30, 9.33	89.17	86.79, 91.17	
12 years	2.89	2.50, 3.33	6.82	5.62, 8.26	90.30	88.83, 91.59	
13-15 years	2.08	1.85, 2.34	6.99	5.45, 8.93	90.93	89.03, 92.54	
16+ years	2.93	2.26, 3.78	4.96	3.75, 6.53	92.11	90.40, 93.54	
Marital Status							
Married	2.59	2.27, 2.95	6.56	5.65, 7.61	90.85	89.77, 91.83	0.0548
Unmarried	3.24	2.87, 3.65	6.49	5.36, 7.85	90.27	88.88, 91.50	
Household Income*							
<$15,000	3.29	2.85, 3.80	6.58	5.41, 7.98	90.12	88.67, 91.41	0.0213
$15,000-$19,999	2.99	2.08, 4.29	7.59	5.10, 11.13	89.42	85.83, 92.19	
$20,000-$24,999	2.15	1.78, 2.59	7.13	4.77, 10.54	90.72	87.42, 93.22	
$25,000-$34,999	2.50	1.88, 3.31	5.42	3.66, 7.94	92.09	89.56, 94.04	
$35,000-$49,999	2.15	1.81, 2.56	7.49	5.23, 10.63	90.36	87.30, 92.74	
$50,000+	2.87	2.24, 3.67	5.45	4.19, 7.07	91.68	89.94, 93.13	

Table 2: Maternal Characteristics for Early, Late and Preterm Births, OK PRAMS 2004-2007.

Characteristic	Early Preterm <34 Weeks %	Early Preterm <34 Weeks 95% CI	Late Preterm 34-36 Weeks %	Late Preterm 34-36 Weeks 95% CI	Full Term Infants ≥37 Weeks %	Full Term Infants ≥37 Weeks 95% CI	Chi Square
Pre-pregnancy BMI							
<19.8	3.61	2.84, 4.57	6.98	5.46, 8.89	89.41	87.34, 91.18	0.2236
19.8-25.9	2.56	2.22, 2.96	5.86	4.87, 7.04	91.58	90.30, 92.65	
26.0-29.0	2.62	2.25, 3.05	7.39	5.23, 10.34	90.00	87.13, 92.28	
>29.0	2.92	2.51, 3.41	7.06	5.56, 8.92	90.02	88.15, 91.62	
Abuse Before and/or During Pregnancy							
Yes	2.66	2.18, 3.24	5.62	3.66, 8.54	91.72	88.87, 93.89	0.6038
No	2.87	2.61, 3.15	6.71	5.92, 7.58	90.42	89.52, 91.26	
History of Preterm							
Yes	8.91	7.03, 11.22	13.13	9.83, 17.32	77.96	73.32, 81.99	0.0000
No	1.79	1.51, 2.12	5.14	4.20, 6.27	93.07	91.92, 94.07	
Pregnancy Intention							
Intended	2.80	2.48, 3.16	7.11	6.05, 8.33	90.09	88.84, 91.21	0.3364
Unintended	2.90	2.53, 3.32	5.98	5.01, 7.11	91.12	89.95, 92.18	
PNC 1st Trimester							
Yes	2.75	2.49, 3.05	6.64	5.82, 7.56	90.61	89.67, 91.48	0.0040
No	3.05	2.45, 3.78	5.93	4.40, 7.95	91.02	88.96, 92.73	
No PNC	5.62	3.85, 8.13	10.54	4.14, 24.31	83.84	71.74, 91.38	
PNC Adequacy-Kotelchuck Index							
NO PNC	5.42	3.88, 7.53	12.83	6.58, 23.53	81.74	71.66, 88.80	<.0001
Inadequate	3.12	2.45, 3.97	7.84	5.77, 10.58	89.03	86.28, 91.29	
Intermediate	0.72	0.60, 0.88	1.59	1.00, 2.53	97.69	96.79, 98.34	
Adequate	1.03	0.87, 1.24	3.10	2.33, 4.10	95.87	94.88, 96.67	
Adequate Plus	6.56	5.77, 7.45	13.50	11.62, 15.63	79.94	77.69, 82.03	

Table 3 highlights delivery outcomes across the birth groups. Early and late preterm infants were more likely to be born via caesarian section and term infants were more likely to be delivered vaginally. More than half of all infants who spent six or more days in the hospital were preterm.

Table 3: Delivery Outcomes for Early, Late and Preterm Births, OK PRAMS 2004-2007.

Delivery Outcome	Early Preterm <34 Weeks %	Early Preterm <34 Weeks 95% CI	Late Preterm 34-36 Weeks %	Late Preterm 34-36 Weeks 95% CI	Full Term Infants ≥37 Weeks %	Full Term Infants ≥37 Weeks 95% CI	Chi Square
Induction of Labor							
Yes	0.48	0.27, 0.85	2.86	2.07, 3.95	96.66	95.55, 97.50	<.0001
No	3.79	3.47, 4.14	7.99	7.05, 9.06	88.21	87.12, 89.23	
Delivery Method							
Vaginal	1.84	1.59, 2.13	5.59	4.76, 6.56	92.56	91.58, 93.44	<.0001
VBAC	3.06	1.47, 6.24	3.03	1.28, 7.00	93.91	88.62, 96.83	0.0975
Primary C-section	6.47	5.76, 7.26	10.36	8.45, 12.65	83.17	80.78, 85.32	<.0001
Repeat C-section	3.20	2.36, 4.33	6.50	4.64, 9.02	90.30	87.68, 92.42	0.7426
Mom Nights in Hospital After Delivery							
1 day or less	2.05	1.62, 2.60	3.45	2.28, 5.19	94.50	92.79, 95.83	<.0001
2 days	1.57	1.27, 1.94	5.35	4.38, 6.51	93.09	91.89, 94.11	
3 or more days	4.99	4.46, 5.58	9.92	8.46, 11.60	85.09	83.35, 86.68	
Days Infant in Hospital							
<2 days	0.60	0.41, 0.88	3.71	2.94, 4..68	95.68	94.70, 96.49	<.0001
3-5 days	0.83	1.44, 1.53	6.67	5.38, 8.24	92.50	90.85, 93.87	
6+ days	27.43	24.63, 30.42	26.25	22.42, 30.47	46.33	41.22, 51.51	
Infant Admitted to ICU							
Yes	21.37	19.28,23.61	22.82	19.45, 26.59	55.81	51.52, 60.02	0.2236
No	0.60	0.41, 0.88	4.50	3.83, 5.29	94.89	94.08, 95.60	

Several variables were significantly associated with early preterm (< 34 weeks) singleton births to women residing in Oklahoma (Table 4). A history of preterm birth increased the odds of delivering a subsequent early preterm birth. Socioeconomic status was an important predictor: women lacking a high school education and women whose prenatal care was covered by SoonerCare were at higher risk of early preterm birth than educated women or those with private insurance. African American mothers were at higher risk of early preterm birth compared with Whites and Native American mothers. Women 35+ years of age were also at higher risk compared to younger women. In agreement with prior studies, smoking during the last 3 months of pregnancy was moderately associated with a higher risk of early preterm birth. Encouragingly, mothers who received adequate or intermediate level prenatal care as measured by the Kotelchuck Index were at significantly lower risk of early preterm birth. Women receiving **adequate plus** prenatal care seemed to experience a **higher** risk of preterm birth, however this association is more likely describing cases where an identified high risk pregnancy led to more than adequate prenatal care (and not adequate plus prenatal care causing a high risk pregnancy).

Table 4: Multivariate Logistic Regression on Singleton Births, OK PRAMS 2004-2007

Maternal Characteristic	<34 Weeks (*n*=3452)		34-36 Weeks (*n*=3767)		≥37 Weeks (*n*=3767)	
	Odds Ratio	95% CI	Odds Ratio	95% CI	Odds Ratio	95% CI
History of Preterm						
Yes	4.52	3.10, 6.59	2.63	1.69, 4.10	0.27	0.19, 0.38
No	1.00	1.00, 1.00	1.00	1.00, 1.00	1.00	1.00, 1.00
Race						
White	1.00	1.00, 1.00	-		-	
Black	2.29	1.24, 4.21	-		-	
Native American	0.64	0.40, 1.03	-		-	
Other	1.59	0.54, 4.68	-		-	
Smoking During Last 3 Months of Pregnancy						
Yes	1.33	0.84, 2.10	1.28	0.80, 2.05	0.76	0.52, 1.12
No	1.00	1.00, 1.00	1.00	1.00, 1.00	1.00	1.00, 1.00
Age						
<20	0.72	0.33, 1.54	-		-	
20-24	0.78	0.50, 1.21	-		-	
25-29	1.00	1.00, 1.00	-		-	
30-34	1.36	0.83, 2.20	-		-	
35+	1.76	0.96, 3.22	-		-	
Education						
<12 years	1.57	1.04, 2.37	-		-	
12+ years	1.00	1.00, 1.00	-		-	
SoonerCare/Medicaid Paid for PNC						
	Yes	1.41	0.97, 2.05	-		-
No	1.00	1.00, 1.00	-		-	
Adequacy of PNC-Kotelchuck Index						
Adequate+	2.76	1.85, 4.13	1.28	0.75, 2.19	0.66	0.43, 1.01
Adequate	0.34	0.24, 0.49	0.43	0.23, 0.79	2.73	1.65, 4.50
Intermediate	0.24	0.15, 0.37	0.19	0.07, 0.50	5.59	2.64, 11.87
Inadequate	1.00	1.00, 1.00	1.00	1.00, 1.00	1.00	1.00, 1.00
Hosmer & Lemeshow Goodness of Fit p-value:						
	0.8047		0.0185		0.2943	

Among women delivering late preterm (34-36 weeks) infants, as with early preterm births, a history of preterm birth was significantly associated with increased odds of delivering a subsequent early preterm birth. Smoking during the last 3 months of pregnancy was moderately associated with a higher risk of late preterm birth. Mothers who received adequate or intermediate level prenatal care were at significantly lower risk of late preterm birth.

Among women delivering term (37+ weeks) infants, women with a history of preterm birth had significantly decreased odds of delivering a term birth. Women who did not smoke during the last 3 months of pregnancy had moderately higher odds of delivering a term infant, again a finding supported by previous studies. In addition, mothers who received adequate or intermediate level prenatal care had significantly higher odds of delivering a term infant.

Discussion:

Preterm birth in Oklahoma is a public health crisis. It impacts more than one in eight Oklahoma families. Overall, early preterm infants are at the highest risks for infant mortality and morbidity. [2-4] However, late preterm infants comprise approximately 70% of all preterm births. Late preterm infants are at a higher risk for hospital readmission than term infants, and those late preterm infants who are released from the hospital Neonatal Intensive Care Unit (NICU) before four days are at a greater risk for readmission when compared to all other infants admitted to the NICU.[17] Studies suggest that when compared to their term counterparts, late preterm infants are at higher risk for developmental delay or disabilities.[18] The last five weeks of pregnancy, from 35 to 40 weeks gestation, is a crucial period of time for brain development.[2,3,5] The issue of late preterm infants and the long-term consequences will be further explored in a future PRAMSGRAM to be released in mid-2010.

Research indicates that little is known about premature labor and the causes behind approximately 50% of preterm births. For many women with clear risk indicators for preterm birth or health problems that might lead to preterm birth (such as smoking or being underweight or obese), interventions to reduce the risk to their baby come too late or not at all. Coupled with the fact that half of the live births in Oklahoma are the result of unintended pregnancies, looking towards improving health prior to pregnancy for women becomes paramount. The message is clear: the key to preventing prematurity is promoting health across a woman's entire lifespan. However, data show that only 14% of Oklahoma women receive any preconception counseling (PCC) prior to pregnancy and approximately 55% of those who did not receive PCC were without health insurance prior to conception.[19] While clear definitions of preconception care and how to provide it are available, it is not currently part of the landscape of women's health care in the U.S. or in Oklahoma to the degree that is necessary to realize positive changes.

Successful, evidence-based interventions to prevent preterm birth do exist. Several programs, like the Nurse-Family Partnership (Children First), Healthy Start, and Centering Pregnancy (group prenatal care in a supportive atmosphere) are already being implemented in Oklahoma. However, the need far exceeds the current capacity of these programs. Other health promotion activities, such as community-based tobacco and obesity prevention efforts, have the potential to improve health for everybody in Oklahoma and its communities, including women of reproductive age. In addition, efforts such as the Oklahoma Perinatal Quality Improvement Collaborative could result in significant risk reduction by working with health care providers and hospitals.

One limitation of this study is that variables implying that an early delivery and/or induction were medically necessary may be missing on some birth certificate records. One study in Pediatrics found that 23% of late preterm births had no recorded indicators for early delivery.[20] States in the Midwest, West, and South were more prone to this problem, which would include Oklahoma. Without solid reliable data, it is difficult to determine on a population level which preterm deliveries were the result of natural progression, medically necessary interventions, or non-medically indicated elective procedures.

Other limitations for the study include: women experiencing miscarriages and stillbirths were excluded from this study due to survey design, as PRAMS only samples live births. The data are largely based on maternal self-report from either the birth certificate or the PRAMS survey. Causation cannot be assessed due to the retrospective nature of the survey design, only associations and risk factors can be determined.

Recommendations:

1. Advocate for the provision of preconception care in all health insurance packages for all females and males of reproductive age and promote preconception care as a necessary piece of medical care. Educate health care providers to view every interaction with a female or male of reproductive age as an opportunity for preconception health counseling.

2. Include special attention on informing and promoting the health of females of reproductive age – especially African American and Native American women in efforts such as Turning Point and other community-based coalitions focused on the issues of tobacco use and obesity.

3. Encourage prenatal care providers to discuss preterm labor (signs and symptoms, what to do, when to call, etc.) during the first trimester beyond simply giving pregnant women a handout or a pamphlet.

4. Address the possible consequences of smoking, drinking etc., multiple times throughout the pregnancy during prenatal care visits and provide counseling and intervention as appropriate; if providers cannot provide the needed service, refer to a person or program that can.

5. Encourage prenatal care providers to talk with pregnant women about brain development in utero and how important the last five weeks of pregnancy are in terms of healthy brain development and cognition; this will potentially increase adoption of healthy behaviors throughout pregnancy to reduce risk for preterm delivery, and reduce the number of early elective procedures.

6. Support implementing an Oklahoma Maternal-Infant Quality Care Collaborative among Oklahoma perinatal care providers and hospitals with obstetric services and other partners to ensure that mothers and newborns receive safe, high-quality perinatal care. This would be accomplished by identifying and removing barriers to providing safe, quality perinatal care; providing comprehensive, evidenced-based education, best practice resources and patient educational resources; and collaborating to standardize perinatal care across the state.

7. Formally designate levels of neonatal care in Oklahoma hospitals to clarify what equipment, facilities and staff are required to care for certain types of mothers and newborns. Decisions regarding delivery and transfers of mothers and newborns can be made according to designations.

8. Refer all women who smoke and who have partners who smoke to the Oklahoma Tobacco Helpline 1-800-QUIT-NOW.

9. Continue to fund and support evidence-based programs like Children First and Healthy Start that reduce the risk of preterm birth and infant mortality, and provide interconception care for the parents they serve.

10. Challenge private and public stakeholders to participate in the Fetal and Infant Mortality Review Projects based in the major metropolitan areas of Oklahoma City and Tulsa by becoming involved in activities and projects that are based on or result from the Case Review and Community Action Team process.

11. Conduct additional research to gain insight and fill in gaps where current population data is lacking on medical indicators and risk factors.

12. Educate mothers with previous poor birth outcomes, such as infant death, premature labor, and pre-existing medical conditions, to ask for appropriate referrals to specialists before becoming pregnant.

13. Enhance the perinatal telemedicine network for rural women with high risk pregnancies, with a particular focus on Native American and African American women in rural areas of the state.

14. Provide additional training to health care providers and clerks who are responsible for filling out the birth certificates on the overall value of the data collected, the importance of quality controls at the data entry level to assure completeness and accuracy, and its potential use for a better understanding of the factors associated with preterm births.

References:

1. Institute of Medicine. Preterm Birth: Causes, Consequences, and Prevention. July 2006.

2. March of Dimes. The Economic and Societal Costs. http://www.marchofdimes.com/index_about_10734.asp. Accessed on 12/23/09.

3. March of Dimes. 2009 Premature Birth Report Card. Accessed December 2, 2009. Available at http://marchofdimes.com/EHP09450PADReportCardMapREVISED.pdf

4. National Center for Health Statistics. Department of Health and Human Services Centers for Disease Control and Prevention: http://www.cdc.gov/reproductivehealth/MaternalInfantHealth/PBP.htm . Accessed 11/25/09

5. March of Dimes. Peristats: Preterm Birth. http://www.marchofdimes.com/peristats/tlanding.aspx?reg=40&lev=0&top=3&slev=4&dv=qf and http://www.marchofdimes.com/peristats/level1.aspx?reg=99&top=3&stop=240&lev=1&slev=1&obj=1&dv=cr. Accessed 11/24/09

6. Ananth, Cande V. and Anthony M. Vintzileos. Medically Indicated Preterm Birth: Recognizing the Importance of the Problem. Clinics in Perinatalolgy. 2008; 35(1)

7. American College of Obstetricians and Gynecologists, ACOG Today: Experts Develop National Plan to Improve Preterm Birth. September 2008.

8. Fuchs, Karin, MD and Ronald Wapner, MD. Elective Cesarean Section and Induction and Their Impact on Late Preterm Births. Clinics in Perinatology, 2006; 33(4)

9. American College of Obstetricians and Gynecologists. Research Support Needed to Investigate Preterm Birth. American College of Obstetricians and Gynecologists ACOG Today, Nov./Dec. 2006, pp. 1& 12.

10. March of Dimes website: http://www.marchofdimes.com/prematurity/21191.asp. Accessed 11/25/09.

11. Simhan HN, Krohn MA. Paternal Race and Preterm Birth. Am J Obstet Gynecol 2008. 198(6).

12. Ananth CV, Vintzileos AM. Maternal-fetal Conditions Necessitating a Medical Intervention Resulting in Preterm Birth. Am J Obstet Gynecol 2006. 195(6).

13. Ananth CV, Getahun D, Peltier MR, Salihu H, Vintzileos AM. Recurrence of Spontaneous versus medically indicated preterm birth. Am J Obstet Gynecol 2006. 195(3):643-50.

14. Shulman H, Colley Gilbert B, Lansky A. The Pregnancy Risk Assessment Monitoring System (PRAMS): current methods and evaluations of 2001 response rates. Public Health Rep 2006;121:74-83.

15. Institute of Medicine. Weight Gain During Pregnancy: Reexamining the Guidelines. Obtained from http://www.iom.edu/~/media/Files/Report%20Files/2009/Weight-Gain-During-Pregnancy-Reexamining-the-Guidelines/Report%20Brief%20-%20Weight%20Gain%20During%20Pregnancy.ashx Accessed December 5, 2009.

16. Kotelchuck M. Overview of adequacy of prenatal care utilization index Obtained from http://www.mchlibrary.info/databases/HSNRCPDFs/Overview_APCUIndex.pdf Accessed December 12, 2009.

17. Engle WA, Tomashek KM,Wallman C. and the Committee on Fetus and Newborn "Late-Preterm" Infants: A Population at Risk. Pediatrics, Dec 2007; 120: 1390 - 1401.

18. Steven Benjamin Morse, MD, MPH, Hao Zheng, MS, Yiwei Tang, MD, MPH and Jeffrey Roth, PhD Early School-Age Outcomes of Late Preterm Infants PEDIATRICS Vol. 123 No. 4 April 2009, pp. e622-e629

19. PRAMS Working Group. Preconception Care Among Oklahoma Women. Oklahoma State Department of Health. Accessed December 15, 2009. Available at: http://www.ok.gov/health/documents/PRAMS_Preconception%20Care_08.pdf

20. Reddy UM, Ko CW, Raju, T NK, Willinger, M. Delivery Indications at Late-Preterm Gestations and Infant Mortality Rates in the United States. Pediatrics 2009 124: 234-240

Acknowledgements

Terry Cline, Ph.D.
Commissioner of Health

Oklahoma State Department of Health
An AA/EEO Employer

Stephen W. Ronck, MPH
Deputy Commissioner, Community and Family Health Services
Oklahoma State Department of Health

Suzanna Dooley, MS, ARNP
Chief, Maternal and Child Health Service
Oklahoma State Department of Health

Special assistance for this edition was provided by: Bonnie Bellah (OK Healthy Mothers, Healthy Babies); Janette Bell, (OU Medical Center); Thad Burk, MPH; Dana Coles, MPH, CPH; Mary Beth Cox, MSW, MPH (Central OK FIMR); Susan Ellerbee, PhD, RNC, IBCLC (OU College of Nursing); Robert Feyerharm, MA; Alicia M. Lincoln, MSW, MSPH; Mike McCoy, MS, ARNP (Oklahoma Infant Alliance); Jill Nobles-Botkin, MSN, CNM; Barbara T. O'Brien, RN, MS (OU Health Science Center, OPCE); Shelly Patterson, MPH (OHCA); Mildred Ramsey, RN, MPH (OSDH Children First); Belinda Rogers, CIMI, CD(DONA) (March of Dimes); Wanda Thomas; Janis Williams (Central OK Healthy Start).

Funding for the PRAMS Project is provided in part by the Centers for Disease Control and Prevention, Atlanta, GA (Grant Number 5UR6DP000483-02), and the Title V Maternal and Child Health Block Grant, Maternal and Child Health Bureau, Department of Health and Human Services. The views expressed here are the responsibility of the authors and may not reflect the official views of the CDC or MCHB/HRSA.

The PRAMSGRAM is issued by the Oklahoma State Department of Health, as authorized by Terry Cline, Ph.D., Commissioner of Health. DPS printed 4,000 copies in February 2010 at a cost of $1947.00. Copies have been deposited with the Publications Clearinghouse of the Oklahoma Department of Libraries.

This and other OK PRAMS publications can be found on the web at: http://www.health.ok.gov Keyword: PRAMSGRAM

For additional copies or questions please call 1-405-271-6761 or email Prams@health.ok.gov