

Oklahoma Health Care Authority

Prenatal Care and Outcomes



Report for Fiscal Year 2008

June 2008

Submitted by:

APS Healthcare

4545 North Lincoln Boulevard

Suite 103

Oklahoma City, Oklahoma 73105

(405) 556-9700

Table of Contents

Executive Summary	1
Introduction.....	3
Background to Study.....	4
Methodology.....	6
Study Objectives.....	6
Definitions of Measures.....	6
Births and Average Lengths of Stay, Newborns.....	7
Delivery Outcomes and Maternity Care.....	7
Prenatal Care, Delivery Method & Newborn Status – Matched Infants and Mothers.....	8
Costs Associated with Maternity Care and Births – Matched Infants and Mothers.....	8
Methodological Changes Between SFY 2006 and SFY 2007.....	9
Confidentiality and Disclosure of Information.....	10
Results.....	11
Births and Average Lengths of Stay, Newborns.....	14
Delivery Outcomes and Maternity Care.....	18
Prenatal Care, Delivery Method & Newborn Status – Matched Infants and Mothers.....	25
Costs Associated with Maternity Care and Births – Matched Infants and Mothers.....	29
Discussion.....	36
Births and Average Lengths of Stay, Newborns.....	36
Delivery Outcomes and Maternity Care.....	37
Prenatal Care, Delivery Method & Newborn Status – Matched Infants and Mothers.....	39
Costs Associated with Maternity Care and Births – Matched Infants and Mothers.....	40
Limitations.....	41
Recommendations.....	42
References.....	43



Prenatal Care and Outcomes SoonerCare

Executive Summary

Early and consistent prenatal care ensures continued health of the mother and unborn child throughout pregnancy and promotes positive delivery outcomes. The purpose of this study was to determine whether the need exists for quality improvement initiatives related to prenatal care provided to members of the SoonerCare programs.

The average length of stay for all newborns identified in State Fiscal Year (SFY) 2007 was 3.7 days, higher than the national Medicaid mean of 3.4 days. For well newborns the average length of stay paralleled the national Medicaid mean at 2.1 days, but for complex newborns, the average length of stay for SoonerCare infants was nearly four days longer than the national Medicaid mean (19.4 vs. 15.6 days, respectively). Overall, more than 90% of SoonerCare newborns were discharged in less than 5 days and were classified as well newborns. However, it was the approximately 10% of complex newborns who required longer lengths of stay and more comprehensive, costly treatment following birth.

Between SFYs 2006 and 2007, the average lengths of newborn stay (well and complex newborns) increased for all racial/ethnic groups; however, the increase was most dramatic for the American Indian newborns whose average length of stay increased from 3.1 days to 3.8 days.

For this report, a "birth" refers to the newborn baby while a "delivery" refers to the mother who gave birth. For mothers who had deliveries in SFY 2007, those who received more than three ultrasounds had the longest average length of stay at 3.1 days. As in SFY 2006, the average length of stay increased as the number of ultrasounds received increased. The average lengths of stay for all SoonerCare deliveries (vaginal and cesarean) were below the national Medicaid means, with average length of stay for SoonerCare cesarean deliveries being one half day below the national Medicaid mean (3.1 days compared to 3.6 days).

Since some information was available only in the baby's record (baby's gender, birth weight, etc.) and some was available only in the mother's record (prenatal care, ultrasounds, aid category, etc.), some of the analyses in this report required that the baby's record be matched to the mother's record. Eighty-eight percent of well newborns and 75% of complex newborns were matched to mothers' records. The matched data

elucidated that over half (54%) of complex newborns were delivered via C-section, while just under one-third (30.5%) of well newborns were delivered via C-section. Not surprisingly, older mothers birthed a slightly higher percentage of complex newborns. A higher percentage of complex newborns (compared to well newborns) were born to mothers in the SoonerCare Traditional program. An examination of the amount of prenatal care provided to mothers was conducted, but the analysis was limited by the information available on certain claims. Some global claims covering multiple services (prenatal visits, the delivery or both) do not specify how many prenatal visits were provided. Nearly 38% of matched mothers of well babies were known to have had 4 or more prenatal visits, while 47.5% of the mothers of complex babies were known to have had 4 or more prenatal visits. Mothers of normal birth weight babies were more likely to have a global code with an unknown number of visits than mothers of low birth weight babies; while mothers of low birth weight babies were more likely to have claims evidence of 4 or more prenatal visits than mothers of normal birth weight babies.

Both newborn and maternity costs increased across the board between SFYs 2006 and 2007. The average cost for newborns born to mothers in the Traditional program was higher than for SoonerCare Choice or aliens. Conversely, the average cost for SoonerCare Choice mothers was higher than for the other groups. The average cost for complex newborns was up to 13.5 times higher than for well newborns. The average cost for 92% of well newborns was under \$3,000.

Delivery and birth outcomes information were analyzed for undocumented aliens in this study. Undocumented aliens had lower average lengths of stay, fewer ultrasounds, fewer complex newborns, shorter newborn lengths of stay, and lower costs than all other SoonerCare members.

Introduction

Prenatal care promotes improved health of the mother and baby throughout the pregnancy and delivery. Pregnant women in Oklahoma with an income that does not exceed 185% of the federal poverty level are eligible for prenatal care through the SoonerCare program.¹ Prenatal services covered include prenatal care visits, prenatal vitamins, and ultrasounds.¹

Initiating care in the first trimester leads to the best health outcomes for both the mother and the child.² Early prenatal care is especially important for the mother if she has any medical conditions or history of family health problems that may put her or the baby at risk for complications.² Inadequate prenatal care may lead to nutritional deficiencies in the mother and baby, as well as to adverse outcomes, such as premature births, lower birth weights, and higher infant mortality.²

A study of Medicaid recipients in Tennessee found that mothers who entered a health plan after becoming pregnant, had an unplanned pregnancy, reported physical violence in their relationships, and/or had little to no help from the baby's father were all more likely to receive late prenatal care.³ A similar study of mothers with Medicaid or private insurance found that almost 30% of women with continuous health insurance did not initiate prenatal care until after the first trimester of pregnancy. The study also found that being a younger mother and/or having an unplanned pregnancy were significant predictors of delayed prenatal care.⁴

Similar patterns were observed in Oklahoma in 2006, where 33% of mothers aged 19 and younger initiated prenatal care after the first trimester.⁵ To the extent that marriage can be viewed as a surrogate for either planned pregnancy or support from the baby's father, 72% of married women received prenatal care in the first trimester in 2006, while 63% of unmarried women did the same.⁵ According to data from the Oklahoma Pregnancy Risk Assessment Monitoring Systems (PRAMS), 37% of women surveyed who had live births between 2000 and 2003 had unintended pregnancies. Of those women with unintended pregnancies, 64% utilized SoonerCare funds for prenatal and/or delivery care.⁶ Oklahoma women under the age of 24, of African-American descent, with less than a high school education, or unmarried were more likely to experience unintended pregnancies.⁶ In a winter 2007 publication of PRAMS data⁷, the role of fathers' intentions toward pregnancy was examined. Between 2000-2003 in Oklahoma, approximately one third of live births were to women who indicated the father had not intended the pregnancy. Men who did not intend their partners' pregnancy were less likely to help them with caring for the baby and paying for baby supplies.⁷

The longer a woman waits to initiate prenatal care, the higher the risk of delivery complications and of the baby needing special care after delivery.² Delivery

complications, longer lengths of stay for the mother and/or baby, and neonatal intensive care all increase costs. Specifically, inadequate prenatal care may result in premature birth and/or low birth weight, leading to higher costs. In 2004, 12.5% of births in the United States were preterm; that is, they were born at less than 37 completed weeks of gestation.⁸ The annual societal economic burden associated with preterm birth in the United States was at least \$26.2 billion in 2005, or \$51,600 per infant born preterm.⁸ In 2006, 11% of infants born in Oklahoma were preterm.⁵ Of those preterm infants, 54% had either low birth weight (below 2,500 grams or 5.5 lbs) or very low birth weight (below 1,500 grams or 3.3 lbs).⁵ Among all infants born in Oklahoma in 2006, 8% had low or very low birth weight.⁵

Background to Study

Research clearly demonstrates the importance of prenatal care. SoonerCare offers comprehensive programs for pregnant women, offering many services and making care more accessible. SoonerCare offers prenatal visits, prenatal vitamins, ultrasounds and pregnancy-specific education and counseling. Providers can talk with expectant mothers about topics such as nutrition, physical activity, what to expect during the birth process, and basic skills in caring for an infant.

This study explored differences between mothers and newborns within the SoonerCare Traditional program, SoonerCare Choice program, and those mothers who were undocumented aliens who received only delivery services from SoonerCare. All SoonerCare providers were required to have a fee-for-service base contract. While all SoonerCare members started out in the SoonerCare Traditional (fee for service) program, most members then transitioned to SoonerCare Choice, the primary care case management program. While there was fluidity regarding membership of SoonerCare Choice and Traditional programs for most members, those in state custody, those who had an additional source of medical coverage, and those in a long-term care facility remained in the SoonerCare Traditional program. Mothers and babies who received medical coverage through both SoonerCare and the Indian Health Service (IHS) had the same benefit package as those in SoonerCare Choice, except that their primary care physicians were employed through the IHS.

In recent years, maternity care for SoonerCare members became an area of focus for quality improvement efforts of the Oklahoma Health Care Authority (OHCA). Working in conjunction with the OHCA, APS Healthcare (APS) adapted 2007 Healthcare Effectiveness Data and Information Set (HEDIS®)⁹ methodologies to monitor three categories of prenatal care and assess possible trends. The three categories of measures included:

- Births and Average Lengths of Stay – Newborns;
- Delivery Outcomes and Maternity Care; and
- Costs Associated with Maternity Care and Births.

The findings from this study will provide direction to the OHCA in the development of initiatives and strategies to improve the health care provided to SoonerCare members.

Methodology

The review period for this study covered SFY 2007 (July 1, 2006, through June 30, 2007). This section outlines the details of the methodology and the measures used in the study.

Study Objectives

- Calculate and report the modified HEDIS measure, *Births and Average Lengths of Stay, Newborns*.⁹
- Calculate and report measures for delivery outcomes and maternity care.
- Explore costs associated with maternity care, delivery, and newborn infant care for the selected members.
- Explore demographic differences between newborn/mother dyads with respect to length of stay for the newborn, delivery outcome, and utilization of prenatal care.
- Compare and contrast SFY 2007 to SFY 2006 data.

Definitions of Measures

For all measures:

- Newborn care included care provided from birth until discharge to home, including care if the newborn was transferred to a different hospital.
- Well newborns were live-born babies who were not defined as complex and had a length of stay less than 5 days.
- Complex newborns were live-born babies who had a length of stay of 5 days or greater, or newborns who had a length of stay of less than 5 days and died.
- Total newborns were all SoonerCare covered live births.
- Maternal age was broken down into the following groups: 10 to 14 years, 15 to 19 years, 20 to 34 years, 35 to 49 years, and 50+ years.
- The average length of stay was defined as the sum of the days between admission and discharge divided by the number of discharges.
- County of residence was categorized into rural or urban based upon the proximity of the county to a metropolitan area. Based upon the USDA's determination of urban counties,¹⁰ the following counties were located near metropolitan areas: Canadian, Cleveland, Comanche, Creek, Grady, LeFlore,

Lincoln, Logan, McClain, Oklahoma, Okmulgee, Osage, Pawnee, Rogers, Sequoyah, Tulsa, and Wagoner. All other counties were defined as rural. County of residence coded as state custody indicated that the member was in state custody and a designation of residence could not be determined.

Births and Average Lengths of Stay, Newborns

These measures, adapted from the HEDIS 2007 measure *Births and Average Lengths of Stay, Newborns*,⁹ summarized utilization information about SoonerCare newborns discharged between July 1, 2006, and June 30, 2007. Utilization information was reported for total newborns, well newborns, and complex newborns.

This group of measures examined SoonerCare newborn member demographic data in conjunction with paid administrative claims. APS matched the member demographic data with the information from paid claims that indicated a live newborn. These measures included live births at inpatient settings or birthing centers between July 1, 2006, and June 30, 2007.

Days for newborn care were all days associated with the discharge of the newborn. The total number of days did not include denied days or the last day of the stay, unless the last day of stay was also the admission day.

Delivery Outcomes and Maternity Care

These measures summarized delivery outcome and utilization of maternity-related care for SoonerCare Choice and SoonerCare Traditional members who had live births and had a discharge date between July 1, 2006, and June 30, 2007. These measures report information for total deliveries, vaginal deliveries, and cesarean section (C-section) deliveries.

This group of measures examined SoonerCare Choice member, SoonerCare Traditional member, and alien demographic data in conjunction with paid administrative and encounter claims. APS matched the member demographic data with the information from paid claims that indicated a live delivery.

To be included in this measure, maternal SoonerCare members had to meet the following criteria:

- A SoonerCare Choice or SoonerCare Traditional member at the time of delivery, or an undocumented alien who received only delivery services from SoonerCare.
- Gave birth to a live infant in an inpatient setting or birthing center.
- Had a discharge date between July 1, 2006, and June 30, 2007.

Days for maternity care were all days associated with the discharge of delivery stay. The total number of days did not include denied days, the last day of the stay, or one-day stays.

Data on the SoonerCare mothers were also examined by several other characteristics:

- Mothers were compared based on whether their eligibility was related or unrelated to their pregnancy.
- Mothers who had a vaginal delivery were compared with those who had a C-section.
- Mothers were classified into different groups based upon the number of ultrasounds they received during the 280 days prior to their hospital admission.

Prenatal Care, Delivery Method and Newborn Status – Matched Infants and Mothers

Mothers and babies were matched to coordinate information in the mother's claims with outcomes reflected in the baby's claims. This was necessary because some information could only be found in the baby's record (baby's gender, birth weight, etc.) and some information was only available in the mother's record (prenatal care, ultrasounds, aid category, etc.). This group of measures examined matched infants and mothers eligible in either the SoonerCare Choice or SoonerCare Traditional program, as well as undocumented aliens. Demographic data was used to match the infants and mothers. The paid claims and encounters for these match infants and mothers were then retrieved.

Matched infants were categorized as either normal birth weight (> 2,500 grams), low birth weight (1,500 grams to 2,500 grams), and very low birth weight (less than 1,500 grams).

Claims for matched mothers were examined for prenatal visits for 280 days prior to admission. Various codes for prenatal care, ultrasounds, and lab tests related to pregnancy were counted toward total prenatal visits.

Costs Associated with Maternity Care and Births– Matched Infants and Mothers

This group of measures examined costs of maternity care and newborn care for matched pairs of SoonerCare mothers and newborns. The costs for these groups included services such as:

- Emergency Room (ER) visits related to the pregnancy;

- Observation stays related to the pregnancy;
- Physician services with diagnosis codes that identified conditions related to a pregnancy (principal diagnosis);
- Maternal-fetal monitoring;
- Discharge services for newborns; and
- Services provided to critically ill infants prior to discharge.

Methodological Changes Between SFY 2006 and SFY 2007

A number of changes were made in response options, stratification, and member inclusion criteria in the study for SFY 2007. Changes are summarized below:

- Members who also have medical coverage through the Indian Health Service were included in the SFY 2007 study. Any enrolled member of an Indian tribe or tribal entity can receive medical services through IHS. These same members may also receive medical coverage through SoonerCare if they meet the criteria for SoonerCare membership. Members who coordinate benefits between IHS and SoonerCare participate in a managed care program similar to SoonerCare Choice members, except that their primary care physicians work for IHS. SoonerCare IHS and SoonerCare Choice member data were aggregated for this report. From this point forward, the aggregated group will be labeled as SoonerCare Choice/IHS in all data tables and figures.
- Undocumented aliens who received delivery services through SoonerCare were included in the study this year in an effort to gauge their impact on SoonerCare utilization and cost statistics. During the SFY 2007 study period, undocumented alien mothers were eligible only for delivery services provided through SoonerCare, although their newborns (automatically U.S. citizens by birth) were eligible for SoonerCare coverage.
- A new race/ethnicity group was added for SFY 2007. "Multiracial" encompasses persons with more than one racial group of origin. "Hispanic" is not a race, thus persons of Hispanic origin are not included in the multiracial group, but rather the Hispanic group.
- The "unknown" category used in the Rural/Urban residence measure in SFY 2006 has been changed to "state custody." We now understand that members whose residence is not indicated are in state custody.
- A "50+" age group was added as two members over age 50 delivered babies in SFY 2007.
- In SFY 2007 study, we were better able to identify transfers between facilities than in the previous year's study. Thus, more mothers and infants who started

out in a SoonerCare facility, but were transferred to another (often due to the severity of their conditions) were included in this year's study.

Confidentiality and Disclosure of Information

The OHCA contracted with APS Healthcare (APS) to conduct this study. Section 1160 of the Social Security Act, "Protecting Against Disclosure of Information," outlines disclosure of external review information by APS. In compliance, all employees of APS have signed confidentiality and disclosure agreements. Additionally, all employees of APS have completed Health Insurance Portability and Accountability Act (HIPAA) training and are educated on the appropriate handling of personal health information. Access to member-specific data was limited to the project staff associated with this study and, for the duration of this study, APS only produced reports with de-identified data. This study examined member demographic and eligibility data in conjunction with paid administrative and encounter claims.

Results

The results presented here are largely in the form of descriptive statistics. Given the large group sizes in a population-based study such as this, tests of significance become quite sensitive to small, possibly unimportant differences. Thus, in this study, we relied on clinical importance for determining whether differences were noteworthy. When statistical tests were conducted, a significance level of .05 was used.

Table 1 summarizes basic demographic data for newborns for SFY 2006 and SFY 2007.

Table 1. Summary of SoonerCare Newborn Demographics – SFYs 2006 and 2007

	SFY 2007		SFY 2006	
	Discharges	Percentages	Discharges	Percentages
All SoonerCare Newborns	32,346		29,654	
Gender				
Female	15,699	48.5%	14,588	49.2%
Male	16,647	51.5%	15,066	50.8%
Race/Ethnicity				
Caucasian	17,828	55.1%	16,843	56.8%
African American	4,186	12.9%	3,992	13.5%
American Indian	3,664	11.3%	3,229	10.9%
Hispanic	6,036	18.7%	5,212	17.6%
Asian	381	1.2%	378	1.3%
Multiracial	251	0.8%	-	-
SoonerCare Program				
Choice/IHS	29,013	89.7%	25,683	86.6%
Traditional	3,333	10.3%	3,971	13.4%
Urban/Rural				
Urban	20,140	62.3%	18,207	61.4%
Rural	12,206	37.8%	11,447	38.6%

“-“ indicates data were not available, not collected, or excluded in SFY 2006 study

Between SFY 2006 and 2007, there was an approximately 9% increase in the number of SoonerCare newborns discharged. Gender ratios, race/ethnicity, and urban/rural residence remained similar. In SFY 2007, a new race/ethnicity category – multiracial – was added. It accounted for less than 1% of the newborns discharged in SFY 2007. There were very small differences in the percentage of newborns in SoonerCare Choice/IHS and Traditional. The percentage of newborns in SoonerCare Choice/IHS was larger in SFY 2007 than in SFY 2006.

Table 2 summarizes basic demographic data for mothers for SFY 2006 and SFY 2007.

Table 2. Summary of SoonerCare Maternal Demographics – SFYs 2006 and 2007

	SFY 2007		SFY 2006	
	Discharges	Percentages	Discharges	Percentages
All SoonerCare Deliveries	31,835		26,066	
Age Group				
10-14 yrs	93	0.3%	76	0.3%
15-19 yrs	6,440	20.2%	5,420	20.8%
20-34 yrs	23,794	74.7%	19,499	74.8%
35-49 yrs	1,506	4.7%	1,071	4.1%
50+	2	0.0%	-	-
Race/Ethnicity				
Caucasian	17,898	56.2%	16,850	64.6%
African American	3,812	12.0%	3,577	13.7%
American Indian	4,265	13.4%	3,540	13.6%
Hispanic	5,425	17.0%	1,837	7.0%
Asian	359	1.1%	262	1.0%
Multiracial	76	0.2%	-	-
SoonerCare Program				
Choice/IHS	24,693	77.6%	21,736	83.4%
Traditional	3,708	11.6%	4,330	16.6%
Alien	3,434	10.8%	-	-
Eligibility Type				
Pregnancy Related	27,000	84.8%	21,174	81.2%
Not Pregnancy Related	4,835	15.2%	4,892	18.8%
Urban/Rural				
Urban	19,626	61.6%	15,391	59.0%
Rural	12,199	38.3%	10,665	40.9%
State Custody	10	0.0%	10	0.0%

Between SFY 2006 and 2007, there was an approximately 22% increase in the number of SoonerCare delivery discharges. Age group percentages of mothers remained similar from SFY 2006 to SFY 2007, although more specific information on mothers' ages is presented in Figure 1.

In SFY 2007, a lower percentage of the overall group of mothers was Caucasian (56% vs. 65%) and a higher percentage was Hispanic (17% vs. 7%). Less than 1% of members were categorized in the new multiracial category.

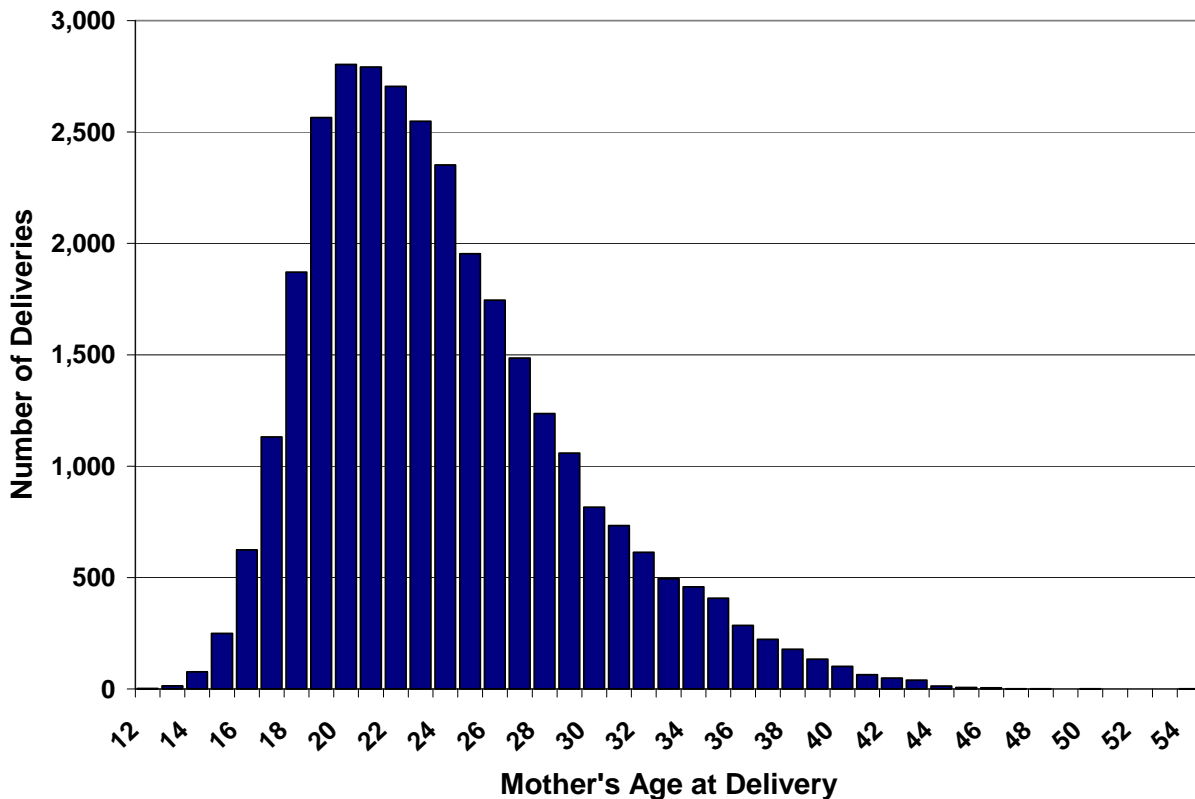
Approximately 11% of SoonerCare deliveries were for undocumented aliens. An examination of these mothers showed that 95% of these mothers were listed as being Hispanic. This is somewhat higher than national statistics which show that approximately 81% of undocumented mothers are of Hispanic ethnicity.¹¹

There was a slight increase in the proportion of mothers eligible for SoonerCare as a result of pregnancy in SFY 2007 (85% in SFY 2007 and 81% in SFY 2006), and the majority of mothers covered in SFY 2007 were eligible due to pregnancy (85%).

A slightly higher proportion of mothers resided in an urban county in SFY 2007 (62% vs. 59%). A new category was added that included mothers who were in state custody where residence data were not collected. Only 10 mothers in state custody delivered in SFY 2007.

Mothers were most likely to be in their 20s, as shown in Figure 1.

Figure 1. The Distribution of Mother’s Age at Delivery – SFY 2007



A further breakdown of the age of the mother at the time of delivery showed that the minimum age was 12 years, the maximum age was 54 years, and the average age was 23.9 years. This is an approximately normal age distribution.

Births and Average Lengths of Stay, Newborns

The following measures, adapted from the HEDIS 2007 measure, *Births and Average Lengths of Stay, Newborns*,⁹ summarize utilization information about SoonerCare total, well, and complex newborns discharged between July 1, 2006, and June 30, 2007.

Table 3 displays the total newborn discharges, and average length of inpatient stay for newborns. The average length of stay (Avg. LOS) is the ratio of the number of days to the number of discharges. These data are presented by the race/ethnicity of the newborn and by fiscal year.

Table 3. Newborn Discharges and Average Lengths of Stay by Race/Ethnicity – SFYs 2006 and 2007

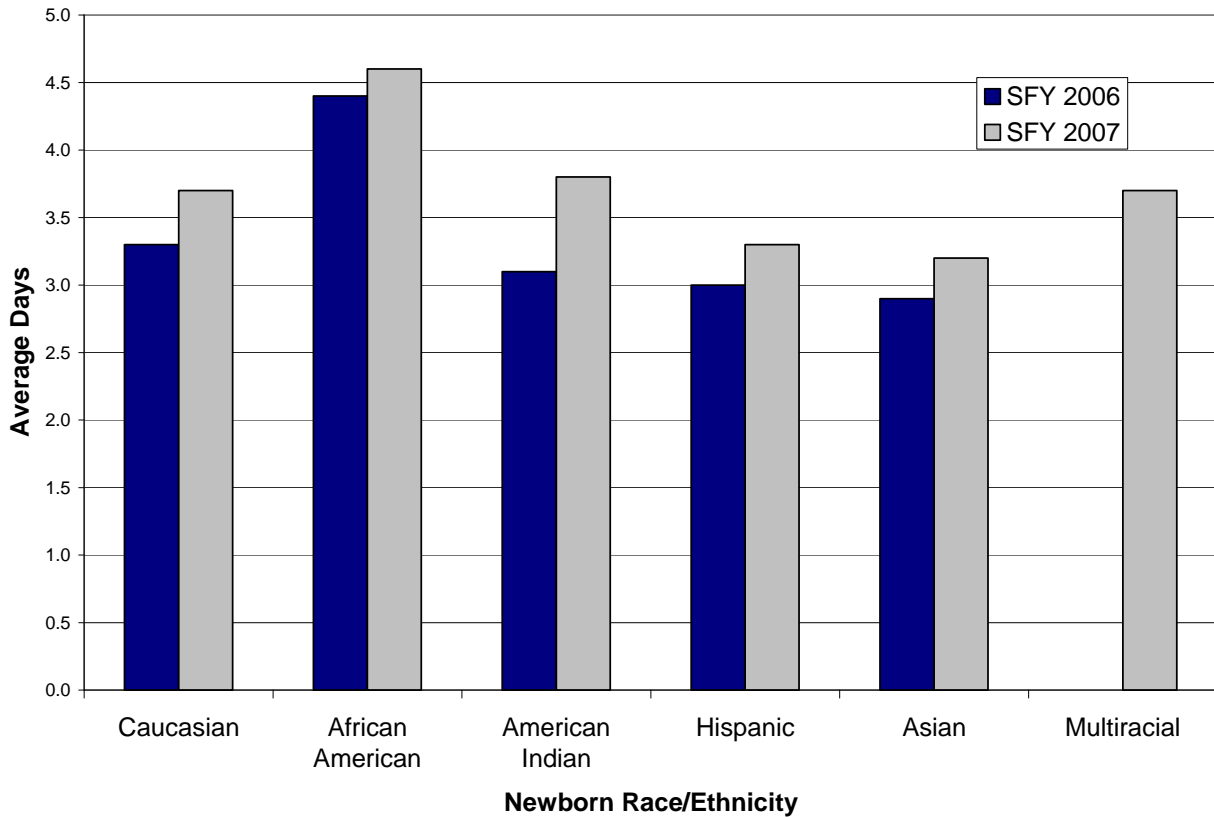
Race/Ethnicity	Total Discharges		Avg. LOS in Days	
	SFY 2007	SFY 2006	SFY 2007	SFY 2006
Caucasian	17,828	16,842	3.7	3.3
African American	4,186	3,992	4.6	4.4
American Indian	3,664	3,229	3.8	3.1
Hispanic	6,036	5,212	3.3	3.0
Asian	381	378	3.2	2.9
Multiracial	251	-	3.7	-
All SoonerCare Newborns	32,346	29,654	3.7	3.4

Table 3 shows that Asian infants continued to have the shortest average length of stay in SFY 2007 (3.2 days) and African American infants continued to have the longest average length of stay (4.6 days). The average length of stay increased for every racial/ethnic group between SFY 2006 and SFY 2007. The greatest increase occurred for American Indian newborns whose average length of stay increased from 3.1 to 3.8 days. This increase maybe attributable to the more accurate methods used to identify the babies that were transferred in the SFY 2007 data.

The average length of stay for all SoonerCare newborns was 3.7 days. This was higher than the 2007 national Medicaid mean for newborns' average length of stay of 3.4 days.¹²

The information on average length of stay from Table 3 is also displayed in Figure 2 where the consistent increase in average lengths of stay for every racial/ethnic group is easier to see graphically.

Figure 2. Average Lengths of Stay for Newborns by Race/Ethnicity – SFYs 2006 and 2007



Just over 90% of SoonerCare newborns discharged in SFY 2007 were well newborns. Table 4 displays total well newborn discharges and the average length of inpatient stay for well newborns. These well newborn discharges are presented by the race/ethnicity of the newborn.

Table 4. Well Newborn Discharges and Average Length of Stay by Race/Ethnicity – SFYs 2006 and 2007

Race/Ethnicity	Total Discharges		Avg. LOS in Days	
	SFY 2007	SFY 2006	SFY 2007	SFY 2006
Caucasian	16,135	15,499	2.1	2.0
African American	3,656	3,548	2.2	2.2
American Indian	3,304	2,991	2.1	2.1
Hispanic	5,602	4,876	2.0	2.0
Asian	347	352	2.1	2.1
Multiracial	226	-	2.1	-
All Well Newborns	29,270	27,266	2.1	2.1

The average length of stay for well newborns was similar for all racial/ethnic groups. The average length of stay for SoonerCare well newborns was 2.1 days. This is the same as the 2007 national Medicaid mean for well newborns' average length of stay.¹² There was little to no change in the average lengths of stay for well newborns across all racial/ethnic groups between SFY 2006 and SFY 2007.

Approximately 9.5% of SoonerCare newborns discharged in SFY 2007 were complex newborns. Table 5 below displays total complex newborn discharges, and the average length of inpatient stay for complex newborns. These complex newborn discharges are presented by the race/ethnicity of the newborn.

Table 5. Complex Newborn Discharges and Average Length of Stay by Race/Ethnicity – SFYs 2006 and 2007

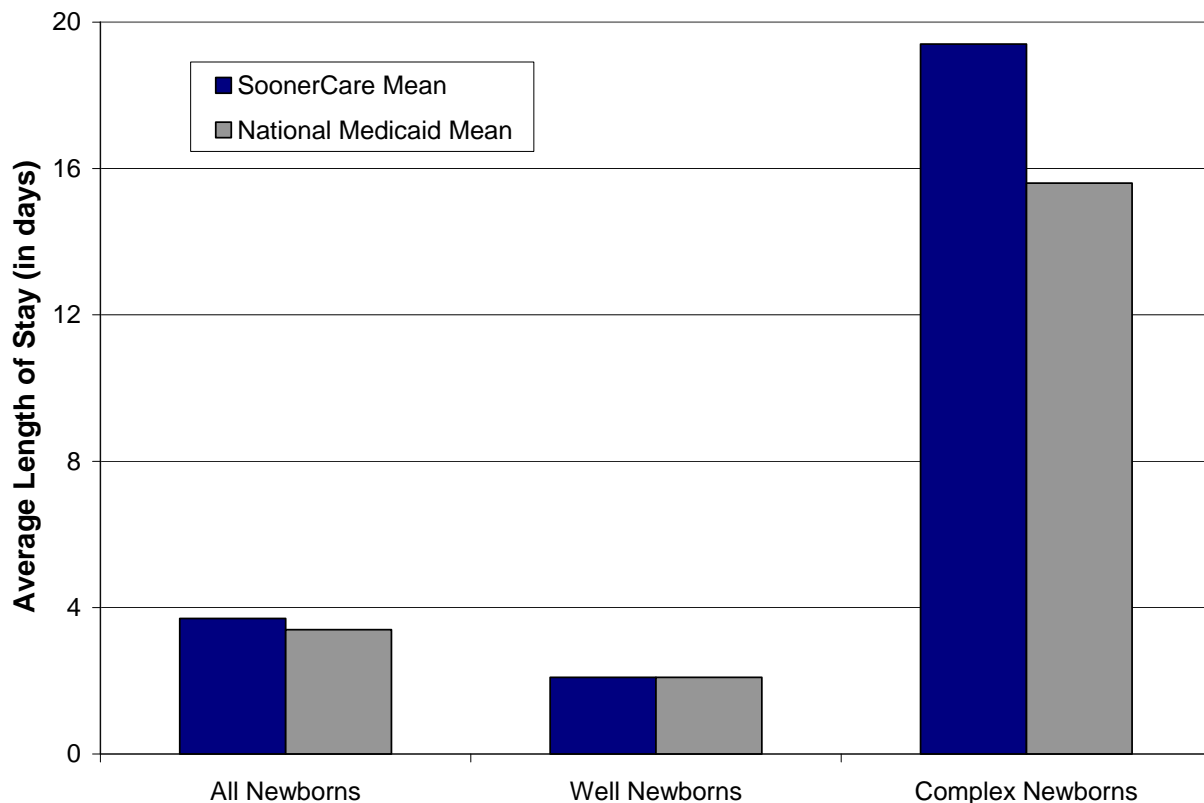
Race/Ethnicity	Total Discharges		Avg. LOS in Days	
	SFY 2007	SFY 2006	SFY 2007	SFY 2006
Caucasian	1,693	1,344	19.2	18.2
African American	530	444	20.8	22.6
American Indian	360	238	18.9	16.2
Hispanic	434	336	19.5	18.1
Asian	34	26	14.6	14.3
Multiracial	25	-	18.9	-
All Complex Newborns	3,076	2,388	19.4	18.7

Similar to SFY 2006, Asian infants categorized as “complex newborns” in SFY 2007 had the shortest average length of stay (14.6 days) compared to complex newborns of other races/ethnicities. Also similar to SFY 2006, African American complex newborns in SFY 2007 had the highest average length of stay at 20.8 days. The African American group was the only racial/ethnic group that showed a decrease (by nearly 2 days) in the

average length of stay for complex newborns. All other racial/ethnic groups demonstrated an increase in the average number of inpatient days for complex newborns. American Indian complex newborns showed more than a 2-day increase in the average length of stay compared to SFY 2006. Caucasian and Hispanic complex newborns showed a 1-day increase in average length of stay. It is possible that our increased ability to identify members who were transferred in SFY 2007 resulted in the inclusion of newborns whose cases were even more serious or complex than last year, leading to the increases in average lengths of stay for many racial/ethnic groups. Complex babies for all SoonerCare racial/ethnic groups, except the Asian group, had average lengths of stay higher than the national Medicaid mean of 15.6 days. Taken together, all SoonerCare complex newborns remained hospitalized nearly 4 days longer on average than the national Medicaid mean.

Figure 3 shows the comparison between the SoonerCare newborns' average length of stay in SFY 2007 and the 2007 national Medicaid means for all newborns, well newborns, and complex newborns.

Figure 3. Average Length of Stay: SoonerCare Newborns Compared to 2007 National Medicaid Means



Overall in SFY 2007, SoonerCare newborns had a slightly higher average length of stay than the national Medicaid mean (3.7 to 3.4 days, respectively). SoonerCare well newborns tracked the national Medicaid mean at 2.1 days. SoonerCare complex newborns had an average length of stay nearly 4 days longer than the national Medicaid mean (19.4 to 15.6 days, respectively).

Delivery Outcomes and Maternity Care

The following measures summarize delivery outcome and utilization of maternity-related care for SoonerCare mothers who had live births and had a discharge date between July 1, 2006, and June 30, 2007. Data are summarized for total deliveries, vaginal deliveries, and cesarean section (C-section) deliveries.

Table 6 displays the number of discharges and the average length of stay in an inpatient facility or birthing center for SoonerCare mothers in the study. These data were broken down by age group, SoonerCare program in which the mother was a member at delivery, type of SoonerCare eligibility (pregnancy related or not), urban/rural residence, and number of ultrasounds.

Table 6. Discharges and Average Length of Stay by Maternal Demographics – All Live Infant Deliveries – SFYs 2006 and 2007

	Discharges		Avg. LOS in Days	
	SFY 2007	SFY 2006	SFY 2007	SFY 2006
All Deliveries	31,835	26,067	2.5	2.5
Age Group				
10-14 yrs	93	76	2.7	3.0
15-19 yrs	6,440	5,420	2.6	2.6
20-34 yrs	23,794	19,499	2.5	2.5
35-49 yrs	1,506	1,071	2.7	2.7
50+	2	-	2.0	-
SoonerCare Program				
Choice/IHS	24,675	21,736	2.5	2.5
Traditional	3,708	4,330	2.6	2.5
Alien	3,434	-	2.3	-
Eligibility Type				
Pregnancy Related	27,000	21,174	2.5	2.5
Not Pregnancy Related	4,835	4,892	2.6	2.6
Urban/Rural				
Urban	19,626	15,391	2.5	2.6
Rural	12,199	10,665	2.4	2.4
State Custody	10	10	2.4	2.6
Number of Ultrasounds				
No Ultrasounds	8,304	4,742	2.4	2.5
1-2 Ultrasounds	21,690	20,499	2.5	2.5
3+ Ultrasounds	1,841	825	3.1	3.0

SFY 2006 and SFY 2007 findings were largely the same when it came to mothers' average length of stay. The average length of stay for all deliveries remained at 2.5 days in SFY 2007, the same as it had been in SFY 2006. This was just slightly lower than the national Medicaid mean of 2.6 days.¹² The biggest change was the decrease in the average length of stay for mothers aged 10 to 14 from 3.0 days in SFY 2006 to 2.7 days in SFY 2007. The (two) mothers over age 50 had the shortest average length of stay at 2.0 days. Mothers who received 3 or more ultrasounds had the highest average length of stay at 3.1 days, consistent with the finding in SFY 2006.

Tables 7a and 7b display the number of discharges and the average length of stay in an inpatient facility or birthing center by delivery method. The data were broken down by age group, SoonerCare program in which the mother was enrolled at delivery, type of SoonerCare eligibility (pregnancy related or not), urban/rural classification based on the mother's residence, and number of ultrasounds.

Table 7a. Discharges and Average Length of Stay by Maternal Demographics – Live Infant Vaginal Deliveries – SFYs 2006 and 2007

	Discharges		Avg. LOS in Days	
	SFY 2007	SFY 2006	SFY 2007	SFY 2006
All Vaginal Deliveries	20,871	17,739	2.2	2.2
Age Group				
10-14 yrs	73	56	2.4	2.6
15-19 yrs	4,658	4,044	2.3	2.3
20-34 yrs	15,342	13,052	2.1	2.1
35-49 yrs	797	586	2.3	2.2
50+	1	-	1	-
SoonerCare Program				
Choice/IHS	16,010	14,732	2.2	2.2
Traditional	2,321	3,006	2.3	2.2
Alien	2,540	-	2.1	-
Eligibility Type				
Pregnancy Related	17,685	14,394	2.2	2.2
Not Pregnancy Related	3,186	3,344	2.3	2.2
Urban/Rural				
Urban	13,371	10,642	2.2	2.2
Rural	7,494	7,087	2.1	2.1
State Custody	6	9	2.0	2.6
Number of Ultrasounds				
No Ultrasounds	5,475	3,489	2.1	2.2
1-2 Ultrasounds	14,424	13,804	2.2	2.2
3+ Ultrasounds	972	445	2.5	2.5

Table 7b. Discharges and Average Length of Stay by Maternal Demographics – Live Infant Cesarean Deliveries – SFYs 2006 and 2007

	Discharges		Avg. LOS	
	SFY 2007	SFY 2006	SFY 2007	SFY 2006
All Cesarean Deliveries	10,116	8,328	3.1	3.2
Age Group				
10-14 yrs	19	20	3.9	3.9
15-19 yrs	1,612	1,376	3.3	3.4
20-34 yrs	7,816	6,447	3.1	3.2
35-49 yrs	668	485	3.2	3.4
50+	1	-	3.0	-
SoonerCare Program				
Choice/IHS	8,089	7,004	3.1	3.2
Traditional	1,140	1,324	3.2	3.2
Alien	887	-	3.1	-
Eligibility Type				
Pregnancy Related	8,634	6,780	3.1	3.2
Not Pregnancy Related	1,482	1,548	3.2	3.2
Urban/Rural				
Urban	5,957	4,749	3.2	3.3
Rural	4,157	3,578	3.0	3.1
State Custody	2	1	3.5	3.0
Number of Ultrasounds				
No Ultrasounds	2,252	1,253	3.0	3.2
1-2 Ultrasounds	7,023	6,695	3.1	3.2
3+ Ultrasounds	841	380	3.7	3.5

SFY 2006 and SFY 2007 findings were quite similar when it came to mothers' average length of stay for either vaginal or cesarean deliveries. The average length of stay remained at 2.2 days for vaginal deliveries in SFY 2007, the same as in SFY 2006. The average length of stay was 3.2 days in SFY 2006 and 3.1 days in SFY 2007. The SFY 2007 SoonerCare average length of stay for vaginal deliveries was consistent with the national Medicaid mean of 2.2 days, while the average length of stay for C-sections for SoonerCare moms was lower than the national Medicaid mean of 3.6 days.¹²

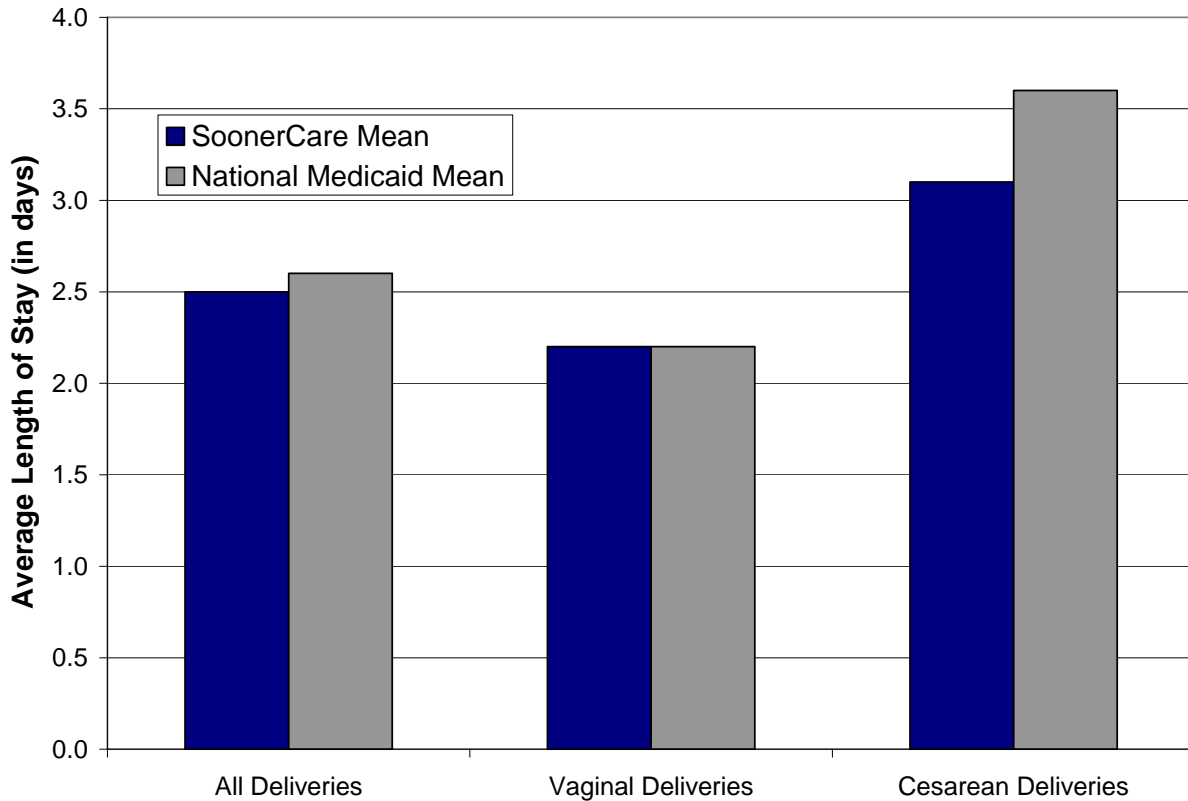
There was a nearly one-day difference in the average length of stay for vaginal deliveries (2.2 days) compared to cesarean deliveries (3.1 days). The largest difference in average length of stay between the two delivery methods was seen in the 10 to 14 year age group with a 2.4-day average length of stay for vaginal deliveries and a 3.9-day average length of stay for cesarean deliveries. Members who had at least three ultrasounds during the prenatal period, as well as those aged 14 and under, had the

highest average lengths of stay of any other groups for both vaginal and cesarean deliveries.

While it appears the change in the average LOS for mothers in state custody may have been significant between SFY 2006 and SFY 2007, the number of mothers in state custody in both years was too small to demonstrate robust and credible changes.

Figure 4 shows the comparison between mothers' average length of stay and the 2007 national Medicaid means for all deliveries, for vaginal deliveries, and for cesarean deliveries.

Figure 4. Average Length of Stay for Mothers and the 2007 National Medicaid Means for All, Vaginal, and Cesarean Deliveries



Overall, average lengths of stay for SoonerCare mothers was either lower or exactly the same as the national Medicaid mean for each delivery type. When combined, the average length of stay for all SoonerCare deliveries was 2.5 days compared to the national Medicaid mean of 2.6 days. SoonerCare vaginal deliveries resulted in an average stay for mothers of 2.2 days, exactly the same as the national Medicaid mean. SoonerCare cesarean deliveries resulted in an average stay of 3.1 days for mothers while the national Medicaid mean for that group was 3.6 days.

Table 8a displays the number of discharges from inpatient facilities by the number of ultrasounds received during pregnancy (0, 1 to 2, or 3 or more ultrasounds). Table 8b displays the average length of stay by the number of ultrasounds received. Table 8a is included to give readers some insight into the number of SoonerCare members included in the length of stay calculations (in Table 8b). The average length of stay (Avg. LOS) is the ratio of the number of days to the number of discharges. The number of ultrasounds received is determined using administrative claims data. These data are broken down by age group, SoonerCare program in which the mother was enrolled at delivery, type of SoonerCare eligibility (pregnancy related or not), and urban/rural classification based on the mother's residence.

Table 8a. Discharges for Mothers by Number of Ultrasounds Received During Pregnancy and Maternal Characteristics – SFYs 2006 and 2007

	No Ultrasounds		1-2 Ultrasounds		3+ Ultrasounds	
	SFY 2007 Discharges	SFY 2006 Discharges	SFY 2007 Discharges	SFY 2006 Discharges	SFY 2007 Discharges	SFY 2006 Discharges
All Deliveries	8,304	4,743	21,690	20,499	1,841	825
Age Group						
10-14 yrs	22	14	65	58	6	4
15-19 yrs	1,449	960	4,666	4,321	325	139
20-34 yrs	6,305	3,534	16,112	15,341	1,377	624
35-49 yrs	526	234	847	779	133	58
50+	2	-	0	-	0	-
SoonerCare Program						
Choice/IHS	3,309	3,177	19,708	17,870	1,676	689
Traditional	404	1,565	1,977	2,629	165	136
Alien	3,429	-	5	-	0	-
Eligibility Type						
Pregnancy Related	7,579	4,007	17,957	16,541	1,464	626
Not Pregnancy Related	725	735	3,733	3,958	377	199
Urban/Rural						
Urban	5,565	2,616	12,892	12,319	1,169	456
Rural	2,737	2,126	8,790	8,170	672	369
State Custody	2	0	8	10	0	0

As shown earlier in Table 2, there was an approximately 22% increase in the number of SoonerCare maternal discharges between SFY 2006 and SFY 2007. Table 8a shows that the greatest increases in the number of discharges in SFY 2007 were among mothers who received no ultrasounds (75% increase in discharges) and mothers who received 3 or more ultrasounds (123% increase in discharges). The two new categories

– aged 50+ and alien – were largely composed of discharges of mothers who had no ultrasounds. There were just five discharges for aliens who had one or two ultrasounds.

Table 8b. Average Length of Stay for Mothers by Number of Ultrasounds Received During Pregnancy and Maternal Characteristics – SFYs 2006 and 2007

	No Ultrasounds		1-2 Ultrasounds		3+ Ultrasounds	
	SFY 2007 Avg. LOS	SFY 2006 Avg. LOS	SFY 2007 Avg. LOS	SFY 2006 Avg. LOS	SFY 2007 Avg. LOS	SFY 2006 Avg. LOS
All Deliveries	2.4	2.4	2.5	2.5	3.1	3.0
Age Group						
10-14 yrs	2.6	2.8	2.8	2.9	3.0	4.0
15-19 yrs	2.4	2.5	2.6	2.6	2.9	2.9
20-34 yrs	2.3	2.4	2.5	2.5	3.1	2.9
35-49 yrs	2.4	2.6	2.8	2.8	3.2	3.2
50+	2.0	-	0	-	0	-
SoonerCare Program						
Choice/IHS	2.3	2.4	2.5	2.5	3.1	3.0
Traditional	2.4	2.5	2.6	2.5	3.0	2.7
Alien	2.3	-	2.8	-	0	-
Eligibility Type						
Pregnancy Related	2.3	2.4	2.5	2.5	3.0	2.9
Not Pregnancy Related	2.4	2.4	2.5	2.6	3.4	3.0
Urban/Rural						
Urban	2.4	2.5	2.5	2.6	3.0	3.1
Rural	2.3	2.4	2.4	2.4	3.1	2.8
State Custody	2.0	0	2.5	2.6	0	0

Between SFY 2006 and SFY 2007, there were virtually no changes in the overall average length of stay for mothers based on the number of ultrasounds they received. However, there were changes from SFY 2006 to SFY 2007 in the average length of stay for mothers who received three or more ultrasounds. In the 10 to 14 year age group, those mothers who received three or more ultrasounds decreased their average length of stay from 4.0 to 3.0 days. This seems like a dramatic change until one realizes that there were only four 10- to 14-year-olds who had three or more ultrasounds in SFY 2006 and only six in SFY 2007. These numbers of young mothers are not high enough to ensure that the changes in average length of stay were not spurious. The group of mothers who were eligible for SoonerCare for reasons unrelated to pregnancy showed an increased average length of stay – up to 3.4 days in SFY 2007 from 3.0 days in SFY 2006. While the number of mothers represented in the “not pregnancy related” eligibility groups was not huge, it was large enough to mitigate spurious findings.

In SFY 2007, for every age, program, eligibility, and residence category, the average length of stay increased as the number of ultrasounds increased. This was consistent with SFY 2006 findings, as well. For those mothers whose SoonerCare eligibility was unrelated to their pregnancy, there was a one-day increase in the average length of stay between those who had zero ultrasounds and those who had three or more (2.4 to 3.4 days, respectively). While the youngest group of mothers showed the longest average lengths of stay in SFY 2006 no matter how many ultrasounds were received, that was not the case in SFY 2007. Mothers aged 10 to 14 did not consistently have the longest lengths of stay in SFY 2007, but rather lengths of stay appeared to be more related to the number of ultrasounds than age of mother. This finding must be viewed with caution, however, since the number of 10- to 14-year-old mothers was relatively low in both study periods.

Prenatal Care, Delivery Method and Newborn Status - Matched Infants and Mothers

The mother's and the baby's records were matched to utilize information from both sources. This enabled a comparison between birth outcome measures in the baby's record (e.g., birth weight) with prenatal services received by the mother. Not all births could be matched to mothers due to differences in surnames and case numbers. However, 88.3% of well newborn and mother records could be matched, and 75.4% of complex newborns and mothers could be matched.

Table 10a displays the number and percentage of well newborns by maternal characteristics for SFYs 2006 and 2007. Table 10b displays the same data for complex newborns. These data were broken down by delivery method, age group, SoonerCare program in which the mother was enrolled at delivery, prenatal care (four or more prenatal visits, fewer than four prenatal visits, or an unknown number of prenatal visits) and rural or urban classification based on the mother's residence.

An explanation is necessary on the number of prenatal visits. Global claims covering both the prenatal care and the delivery carry certain procedure codes. For example, the procedure code 59400 is defined as "routine obstetric care including antepartum care, vaginal delivery (with or without episiotomy, and/or forceps) and postpartum care." Such claims do not specify how many prenatal visits were provided. In the absence of claims for other services (e.g., ultrasounds) to provide evidence of 4 or more prenatal visits, the mothers in the SFY 2008 study could not be classified and were labeled as having an unknown number of prenatal visits. The SFY 2007 study on prenatal care and outcomes classified such mothers as having fewer than 4 prenatal visits, so comparisons between the SFY 2007 and 2008 results on prenatal care in the next three tables must be made with care.

Table 10a. Matched Infants and Mothers: Well Newborns by Prenatal Care, Delivery Method and Maternal Characteristics – SFYs 2006 and 2007

Mothers' Characteristics	2007		2006	
	Number	Percentage	Number	Percentage
Delivery Method				
Vaginal	17,422	67.4%	14,808	69.3%
Cesarean	7,880	30.5%	6,548	30.7%
Unknown	557	2.2%	-	-
Age Group				
10 to 14	65	0.3%	52	0.2%
15 to 19	4,986	19.3%	4,349	20.4%
20 to 34	19,644	75.2%	16,122	75.5%
35 to 49	1,163	4.5%	833	3.9%
50+	1	0.0%	0	0.0%
Average Age	23.9	<i>SD</i> = 5.2	23.6	<i>SD</i> = 5.0
SoonerCare Program				
Choice/IHS	20,212	78.2%	18,035	84.4%
Traditional	2,730	10.6%	3,321	15.6%
Alien	2,917	11.3%	-	-
Prenatal Care				
4 or More Prenatal Visits	9,718	37.6%	8,535	40.0%
Fewer Than 4 Prenatal Visits	8,254	31.9%	12,821	60.0%
Unknown Number of Prenatal Visits	7,887	30.5%	-	-
Rural or Urban County				
Rural	9,875	38.2%	8,914	41.7%
Urban	15,984	61.8%	12,441	58.3%
Total Well Newborn Deliveries	25,859	91.8%	21,356	93.1%

* *SD* is the standard deviation.

Table 10b. Matched Infants and Mothers: Complex Newborns by Prenatal Care, Delivery Method and Maternal Characteristics – SFYs 2006 and 2007

Mothers' Characteristics	2007		2006	
	Number	Percentage	Number	Percentage
Delivery Method				
Vaginal	1,028	44.3%	763	47.9%
Cesarean	1,255	54.1%	831	52.1%
Unknown	35	1.5%	-	-
Age Group				
10 to 14	8	0.3%	5	0.3%
15 to 19	424	18.3%	306	19.2%
20 to 34	1,722	74.3%	1,192	74.8%
35 to 49	164	7.1%	91	5.7%
Average Age	24.5	<i>SD</i> = 5.7	24.1	<i>SD</i> = 5.5
SoonerCare Program				
Choice/IHS	1,805	77.9%	1,301	81.6%
Traditional	325	14.0%	293	18.4%
Alien	188	8.1%	-	-
Prenatal Care				
4 or More Prenatal Visits	1,100	47.5%	818	51.3%
Fewer Than 4 Prenatal Visits	371	16.0%	776	48.7%
Unknown Number of Prenatal Visits	847	36.5%	-	-
Rural or Urban County				
Rural	755	32.6%	487	30.6%
Urban	1,563	67.4%	1,107	69.4%
Total Complex Newborn Deliveries	2,318	8.2%	1,594	6.9%

* *SD* is the standard deviation.

Of the mother/newborn pairs whose records were matched, nearly 92% were well newborns. The percentages of vaginal and cesarean deliveries in SFYs 2006 and 2007 were relatively similar. For well newborns, just under one-third of deliveries (30.5%) were by C-section. For complex newborns, the rate of C-sections was higher (54%). In SFY 2007, data were included for mother/newborn pairs for whom the claims data indicated no particular delivery method. The pairs with unknown delivery method represented just over 2% of the well newborns and 1.5% of complex newborns.

Some trends noted earlier in this report (Table 2) are also shown in Tables 10a and 10b. Both the age group and average age of mothers remained fairly similar between SFY 2006 and 2007. Mothers in the 20 to 34 year age group had the highest percentage of births for both well and complex newborns. Additionally, mothers in the 35 to 49 year age group appeared to have a slightly higher percentage of complex newborns in SFY 2007 compared to SFY 2006. The average age of the mother was higher for those who had complex newborns, compared with those who had well newborns (24.5 vs. 23.9 years, respectively).

While over three-quarters of the matched members were in the SoonerCare Choice/IHS program, there was a decline in the relative percentage of members in both the Choice/IHS and Traditional programs in SFY 2007 compared to SFY 2006 due to the addition of the Alien category. Over 11% of well newborns and just over 8% of complex newborns were born to a mother who was an undocumented immigrant to the U.S. A higher percentage of mothers in the SoonerCare Traditional program had complex newborns compared to the well newborn group.

Comparisons between SFYs 2006 and 2007 in the number of prenatal visits the mothers received cannot be made due to the addition of the category of unknown number of prenatal visits in SFY 2007. For SFY 2007, more mothers of complex newborns were known to have had 4 or more prenatal visits than mothers of well newborns (47.5% as compared to 37.6%). The rest of the mothers of well newborns were nearly evenly split between having claims evidence of fewer than 4 prenatal visits (31.9%) and an unknown number of prenatal visits (30.5%). For the mothers of complex newborns, only 16% appeared to have fewer than 4 prenatal visits, while the number of visits was unknown for 36.5% of these mothers.

Residence of the mothers remained relatively stable between SFY 2006 and 2007, although there were approximately 3.5% more mothers with well newborns in urban areas, and approximately 2% more mothers with complex newborns in rural areas in SFY 2007 compared to SFY 2006. A higher percentage of mothers who resided in urban counties had a complex newborn

Table 11 displays the number and percentage of normal birth weight, low birth weight, and very low birth weight newborns by prenatal care. Prenatal care was categorized by four or more visits, fewer than four visits, and unknown number of visits. The chi-square statistic was used to test for differences in the distributions across categories.

Table 11. Matched Infants and Mothers: Birth Weight by Prenatal Care Received – SFY 2007

	Normal Birth Weight		Low Birth Weight		Very Low Birth Weight		<i>p</i> -value
	Number	Percentage	Number	Percentage	Number	Percentage	
Prenatal Care							<.0001
4 or More Prenatal Visits	10,767	38.4%	43	41.7%	8	50.0%	
Fewer Than 4 Prenatal Visits	9,045	32.2%	48	46.6%	8	50.0%	
Unknown Number of Prenatal Visits	8,246	29.4%	12	11.7%	0	0.0%	

The results of a statistical analysis of the data in Table 11 showed that there were differences in the birth weight of the babies and the category of prenatal care received by their mothers. Similar to what was noted in the prenatal care received by mothers of well and complex newborns, low birth weight deliveries are more likely known to have had 4 or more prenatal visits. The numbers of very low birth weight infants were too small to provide robust insight.

In SFY 2006, data for Table 11 were significant at the $p=.0017$ level. Mothers who had fewer than four prenatal visits were more likely to have a normal birth weight infant, while mothers with four or more prenatal visits were more likely to have low and very low birth weight infants.

The number of recommended prenatal visits is much higher than four, but the OHCA system of paying global claims for pregnancy-related services limits the ability to analyze by specific number of prenatal visits. Another limitation is that the numbers of identified low and very low birth weight babies in SFYs 2006 and 2007 represented a small percentage of total births, so findings may be unreliable.

Costs Associated with Maternity Care and Births - Matched Infants and Mothers

Mothers' and babies' records were matched to utilize information from both sources for all cost comparisons in this study.

Table 12 displays the average costs associated with live births for all matched SoonerCare newborns discharged in SFYs 2007 and 2006 according to SoonerCare program and residence of mother.

Table 12. Costs Associated with Live Births – Matched Newborns, SFYs 2006 and 2007

	SFY 2007			SFY 2006		
	Number	Total Cost	Avg. Cost	Number	Total Cost	Avg. Cost
Totals	28,177	\$89,931,142	\$3,192	22,944	\$57,910,988	\$2,524
SoonerCare Program of Mother						
Choice/IHS	22,017	\$71,108,060	\$3,230	20,238	\$49,205,644	\$2,431
Traditional	3,055	\$11,347,165	\$3,714	2,706	\$8,705,344	\$3,217
Alien	3,105	\$7,475,917	\$2,408	-	-	-
Residence (by county) of Mother						
Rural	10,659	\$33,672,517	\$3,159	9,399	\$22,159,069	\$2,358
Urban	17,515	\$56,251,874	\$3,212	13,545	\$35,751,919	\$2,639
State Custody	3	\$6,751	\$2,250	-	-	-

Table 12 shows a higher average cost of live birth for every category in SFY 2007 compared to SFY 2006. Similar to last year's findings, matched newborns in the SoonerCare Traditional program had a higher average cost than those in the SoonerCare Choice/IHS program in SFY 2007. The newborns of alien mothers had the lowest average cost of all groups. Also similar to SFY 2006 findings, mothers who resided in an urban county in SFY 2007 had a higher average live birth cost than those who resided in a rural county. Those infants born to mothers in state custody had the lowest average cost. However, since there were just three mothers in state custody, the average could have been easily skewed by one cost outlier.

Table 13a displays the average cost associated with live births of well newborns by SoonerCare program and residence of mother for SFY 2007. Table 13b displays the same data for complex newborns. While overall cost data were calculated for matched mother/newborn pairs in the SFY 2006 study, costs were not broken out according to well and complex newborns. Thus, Tables 13a and 13b present SFY 2007 costs alone.

Table 13a. Costs Associated with Well Newborn Births – Matched Newborns, SFY 2007

	Well Newborns - Matched		
	Number	Total Cost	Average Cost
Totals	25,859	\$39,506,862	\$1,528
SoonerCare Program of Mother			
Choice/IHS	20,212	\$31,422,956	\$1,555
Traditional	2,730	\$4,361,576	\$1,598
Alien	2,917	\$3,722,329	\$1,276
Residence (by county) of Mother			
Rural	9,902	\$16,771,030	\$1,694
Urban	15,954	\$22,729,081	\$1,425
State Custody	3	\$6,751	\$2,250

Table 13b. Costs Associated with Complex Newborn Births – Matched Newborns, SFY 2007

	Complex Newborns - Matched		
	Number	Total Cost	Average Cost
Totals	2,318	\$50,424,280	\$21,753
SoonerCare Program of Mother			
Choice/IHS	1,805	\$39,685,103	\$21,986
Traditional	325	\$6,985,589	\$21,494
Alien	188	\$3,753,587	\$19,966
Residence (by county) of Mother			
Rural	757	\$16,901,488	\$22,327
Urban	1,561	\$33,522,792	\$21,475

For both well and complex newborns, the average cost for births to aliens was less than the average for newborns in the SoonerCare Choice/IHS or Traditional programs. For well newborns, the average cost was highest for those born to mothers in state custody and lowest for those in urban areas. For complex newborns, none were born to mothers in state custody and the average cost was higher in rural counties. As expected, the average cost of complex newborns was much higher – 13 to 15.5 times higher – than the average cost of a well newborn across both SoonerCare programs and residence.

Table 14 shows the distribution of costs for matched well newborns in SFY 2007.

Table 14. Cost Distribution for Well Newborn Births – Matched Newborns, SFY 2007

Category	Well Babies	Percentage of All Babies	Total Costs	Percentage of Total Costs	Average Costs per Baby in Category
Under \$1,000	15,300	54.3%	\$12,214,779	13.6%	\$798
\$1,000 - \$1,999	7,391	26.2%	\$10,281,436	11.4%	\$1,391
\$2,000 - \$2,999	1,097	3.9%	\$2,351,905	2.6%	\$2,144
\$3,000 - \$3,999	774	2.7%	\$2,787,907	3.1%	\$3,602
\$4,000 - \$4,999	191	0.7%	\$822,722	0.9%	\$4,307
\$5,000 - \$5,999	185	0.7%	\$978,151	1.1%	\$5,287
\$6,000 - \$6,999	24	0.1%	\$159,506	0.2%	\$6,646
\$7,000 - \$7,999	151	0.5%	\$1,152,084	1.3%	\$7,630
\$8,000 - \$8,999	171	0.6%	\$1,450,715	1.6%	\$8,484
\$9,000 and Over	575	2.0%	\$7,307,658	8.1%	\$12,709
Totals - Well Babies	25,859	91.80%	\$39,506,862	43.9%	

Nearly ninety-two percent (91.8%) of SoonerCare matched births were for well newborns in SFY 2007. Just over half (54.3%) of all matched well newborns had costs of less than \$1,000, and 92% had costs under \$3,000. The well newborns with costs under \$3,000 accounted for roughly 63% of the total SoonerCare matched well newborn costs. Those newborns whose costs were \$8,000 and over represented 2.8% of the matched well newborns, but also accounted for 22% of the total SoonerCare matched well newborn costs. The SoonerCare well newborns accounted for less than half (43.9%) of the total SoonerCare costs for matched newborns in SFY 2007.

Table 15 shows the distribution of costs for matched complex newborns in SFY 2007.

Table 15. Cost Distribution for Complex Newborn Births – Matched Newborns, SFY 2007

Category	Complex Babies	Percentage of All Babies	Total Costs	Percentage of Total Costs	Average Costs per Baby in Category
Under \$3,000	395	1.4%	\$700,689	0.8%	\$1,774
\$3,000 - \$5,999	212	0.8%	\$944,022	1.0%	\$4,453
\$6,000 - \$8,999	129	0.5%	\$994,076	1.1%	\$7,706
\$9,000 - \$11,999	286	1.0%	\$3,027,964	3.4%	\$10,587
\$12,000 - \$14,999	231	0.8%	\$3,099,616	3.4%	\$13,418
\$15,000 - \$17,999	262	0.9%	\$4,343,040	4.8%	\$16,576
\$18,000 - \$20,999	215	0.8%	\$4,171,905	4.6%	\$19,404
\$21,000 - \$29,999	165	0.6%	\$3,908,055	4.3%	\$23,685
\$30,000 - \$39,999	57	0.2%	\$2,035,997	2.3%	\$35,719
\$40,000 - \$49,999	127	0.5%	\$5,710,787	6.4%	\$44,967
\$50,000 - \$69,999	130	0.5%	\$7,873,693	8.8%	\$60,567
\$70,000 and Over	109	0.4%	\$13,614,437	15.1%	\$124,903
Totals - Complex Babies	2,318	8.2%	\$50,424,280	56.1%	

Unlike the cost data for the matched well newborns that aggregated at the lower end, the cost data for the complex newborns varied greatly, and was distributed much more evenly across the range of costs. Costs ranged from under \$3,000 to over \$70,000. Complex newborns accounted for only 8% of all SoonerCare matched births (or 2,318 babies), but accounted for 56% of all costs. Even more dramatically, less than half of one percent (0.4%) of all SoonerCare matched complex births (or 109 babies) that had \$70,000 or more in costs accounted for nearly 15% of all costs.

Table 16 displays the average cost associated with prenatal care, emergency room visits or hospitalizations for pregnancy-related conditions, delivery, and aftercare costs for all matched mothers who had live deliveries and were discharged in SFYs 2006 and 2007.

Table 16. Costs Associated with Maternity Care and Deliveries – Matched Mothers, SFYs 2006 and 2007

	2007			2006		
	Number	Total Cost	Avg. Cost	Number	Total Cost	Avg. Cost
Totals	28,177	\$131,628,806	\$4,672	22,938	\$96,304,556	\$4,198
SoonerCare Program						
Choice/IHS	22,017	\$106,427,021	\$4,834	19,326	\$82,065,342	\$4,246
Traditional	3,055	\$12,816,161	\$4,195	3,612	\$14,239,214	\$3,942
Alien	3,105	\$12,385,625	\$3,989	-	-	-
Rural or Urban County						
Rural	10,659	\$50,145,305	\$4,705	9,402	\$38,891,817	\$4,137
Urban	17,515	\$81,466,950	\$4,651	13,532	\$57,395,989	\$4,242
State Custody	3	\$16,551	\$5,517	4	\$16,750	\$4,188

Average maternity care and delivery costs for all groups increased between SFY 2006 and 2007. However, total cost decreased for mothers in SoonerCare Traditional between SFY 2006 and 2007. SoonerCare Choice/IHS members had the highest average cost in SFYs 2006 and 2007 compared to SoonerCare Traditional. However, in SFY 2007, the alien group had the lowest average cost of all. In SFY 2007, the mothers in state custody had a much higher average cost than those who lived in rural or urban areas. In SFY 2006, mothers who lived in rural areas had the highest costs. Again, the number of women in state custody is quite small for both SFYs 2006 and 2007, so the averages for this group can be remarkably skewed by one mother.

Table 17 shows the distribution of costs for maternity care and deliveries in SFY 2007.

Table 17. Cost Distribution for Maternity Care and Deliveries – Matched Mothers, SFY 2007

Category	Total Mothers	Percentage of Mothers	Total Costs	Percentage of Total Costs	Average Costs per Mother in Category
Under \$2,000	1,145	4.1%	\$617,470	0.5%	\$539
\$2,000 - \$2,999	1,513	5.4%	\$4,003,952	3.0%	\$2,646
\$3,000 - \$3,999	7,647	27.1%	\$27,287,817	20.7%	\$3,568
\$4,000 - \$4,999	6,221	22.1%	\$27,806,186	21.1%	\$4,470
\$5,000 - \$5,999	6,912	24.5%	\$38,007,423	28.9%	\$5,499
\$6,000 - \$6,999	3,316	11.8%	\$21,216,316	16.1%	\$6,398
\$7,000 and Over	1,423	5.1%	\$12,689,641	9.6%	\$8,918
	28,177	100.0%	\$131,628,806	100.0%	

Maternity care and delivery costs for matched mothers ranged from under \$2,000 (4% of matched mothers) to \$7,000 and over (5% of mothers). Just over 85% of mothers had costs between \$3,000 and \$6,999.

Discussion

As in the SFY 2006 study, the SFY 2007 prenatal care and outcomes study did not begin with preconceived hypotheses regarding the findings, or a specific intervention to evaluate, but rather sought to review existing claims data according to a variety of different stratifications. Because the group sizes used for the study were large and would cause tiny (and likely clinically insignificant) changes to appear to be statistically significant, few tests of significance were done. As such, innumerable comparisons are presented and some recommendations are offered. However, the most meaningful interpretation of the data will come from those persons involved in the OHCA programs related to prenatal care. There was an approximately 9% increase in the number of SoonerCare newborn discharges in SFY 2007 compared to the SFY 2006 study. There was also a 3% shift within the SoonerCare program percentages – an increase in the percentage of newborns in SoonerCare Choice/IHS and a decrease in those in SoonerCare Traditional. The percentage of SoonerCare mothers discharged also increased – by 22% – between SFYs 2006 and 2007. Maternal demographics changed little between SFYs 2006 and 2007. However, there was about a 10% decrease in the proportion of members identified as Caucasian and a corresponding increase in the proportion identified as Hispanic. This may have occurred as a result of the new racial/ethnic classification for SFY 2007 that forced members to choose either Hispanic or a race to identify themselves. Additionally, in SFY 2007, data were collected on undocumented aliens who received services through SoonerCare. Approximately 11% of deliveries in SFY 2007 were for births to undocumented aliens who may have been more likely to either identify themselves or have been identified by staff as Hispanic rather than Caucasian. The increased number of newborn discharges may also have been influenced by the addition of the alien population in the study.

Births and Average Lengths of Stay, Newborns

The average length of stay for all SoonerCare newborns identified in SFY 2007 was 3.7 days, up from 3.4 days in SFY 2006, and higher than the 2007 national Medicaid mean of 3.4 days.¹² The average length of stay increased for every racial/ethnic group between SFYs 2006 and 2007. The greatest increase occurred for the American Indian infants for whom the SFY 2006 average length of stay of 3.1 days rose to 3.8 days in SFY 2007. Asian infants continued to have the shortest average length of stay at 3.2 days, while African American infants continued to have the longest average length of stay at 4.6 days.

Just over 90% of all SoonerCare newborns were classified as well newborns (length of stay less than 5 days). The average length of stay for well newborns in SFY 2007 remained at 2.1 days, consistent with the 2007 national Medicaid mean.¹² There was little variation in the average lengths of stay between racial/ethnic groups and from SFY 2006 to SFY 2007 for the well newborns. On the other hand, the average length of stay

for complex newborns (length of stay greater than 5 days) increased from 18.7 days in SFY 2006 to 19.4 days in SFY 2007. SoonerCare newborns classified as complex stayed approximately 4 days longer than the national Medicaid mean of 15.6 days in SFY 2007.¹² All racial/ethnic groups except for African American newborns had an increase in the length of stay from SFY 2006 to SFY 2007. American Indian complex newborns had more than a 2-day increase in the average length of stay between SFYs 2006 and 2007 (16.2 to 18.9 days, respectively). While the length of stay for African American complex newborns decreased, it was still the longest length of stay of all groups at 20.8 days. Complex newborns of Asian descent had the shortest average length of stay at 14.6 days.

These findings for well and complex newborns suggest a couple factors. Average lengths of stay either remained the same or increased for both well and complex newborns, but the increase was most dramatic for the complex newborns. In the SFY 2007 study, APS was better able to identify from claims newborns who had been transferred. For the well newborns, there was a 7% increase (22% for matched newborns) in the number of discharges identified, whereas for complex newborns, there was a 29% increase (45% for matched newborns) in the number of discharges identified. As a result, a greater number of complex and very sick newborns may have been identified in SFY 2007 compared to the SFY 2006 study.

The complex cases bear delving into in an effort to identify diagnoses and/or co-morbidities that may be leading to increased lengths of stay for complex newborns. Possibly a future study could focus on these complex newborns to examine co-morbidities. While it may be the case that disparities in health and health care played a role in causing the average length of stay for well, and especially complex, newborns of African American descent to be high, the average lengths of stay for complex newborns of Caucasian, Hispanic, and American Indian descent were all much higher than the national Medicaid mean.

Delivery Outcomes and Maternity Care

Mothers' overall (vaginal and cesarean deliveries) average length of stay remained at 2.5 days, consistent with SFY 2006 findings, and just under the 2007 national Medicaid mean of 2.6 days.¹² When vaginal and cesarean deliveries were combined, there were few differences between SFY 2006 and SFY 2007 data, with the exception of average length of stay for the youngest mothers. Mothers aged 10-14 had a small decrease in average length of stay from 3.0 days in SFY 2006 to 2.7 days in SFY 2007. The (two) mothers over age 50 had the shortest average length of stay (2.0 days), while mothers who received more than three ultrasounds had the longest average length of stay (3.1 days).

When broken out according to vaginal and cesarean deliveries, mothers still had average lengths of stay fairly consistent with SFY 2006 data. The average length of stay for a vaginal delivery was exactly the same as the national Medicaid mean of 2.2 days. The average length of stay for SoonerCare mothers who had cesarean deliveries (3.1 days) was half a day lower than the national Medicaid mean.¹² Average lengths of stay for mothers with cesarean deliveries were approximately 1 day longer than the stays for those with vaginal deliveries. This would be expected for the recovery of the mother after surgery. The largest difference between vaginal and C-section average lengths of stay were found in the 10- to 14-year-old mothers who stayed an average of 2.4 days for a vaginal delivery and 3.9 days for a C-section.

SoonerCare mothers had average lengths of stay at or lower than the national Medicaid mean, while SoonerCare newborns had average lengths of stay equal to or longer than the national average. The complex newborns caused the average length of stay to spike well beyond the national Medicaid mean. In order to understand this phenomenon, it may be necessary in future studies to look at exactly what causes a newborn to be complex.

As mentioned earlier, between SFYs 2006 and 2007, there was a 22% increase in the number of SoonerCare maternal discharges. The largest increases in the number of maternal discharges were for mothers who received no ultrasounds at all (43% increase) and for those who received three or more ultrasounds (55% increase). It is not entirely clear why the increased number of maternal discharges in SFY 2007 clustered at the extremes of ultrasound use. We do know from the SFY 2006 study that mothers who had been eligible for SoonerCare services longer tended to have more ultrasounds. The two new categories – alien and women aged 50+ – were largely composed of mothers who received no ultrasounds, so those mothers would contribute to the 43% increase.

Between SFY 2006 and SFY 2007, there were few changes in maternal length of stay based on number of ultrasounds received. Only the group of mothers who received three or more ultrasounds showed any change from SFY 2006. Specifically, those mothers whose SoonerCare eligibility was not pregnancy related who received 3+ ultrasounds showed an increased average length of stay from 3.0 days in SFY 2006 to 3.4 days in SFY 2007. As in SFY 2006, the average length of stay increased as the number of ultrasounds increased in SFY 2007. For those same mothers whose SoonerCare eligibility was not pregnancy related, there was a full day increase in average length of stay between those who received no ultrasounds (2.4 days) and those who received three or more (3.4 days).

Prenatal Care, Delivery Method and Newborn Status - Matched Infants and Mothers

Records for mothers and newborns were matched for 88% of well newborns and 75% of complex newborns in the study. Some analyses using the infant-mother matched pairs corroborated findings mentioned earlier in the paper. For example, over 90% of newborns were well newborns, and mothers aged 20-34 had the highest percentage of births (well or complex). Findings uncovered as a result of matching mother and infant records follow. Rates of vaginal and cesarean deliveries were similar from SFY 2006 to SFY 2007. Over half (54%) of complex newborns were delivered via C-section, whereas just under one-third (30.5%) of well newborns were delivered via cesarean. Mothers aged 35-49 had a slightly higher percentage of complex newborns compared to well newborns. The average age of the mother was also higher for complex newborns than well newborns (24.5 years vs. 23.9 years, respectively). Over 11% of well newborns and 8% of complex newborns were delivered by mothers who were undocumented aliens. Compared to the well newborns, a higher percentage of complex newborns were born to mothers in the SoonerCare Traditional program. Also compared to the well newborns, the complex newborns were less likely to have a mother who was an alien.

For SFY 2007, 47.5% of mothers with complex newborns were known to have had 4 or more prenatal visits while 37.6% of mothers with well newborns were known to have had 4 or more prenatal visits. Mothers who lived in urban areas were also more likely to have had a complex newborn. Overall, residence of the mothers changed little between SFY 2006 and SFY 2007.

There were significant differences in the category of prenatal visits by the mother and the birth weight of the baby. Mothers of normal birth weight babies were more likely to have a global code with an unknown number of visits than mothers of low birth weight babies; while mothers of low birth weight babies were more likely to have known to have 4 or more prenatal visits than mothers of normal birth weight babies. One possible explanation for this could be that high risk pregnancies would be more likely to have specialist visits and additional individual visits when compared to a normal lower risk pregnancy. Normal lower risk pregnancies could have been billed with a global routine obstetric care code that included all prenatal care; these codes do not specify the number of prenatal visits provided.

Only one test of statistical significance was run in this study – examining the relationship between birth weight and the number of prenatal visits – and the findings were not statistically significant. When the same analyses were run for the SFY 2006 study, the findings were statistically significant – mothers with fewer than four prenatal visits appeared less likely to have babies who had low birth weight or very low birth weight. Despite the lack of statistical significance in SFY 2007, at least one interesting finding

emerged. Of the normal birth weight newborns, over 60% of the mothers received fewer than four prenatal visits; of the low birth weight newborns, nearly 60% of the mothers received fewer than four prenatal visits; and of the very low birth weight newborns, 50% had received four or more visits and 50% had received fewer than four visits. Given the very broad measure of prenatal visits used (four or more; fewer than four visits, unknown number of visits), it appeared that prenatal visits did not affect the birth weight of the newborn. The current use of global claims that include prenatal, delivery, and postpartum care do not include the precise number of prenatal visits received. Clearly, a more robust measure of prenatal visits than that provided via global claims must be used if insight is to be gained into its potential effects on birth weight. Future studies may consider looking at the point in time in a woman's pregnancy when she began receiving prenatal care, as well as number of prenatal visits.

Costs Associated with Maternity Care and Births - Matched Infants and Mothers

As noted earlier in this report, since matched newborn costs were not separated according to well and complex newborns in SFY 2006, only SFY 2007 costs are discussed for well and complex newborns.

Between SFYs 2006 and 2007, newborn costs associated with live births increased for all SoonerCare programs and regardless of where the mother resided. Infants born to mothers in the Traditional program showed much higher average costs than those in the Choice program in both study periods. Since the services offered in the Traditional program do not differ markedly from those offered through the Choice program (with the exception of a primary care provider in the Choice program), it is possible that greater differences exist between the members served in each program. Similar to SFY 2006, newborns born in SFY 2007 to mothers who lived in urban counties had higher average birth costs than those in rural counties. Average birth costs for children born to aliens were dramatically lower than for infants born to SoonerCare Choice/IHS or Traditional members in SFY 2007.

Some cost differences became evident or changed when well and complex newborns were viewed separately. Contrary to when they were combined, both well and complex newborns viewed separately had average birth costs lower if they were born to a mother who lived in an urban area. Not at all surprisingly, the average birth cost for complex newborns was much higher – 13 to 13.5 times higher – than for well newborns across all SoonerCare programs and residence.

Birth costs for well newborns ranged from under \$1,000 to \$9,000+ while costs for complex newborns ranged from under \$3,000 to \$70,000+. More than half of all well newborns had birth costs under \$1,000, and 92% had costs under \$3,000, the starting point for complex birth costs. Unlike the well newborn birth costs that aggregated at the low end of spectrum, birth costs for complex newborns were more widely distributed.

While complex newborns accounted for a small proportion of all SoonerCare matched births (8%), they accounted for more than half (56%) of all birth costs.

Costs associated with maternity care and delivery (mothers' costs) for matched mother/baby pairs increased across the board from SFY 2006 to SFY 2007. Mothers in the SoonerCare Choice/IHS program had the highest average cost while alien mothers had the lowest average cost in SFY 2007. Costs for mothers who resided in rural areas were somewhat higher than those in urban areas. Maternity and delivery care costs ranged from under \$2,000 to \$7,000+. Five percent of mothers had costs of \$7,000 or more.

Limitations

The prenatal measures in this study were based on SoonerCare administrative claims data. Many of the prenatal services that mothers receive are filed on a global claim that includes prenatal care, delivery and postpartum care. The precise number of prenatal visits that the mother received using the administrative claim cannot be captured. These claims indicate that the mother had at least four prenatal visits but they could have had many more. This limitation meant that the number of prenatal visits had to be categorized into those with four or more prenatal visits and those with less than four prenatal visits. Four prenatal visits is far below the number recommended, but was used because it was the only available method of stratification.

Risk factors such as marital status, tobacco and alcohol use during pregnancy, information on previous births, and education level were outside the scope of this study.

Recommendations

APS offers the following recommendations in an effort to promote healthier pregnancies and improve birth outcomes for SoonerCare members.

- Future prenatal care studies may benefit the OHCA most by focusing on complex newborns. Since complex newborns require dramatically higher resources than the 90% of well newborns, they offer the greatest potential for improvements in care, resource utilization, and costs.
- Beginning on May 1, 2007, dental services were added as a covered benefit for pregnant women aged 21 and over through the Perinatal Dental Access Program¹³ (Those under age 21 were already covered.) This expansion was based on recommendations from the OHCA's Perinatal Task Force, which cited research suggesting that periodontal disease is associated with pre-term births¹⁴ and low birth weights.¹⁵ Dental services were covered for SoonerCare mothers for just two months during this study period; the OHCA should plan to monitor the use of covered dental services during pregnancy to assess effects on birth outcomes in the future.
- Cesarean section rates were quite high for deliveries of both well and complex newborns (30.5% and 54%, respectively). Since the length of hospitalization increases for every mother who has a C-section, it may benefit both mothers and the OHCA if safe alternatives to C-sections are explored. Last year, a recommendation for the OHCA Perinatal Task Force to explore the use of vaginal birth after Cesarean (VBAC) was suggested. The recommendation remains relevant this year.
- Both this year and last year's prenatal studies found no direct link between the number of prenatal visits and the health measures (weight and length of stay) collected for SoonerCare newborns. Since we know from the scientific literature that prenatal care does affect birth outcomes,² it would appear that either the Oklahoma population of mothers and newborns presents an anomaly or the measures used in the study are lacking. Before declaring mothers and newborns in Oklahoma to be anomalous and not in need of prenatal services, the OHCA should consider improving the rigor of measures used in future prenatal studies. Currently, prenatal care could only be examined according to three categories – four or more visits, fewer than four visits, and unknown number of visits. Collecting the actual number of visits, as well as the time in the pregnancy when visits began would go a long way to making the prenatal care measures more robust.

References

1. Oklahoma Health Care Authority. *Prenatal Care*. Available at: <http://www.okhca.org/individuals.aspx?id=702&menu=48>
Accessed June 10, 2008.
2. U.S. Department of Health and Human Services. (2000). *Healthy People 2010*, 2nd ed. Washington, DC. Available at: http://www.healthypeople.gov/Document/HTML/Volume2/16MICH.htm#_Toc494699663
Accessed June 10, 2008.
3. Gazmararian, J., Arrington, T., Bailey, C., Schwarz, K., & Koplan, J. (1999). Prenatal care for low-income women enrolled in a managed-care organization. *Obstetrics and Gynecology*, 94(2), 177-184. Available at: <http://www.greenjournal.org/cgi/content/full/94/2/177>
Accessed June 10, 2008.
4. Braveman, P., Marchi, K., Egerter, S., Pearl, M., & Neuhaus, J. (2000). Barriers to timely prenatal care among women with insurance: The importance of prepregnancy factors. *Obstetrics and Gynecology*, 95(6), 874-880. Available at: <http://www.greenjournal.org/cgi/content/full/95/6/874>
Accessed June 10, 2008.
5. Oklahoma State Department of Health. *OK2SHARE*. Available at: <http://www.health.state.ok.us/ok2share/birthstatistics.html>
Accessed June 10, 2008.
6. Oklahoma State Department of Health. (Spring 2006). *PRAMSGRAM, Oklahoma Pregnancy Risk Monitoring System, Unintended Pregnancy*, Vol. 10, No. 1. Available at: http://www.ok.gov/health/documents/PRAMS_Unintended_Pregnancy_06.pdf.pdf
Accessed June 11, 2008.
7. Oklahoma State Department of Health. (Winter 2007). *PRAMSGRAM, Oklahoma Pregnancy Risk Monitoring System, Father's Intention of Pregnancy*, Vol. 11, No. 1. Available at: http://www.ok.gov/health/documents/PRAMS_Fathers%20Intention%20PRAMSGram_07.pdf.pdf
Accessed June 11, 2008.

8. Behrman, R.E. & Stith Butler, A. (Eds), Committee on Understanding Premature Birth and Assuring Healthy Outcomes. (2007). *Preterm Birth: Causes, Consequences, and Prevention*. National Academies Press. Available at: http://books.nap.edu/openbook.php?record_id=11622&page=398
Accessed June 11, 2008.
9. National Committee for Quality Assurance (NCQA). (2007). *HEDIS® 2007, Technical Specifications, Volume 2*. Washington, DC: Author.
10. US Department of Agriculture. (2003). *Rural Urban Continuum Codes*. Available at: <http://www.ers.usda.gov/Data/RuralUrbanContinuumCodes/>
Accessed June 11, 2008.
11. Passel, J. (2005, March 21). *Estimates of the Size and Characteristics of the Undocumented Population*. Washington, DC: Pew Hispanic Center, a Pew Research Center Project. Available at: <http://pewhispanic.org/files/reports/44.pdf>
Accessed July 25, 2008.
12. National Committee for Quality Assurance (NCQA). (2007). *Medicaid HEDIS® 2007 Means, Percentiles, and Ratios*. Washington, DC: Author. Available at: http://www.ncqa.org/Portals/0/HEDISQM/Programs/CompAud/MPR/HEDIS_2007_Medicaid_HMO_Means_Percentiles_Ratios.xls
Accessed July 29, 2008.
13. Oklahoma Health Care Authority. *Perinatal Dental Access Program*. Available at: <http://www.ohca.state.ok.us/individuals.aspx?id=3089&menu=44>
Accessed August 11, 2008.
14. Jeffcoat, M.K., Hauth, J.C., Geurs, N.C., Reddy, M.S., Cliver, S.P., Hodgkins, P.M., et al. (2003). Periodontal disease and preterm birth: Results of a pilot intervention study [Abstract]. *Journal of Periodontology*. 74(8), 1214-1218. Available at: <http://www.joponline.org/doi/abs/10.1902/jop.2003.74.8.1214?journalCode=jop>
Accessed August 11, 2008.
15. Uslu Toygar, H., Seydaoglu, G., Kurklu, S., Guzeldemir, E. & Arpak, N. (2007). Periodontal health and adverse pregnancy outcome in 3576 Turkish women. *Journal of Periodontology*, 78(11), 2081-2094. Available at: <http://jdr.iadrjournals.org/cgi/reprint/81/1/58>
Accessed August 11, 2008.