PAID BY MEDICAID FINAL REPORT

Comparing Private Pay to Medicaid Managed Care Organizations and Fee for Service Birth Outcomes

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NEW MEXICO
DEPARTMENT OF
HEALTH

PAID BY MEDICAID

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Managed Care Organizations and Fee for Service
Birth Outcomes

Executive Summary

Beginning in 1997, Salud! was introduced to the New Mexico Medicaid population through Managed Care Organizations (MCOs). By 1999-2000:

- Nearly half (49%) of all births to New Mexico residents were paid by Medicaid.
- The majority (72%) of Medicaid-paid births were covered by Salud!

Compared to mothers of children whose births were not paid by Medicaid, Medicaid mothers tended to:

- Be younger;
- Be White Hispanic;
- Have fewer years of education;
- Have lower levels of prenatal care;
- Be outside of the major metropolitan areas.

Both Fee for Service (FFS) and Salud! provided Medicaid services between 1999-2000. Salud! participants appeared to fare better than FFS participants. Comparing Salud! to FFS shows that:

- Salud! mothers had higher levels of prenatal care and began care earlier;
- FFS mothers were more likely to have fewer years of education;
- American Indian mothers were more likely to use FFS;
- FFS mothers were more likely to be older.

Medicaid-paid births were evaluated for relationship with select indicators of medical care access and utilization and impact on infant health. The infant health indicators were low birth weight and preterm births. Statistically, Medicaid indicators relate to preterm births and low birth weight. Mother's medical and behavioral risk factors were the only factors that significantly interacted with Medicaid indicators to affect preterm birth and low birth weight. Mother's medical risk factors were represented by the presence or absence of any of three indicators relied on: diabetes, hypertension and previous preterm deliveries. Behavioral risk factors were similarly represented for reported tobacco and alcohol use. Multivariate analysis of birth outcomes indicated that:

- The Medicaid population had higher risks for poor birth outcomes than the non-Medicaid population;
- Salud! clients generally fared better than FFS participants;
- Often there were little to no detectable differences between Salud! and non-Medicaid births;
- Controlling for behavioral and medical risk factors, Salud! or non-Medicaid mothers were more likely to have preterm births than FFS mothers.
- Controlling for behavioral risk factors, FFS and non-Medicaid mothers were more likely to have low weight births.

Introduction and Summary Findings

Medicaid is a Federal-State matching entitlement program that pays for medical assistance. Originating in 1965 as Title XIX of the Social Security Act, it was created as a medical extension of the federally funded cash income assistance program emphasizing care for dependent children and their mothers, the disabled, and the elderly.

Federal and state initiatives intending to expand access to maternity and child health care have resulted in dramatic changes in policy and manner of health care delivery. Federal Omnibus Budget Reconciliation Acts (OBRA) of 1986, 1987, and 1989 required states to grant Medicaid eligibility/coverage for pregnant woman and infants, ultimately, at or below the 133% of federal poverty levels, and allow for eligibility up to 185%. The State of New Mexico followed this progression and complimented the initiatives by extending eligibility up to 225% of federal poverty levels.

In 1996, the federal Personal Responsibility and Work Act was enacted, intending to allow states to further expand Medicaid eligibility. A key component of the act was to enable Medicaid eligibility to be independent of cash assistance programs. It was in this same time frame that Managed Care was introduced to the New Mexico Medicaid population through managed care organizations (MCOs), the Salud! program.

Figure 1. New Mexico Counties Grouped by Salud! Implementation Phase
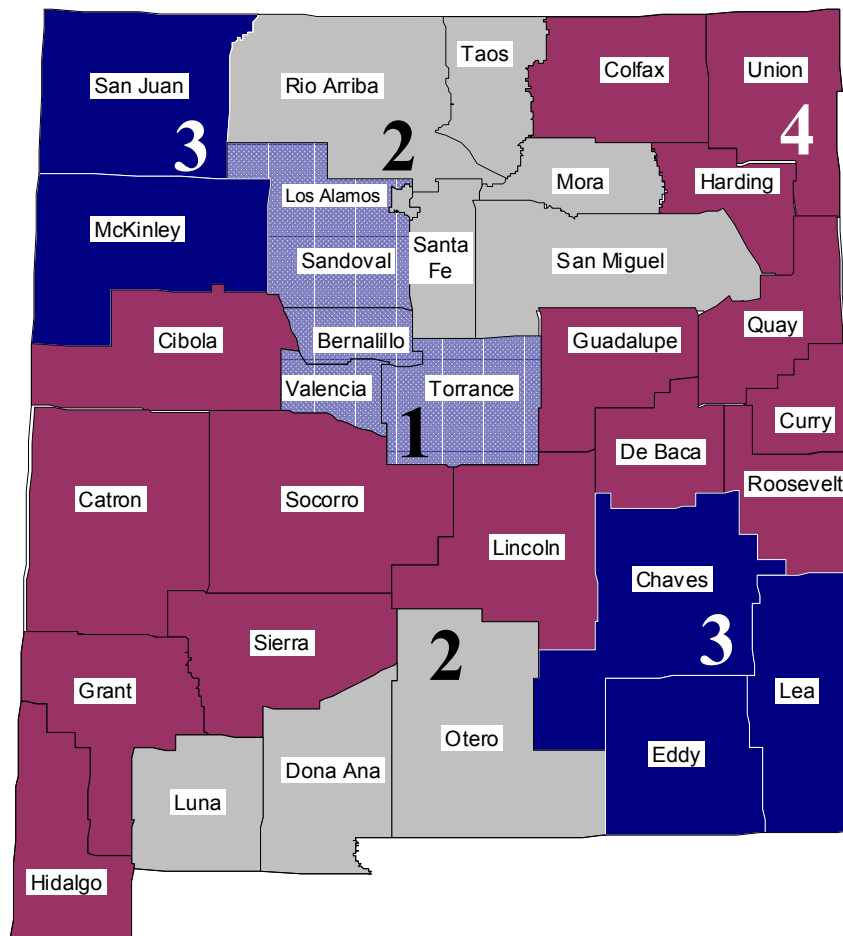
Salud! was implemented as a waiver from the traditional fee-for-service (FFS) program and was designed to help control costs while maintaining services. The map in Figure 1 indicates the timing of the Salud! program implementation. Implementation of managed care for Medicaid participants began in July 1997. The Salud! Program began for eligible individuals in Bernalillo, Sandoval, Torrance and Valencia counties. In October, the second phase was implemented in Los Alamos, Mora, Rio Arriba, San Miguel, Santa Fe, Taos, Dona Ana, Luna and Otero counties. The remaining counties were phased in during 1998.

Cooperative agreements between the Human Services Department (HSD) and the Department of Health's Office of New Mexico Vital Records and Health Statistics (ONMVRHS) enabled the electronic linkage of Medicaid claims and registered birth records. Linkage of the data provides information on Medicaid-paid births in the context of the state's birth population. Mothers' and newborns' demographics, access and utilization of prenatal health care, mother's medical and behavioral health risks, birth characteristics, obstetric and delivery procedures and newborn health outcomes were all derived from the registered births records.

Linkage efforts have been ongoing since 1990, with the staff of Information Services Bureau, Administrative Services Division of the Department of Health (ISB, ASD, DOH) conducting the linkages up to 1997 data and the Office of New Mexico Vital Records and Health Statistics, Public Health Division of the Department of Health (ONMVRHS, PHD, DOH) providing analyses. Following the phasing in of the Salud! program in 1997 and 1998, the linkage for 1999-2000 data was conducted by ONMVRHS.

Linkage was conducted with all registered births. Analyses were performed for births to resident mothers only. Linkage information is presented with regard to all registered births and then narrows to residents only.

There were an average of 12,240 records in the Delivery claims file and 10,784 in the Newborn claims file for the two years. Roughly, 83% of the Newborn claims matched Delivery claims and 73% of the Delivery claims matched Newborn claims. Matched Newborn and Delivery claims and unmatched claims were then matched to Vital Statistics birth records.

Nearly half (48%) of all registered births in New Mexico were paid by Medicaid for the years 1999-2000, 97% of the Medicaid Newborn claims records linked to registered births. (There were 563 Newborn claims that could not be linked to a registered birth.) A substantial number of registered births (5,675 —10%) were linked to Delivery claims records only.

Table 1 reports frequency and percent information on Medicaid-paid births linked to the 26,600 resident births (49% of resident births) by the status of Medicaid provider types, FFS and Salud!.

Table 1. Linked Resident Births and Medicaid Delivery and Newborn Claims

Linked to Vital Statistics Resident Births	Total Linked Medicaid		FFS		Salud!	
Total	26,600	100.0%	7,441	100.0%	19,159	100.0%
Linked Medicaid Delivery and Newborn Claims	17,622	66.2%	4,474	60.1%	13,148	68.6%
Medicaid Delivery Claims Only	5,655	21.3%	1,015	13.6%	4,640	24.2%
Medicaid Newborn Claims Only	3,323	12.5%	1,952	26.2%	1,371	7.2%

Linkages of Medicaid Delivery and Newborn claims records with Vital Statistics resident birth records show significant variation between FFS and Salud!. Overall, two-thirds of the claims matching resident births were linked Delivery and Newborn claims. Medicaid Delivery claims accounted for two-thirds of the remaining matches to births with the residual matches based on newborn claims only.

Examination of the linked Medicaid and Vital Statistics data show:

1) The majority (3 to 1) of Medicaid services were reported by Salud!;
2) Based on information from the birth certificates, Medicaid and non-Medicaid Births differed in:
   - Demographic characteristics,
   - Prenatal care access and utilization,
   - Mother's medical health risks,
   - Birth characteristics,
   - Newborn health outcomes;
3) Births paid through FFS also differed from births covered by Salud! across the same categories.

Table 2 shows distributions of selected demographic maternal characteristics: age, education, race/ethnicity, and marital status. All characteristics suggest differences by Medicaid status, FFS and Salud!, and non-Medicaid mothers.

The overall distribution for New Mexico resident births for the years 1999-2000 show 48% births were to mothers less than 25 years of age and 52% were to older mothers. Within the Medicaid services, 57% and 66% of births were to mothers under age 25 for the FFS and Salud! groups, respectively. Of the births not covered by Medicaid, 32% of births were to mothers under age 25. Figure 2 illustrates the predominance of under age 25 mothers in Medicaid services.

Figure 2. Mother's Age by Medicaid Services
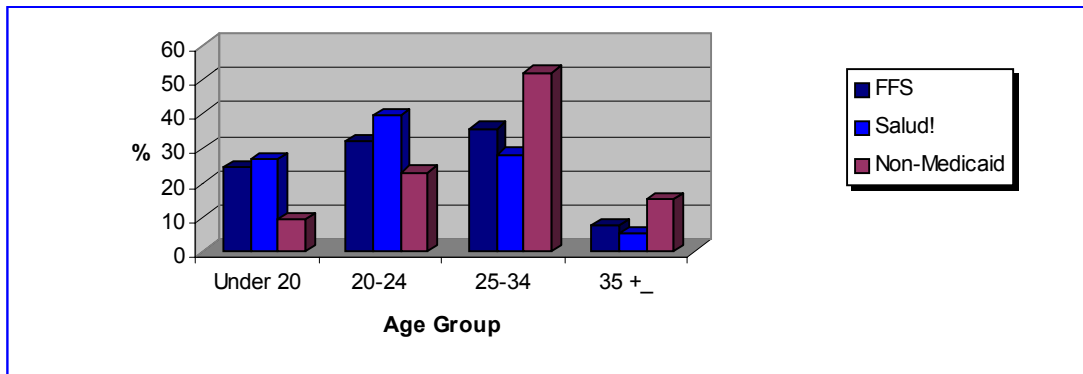
Since age and education are related, the same pattern holds for education levels with respect to less than 12 years of education. Medicaid mothers were disproportionately more likely to have less than 12 years of education, as indicated in Table 2 and Figure 3.

Figure 3. Mother's Education by Medicaid Services
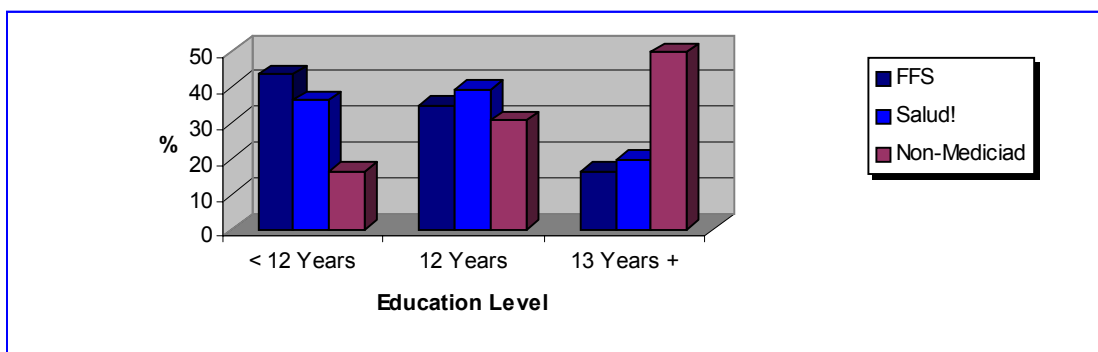
Table 2. New Mexico Resident Births
by Maternal Characteristics and by Medicaid Status

Selected Characteristics	Total Resident Births		Medicaid Services				Non-Medicaid	
			Fee for Service		Salud!			
	Number	*Percent*	Number	*Percent*	Number	*Percent*	Number	*Percent*
Mother's Age								
<15	180	*0.3*	49	*0.7*	98	*0.5*	33	*0.1*
15-19	9,387	*17.3*	1,773	*23.8*	5,045	*26.3*	2,569	*9.3*
20-24	16,346	*30.1*	2,381	*32.0*	7,574	*39.5*	6,391	*23.1*
25-34	22,516	*41.5*	2,661	*35.8*	5,416	*28.3*	14,439	*52.1*
35 and older	5,822	*10.7*	575	*7.7*	1,016	*5.3*	4,231	*15.3*
Unknown	59	*0.1*	2	*0.0*	10	*0.1*	47	*0.2*
Totals	54,310	*100.0*	7,441	*100.0*	19,159	*100.0*	27,710	*100.1*
Mother's Education								
< 12 Years	14,745	*27.2*	3,228	*43.4*	6,933	*36.2*	4,584	*16.5*
12 Years	18,625	*34.3*	2,589	*34.8*	7,550	*39.4*	8,486	*30.6*
13 Years or More	18,747	*34.5*	1,213	*16.3*	3,802	*19.8*	13,732	*49.6*
Unknown	2,193	*4.0*	411	*5.5*	874	*4.6*	908	*3.3*
Totals	54,310	*100.0*	7,441	*100.0*	19,159	*100.0*	27,710	*100.0*
Mother's Race/Ethnicity								
White Non-Hispanic	18,161	*33.4*	954	*12.8*	5,248	*27.4*	11,959	*43.2*
White Hispanic	27,521	*50.7*	3,681	*49.5*	11,907	*62.2*	11,933	*43.1*
American Indian	6,868	*12.7*	2,681	*36.0*	1,392	*7.3*	2,795	*10.1*
Black	990	*1.8*	76	*1.0*	468	*2.4*	446	*1.6*
Asian or Pacific Islander & Other	770	*1.4*	49	*0.7*	144	*0.8*	577	*2.1*
Totals	54,310	*100.0*	7,441	*100.0*	19,159	*100.1*	27,710	*100.1*
Mother's Marital Status								
Single	24,626	*45.3*	4,794	*64.4*	12,063	*62.9*	7,769	*28%*
Not Single	29,684	*54.7*	2,647	*35.6*	7,096	*37.1*	19,941	*72%*
Totals	54,310	*100.0*	7,441	100.0	19,159	100.0	27,710	100.0

Note: Due to rounding, percentages may not add to 100.

Because education and age are interrelated, an adjusted measure of educational status based on lower- or higher-than-expected by age was used in the analyses.[1] The resulting design variables indicate whether an individual is more educated for their age or less. The average educational status is based on the following grade and age ranges.

Table 3.
Average Age at Grade Level

Grade	4	5	6	7	8	9	10	11	12	13
Age Range, in Years	10	10-11	10-12	11-13	12-14	13-15	14-16	15-17	16+	17+

[1] Greg R. Alexander, RS, MPH, ScD, Professor and Chair, Department of Maternal and Child Health, University of Alabama at Birmingham personal communication, 4/18/2003.

The two derived design variables flag mothers with lower than average educational status or with higher than average educational status.

As shown in Table 2, births to White Hispanic or American Indian mothers were more likely to be paid by Medicaid than births to White non-Hispanic or Asian/Pacific Islander mothers.

The sharpest contrast in demographics was the difference in marital status between non-Medicaid and Medicaid mothers. Both FFS and Salud! mothers were predominantly single, 64% and 63%, respectively. Only 28% of the non-Medicaid mothers were single. The contrast in marital status was expected due to Medicaid eligibility requirements.

The map in Figure 4 illustrates the percent of Medicaid-paid births to county residents. The counties with the lowest percents of births paid by Medicaid tended to be the more urban counties of Bernalillo, Dona Ana, Los Alamos, Otero, Sandoval, Santa Fe, and San Juan. Harding and Union counties also fell into the same range of under 50% Medicaid-paid births. The remaining counties all had more than 50% of births paid by Medicaid.

Figure 4. New Mexico Counties, Percent Paid by Medicaid

PERCENT OF BIRTHS PAID BY MEDICAID

70.0 +
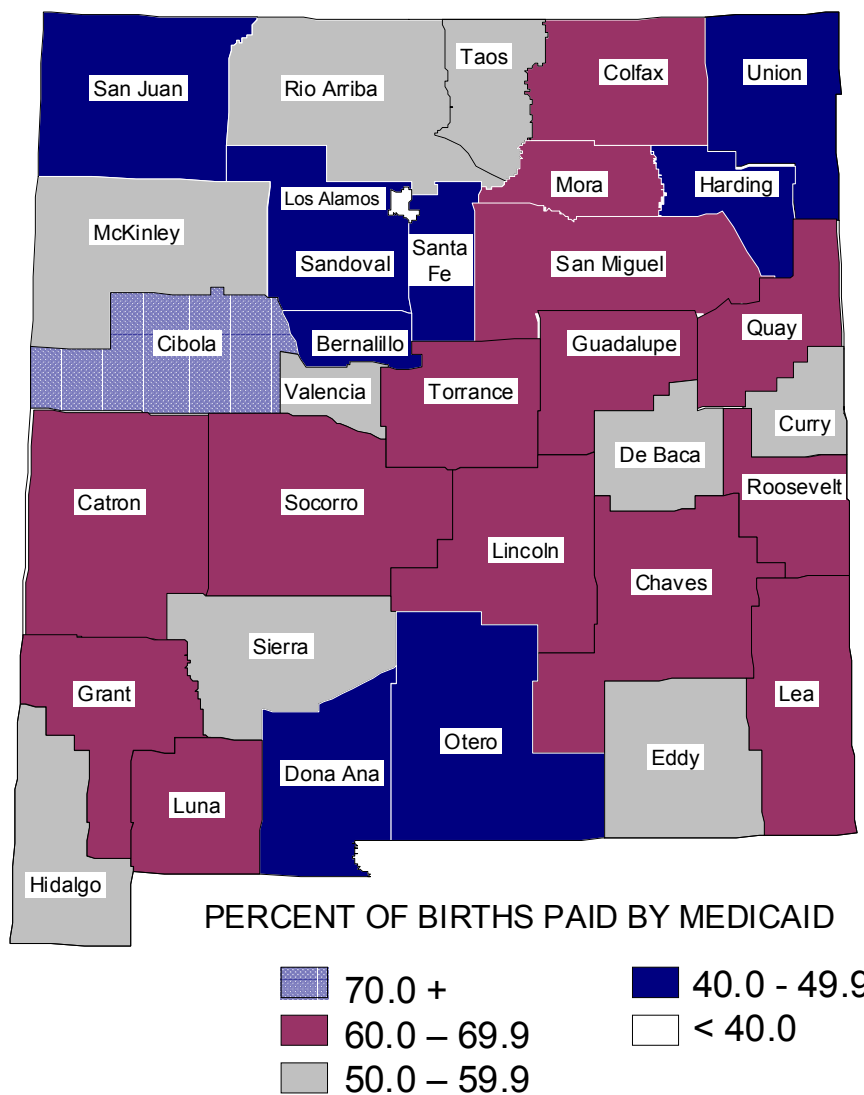60.0 – 69.9
50.0 – 59.9
40.0 - 49.9
< 40.0

Table 4 describes selected birth characteristics by Medicaid status. There were 1% decreases in both Salud! and non-Medicaid populations between 1999 and 2000. There was a 2% increase in the FFS population, a small but statistically significant change.

First births were slightly more likely to be paid by Medicaid than second or later births, reflecting the youthful composition of the Medicaid population. For births occurring to mothers with a previous birth, Medicaid mothers were more likely to show a short interval between births.   The percentage of singleton and multiple births did not differ greatly by Medicaid status. There was a higher percentage of repeat births among teens on Medicaid. Table 4 shows that 3% of non-Medicaid repeat births are to teens, 9% of Salud! repeat births and 8% of FFS repeat births were to teens.

Table 4								
Selected Characteristics of New Mexico Resident Births								
Birth Characteristics	**Total New Mexico Resident Births**		**Medicaid Services**				**Non-Medicaid**	
			Fee for Service		**Salud!**			
	Number	*Percent*	**Number**	*Percent*	**Number**	*Percent*	**Number**	*Percent*
Year of Birth								
1999	27,129	*50.0*	3,106	*41.7*	9,809	*51.2*	14,214	*51.3*
2000	27,181	*50.0*	4,335	*58.3*	9,350	*48.8*	13,496	*48.7*
Total	54,310	*100.0*	7,441	*100.0*	19,159	*100.0*	27,710	*100.0*
First birth								
First Birth	21,312	*39.2*	3,027	*40.7*	7,766	*40.5*	10,519	*38.0*
Not First Birth	32,998	*60.8*	4,414	*59.3*	11,393	*59.5*	17,191	*62.0*
Total	54,310	*100.0*	7,441	*100.0*	19,159	*100.0*	27,710	*100.0*
Spacing between births for mothers having 2nd or higher order birth								
Less than 18 Months	3,206	*10.6*	522	*13.6*	1,398	*13.2*	1,286	*8.1*
18 – 23 Months	3,605	*11.9*	490	*12.8*	1,320	*12.4*	1,795	*11.4*
24 or more months	23,418	*77.4*	2,825	*76.6*	7,889	*74.4*	12,704	*80.5*
Total	30,229	*100.0*	3,837	*100.0*	10,607	*100.0*	15,785	*100.0*
Multiples								
Singleton	53,029	*97.6*	7,272	*97.7*	18,762	*97.9*	26,995	*97.4*
Twin	1225	*2.3*	158	*2.1*	390	*2.0*	677	*2.4*
Triplet or More	56	*0.1*	11	*0.1*	7	*0.04*	38	*0.1*
Total	54,310	*100.0*	7,441	*100.0*	19,159	*100.02*	27,710	*100.0*
Repeat Births								
Teens	1,818	*5.9*	290	*7.6*	1,050	*9.4*	478	*3.0*
20 Years Old and Older	28,411	*94.1*	3,547	*92.4*	1,050	*90.6*	15,307	*97.0*
Total	30,229	*100.0*	3,837	*100.0*	9,557	*100.0*	15,785	*100.0*
Note: Due to rounding, percentages may not add to 100.								

Table 5 presents data on access to prenatal care by Medicaid status. A primary purpose of prenatal care is to identify and treat maternal morbidity. Access to prenatal care data is based on information provided on the birth certificate. The table presents a snapshot of maternal prenatal care by Medicaid status. Mothers in the FFS program were less likely to begin prenatal care in the first trimester, while mothers who did not receive Medicaid were more likely to begin care in the first trimester. Three additional measures of access to care are presented, a modified Kessner index of level of prenatal care and the adequacy of prenatal care utilization (Kotelchuck[2]) index. Infants covered under FFS were more likely to be born to mothers who received a low level of prenatal care. FFS mothers also were more likely to be classified with inadequate prenatal care utilization. Births covered under Salud! were closer to non-Medicaid births in access and utilization of prenatal care. Mothers receiving FFS appeared to fare worse for prenatal care. These mothers may not have been eligible for Medicaid until they became pregnant so there was a delay in receiving services.

Table 5 New Mexico Resident Births Prenatal Care								
Prenatal Care Access and Utilization Characteristics	Total New Mexico Resident Births		Medicaid Services				Non-Medicaid	
			Fee for Service		Salud!			
	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Trimester Prenatal Care Began								
First Trimester	34,533	63.6	4,011	53.9	11,619	60.6	18,903	68.2
Second Trimester	11,520	21.2	1,856	24.9	4,889	25.5	4,775	17.2
Third Trimester	3,980	7.3	811	10.9	1,342	7.0	1,827	6.6
No Care	965	1.8	255	3.4	138	0.7	572	2.1
Unknown	3,312	6.1	508	6.8	1,171	6.1	1,633	5.9
Total	54,310	100.0	7,441	100.0	19,159	100.0	27,710	100.0
Kessner Level of Prenatal Care								
Low/No	7,183	13.2	1,525	20.5	2,381	12.4	3,277	11.8
Mid	16,298	30.0	2,402	32.3	6,481	33.8	7,415	26.8
High	27,049	49.8	2,958	39.7	8,975	46.8	15,115	54.6
Unknown	3,780	7.0	556	7.5	1,322	6.9	1,902	6.9
Total	54,310	100.0	7,441	100.0	19,159	100.0	27,709	100.0
Adequacy of Prenatal Care Utilization – Kotelchuck Index								
Inadequate	12,826	25.5	2,390	34.9	4,665	26.3	5,771	22.5
Intermediate	8,452	16.8	1,188	17.4	3,111	17.6	4,153	16.2
Adequate	15,961	31.8	2,013	29.4	5,518	31.2	8,430	32.9
Intensive	12,974	25.8	1,248	18.3	4,418	24.9	7,308	28.5
Total	50,213	100.0	6,839	100.0	17,712	100.0	25,662	100.0
G-index								
No Care	965	1.9	255	3.8	138	0.8	572	2.2
Inadequate	10,608	21.3	1,884	27.8	3,972	22.6	4,752	18.6
Intermediate	21,536	43.2	2,931	43.2	8,039	45.7	10,566	41.5
Adequate	14,399	28.9	1,498	22.1	4,612	26.2	8,289	32.5
Intense	2,342	4.7	215	3.2	824	4.7	1,303	5.1
Total	49,850	100.0	6,783	100.0	17,585	100.0	25,482	100.0

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[2] M Kotelchuck, *An evaluation of the Kessner Adequacy of Prenatal Care Index and a proposed Adequacy of Prenatal Care Utilization Index*, Am J Public Health 1994 84: 1414-1420

The Adequacy of Prenatal Care Utilization Index (APNCU) was developed to adjust for some of the weaknesses of two other widely used measures of prenatal care: "Trimester Prenatal Care Began" and the Kessner index. Both rely heavily on when prenatal care was initiated, as reported on the birth certificate. The APNCU (Kotelchuck Index) is more sophisticated and uses two dimensions, the timing of the initiation of care and the adequacy of services received (ratio of observed to expected visits) which are combined into a single summary index.

The revised G-index of prenatal care, shown in Table 5, shows a similar pattern to the patterns found with the Kotelchuck and modified Kessner indexes. FFS mothers tended to have lower levels of prenatal care. The revised G-index allows for a wider definition of adequate care and a narrower definition of intense care, adjusting for gestational age, time prenatal care began, and number of visits. Like the other three measures of prenatal care, the G-index relies on data provided on the birth certificate.

Sixteen medical risk factors affecting pregnancy outcomes are listed on the birth certificate. Although medical risk factors are probably underreported due to a lack of uniform definitions and difficulty in interpreting data from medical records[3], it is interesting to note that births to FFS mothers were the most likely to report a medical risk factor. These are reported in Table 6.

Also reported in Table 6 are three of the 16 medical risk factors that are known correlates of preterm and low birth weight babies: diabetes, hypertension and previous preterm deliveries.[4] These three were flagged and summarized in addition to the measure indicating any of the 16 medical risk factors found on the birth certificate. In Table 6, the select medical risk factors also show that FFS had disproportionately higher risk mothers.

	Total New Mexico Resident Births		Medicaid Services				Non-Medicaid	
Table 6 — **New Mexico Resident Births, Mother's Medical Risk and Behavioral Factors**								
Risks			**Fee for Service**		**Salud!**			
	Number	**Percent**	**Number**	**Percent**	**Number**	**Percent**	**Number**	**Percent**
All Medical Risks								
Any Medical Risks	9,854	18.1	1,560	21.0	3,273	17.1	5,021	18.1
None noted	44,456	81.9	5,881	79.0	15,886	82.9	22,689	81.9
Total	54,310	100.0	7,441	100.0	19,159	100.0	27,710	100.0
Select Medical Risks; Diabetes, Hypertension and Previous Preterm Delivery								
High Medical Risk	2,416	4.4	487	6.5	767	4.0	1.162	4.2
None Noted	51,894	95.6	6,954	93.5	18,392	96.0	26,548	95.8
Total	54,310	100.0	7,441	100.0	19,159	100.0	27,710	100.0
Behavioral Risks: Tobacco and/or Alcohol Use								
Alcohol and/or Tobacco	7,042	13.0	830	11.2	3,594	18.8	2,618	9.5
None Noted	47,268	87.0	6,611	88.8	15,565	81.2	25,092	90.5
Total	54,310	100.0	7,441	100.0	19,159	100.0	27,710	100.0

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[3] Martin JA, Hamilton BE, Ventura SJ, Menacker F, Park MM. Births: Final Data for 2000. National Vital Statistics Reports; vol. 50 no.5. Hyattsville, Maryland: National Center for Health Statistics, 2002
[4] Greg R. Alexander, RS, MPH, ScD, Professor and Chair, Department of Maternal and Child Health, University of Alabama at Birmingham personal communication, 4/18/2003.

Table 6 further reports behavioral risk factors based on self-reported alcohol and tobacco use. It is believed that self-reported alcohol and tobacco use are underreported on the birth certificate. Overall, 13% reported behavioral risk factors. Salud! mothers reported alcohol and/or tobacco use more often than either FFS or non-Medicaid mothers, 19% versus 11% and 10% use, respectively.

Obstetric procedures and delivery procedures were also examined by Medicaid status and reported in Table 7. Small, but statistically significant, differences were found between Medicaid and non-Medicaid births. Both FFS and Salud!-Medicaid reported more fetal monitoring than non-Medicaid, while Salud! providers tended to use more ultrasound procedures than either FFS or non-Medicaid.

Table 7
New Mexico Resident Births by Obstetric Procedures by Medicaid Status

Procedure	Total New Mexico Resident Births		Medicaid Services				Non-Medicaid	
			Fee for Service		Salud!			
	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Fetal Monitoring								
Fetal Monitoring	42,021	77.4	5,879	79.0	15,042	78.5	21,100	76.2
None noted	12,289	22.6	1,562	21.0	4,117	21.5	6,610	23.9
Total	54,310	100.0	7,441	100.0	19,159	100.0	27,710	100.1
Ultrasound								
Ultrasound	32,291	59.5	4,174	56.1	12,427	64.9	15,690	56.6
None Noted	22,019	40.5	3,267	43.9	6,732	35.1	12,020	43.4
Total	54,310	100.0	7,441	100.0	19,159	100.0	27,710	100.0

Table 8
Infant Health Outcome Characteristics by Medicaid Status

Selected Outcomes	Total Resident Births		Medicaid Services				Non-Medicaid	
			Fee for Service		Salud!			
	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Preterm Births								
Preterm Births	5,618	10.3	992	13.3	1,990	10.4	2,636	9.5
Term Gestation	48,692	89.7	6,449	86.7	17,169	89.6	25,074	90.5
Totals	54,310	100.0	7,441	100.0	19,159	100.0	27,710	100.0
Low Birth Weight								
Low Birth Weight	4,249	7.8	742	10.0	1,603	8.4	1,904	6.9
Not Low Birth Weight	50,061	92.2	6,699	90.0	17,556	91.6	25,806	93.1
Totals	54,310	100.0	7,441	100.0	19,159	100.0	27,710	100.0
Very Low Birth Weight								
Very Low Birth Weight	670	1.2	162	2.2	229	1.2	279	1.0
Not Very Low Birth Weight	53,640	98.8	7,279	97.8	18,930	98.8	27,431	99.0
Totals	54,310	100.0	7,441	100.0	19,159	100.0	27,710	100.0

Note: Due to rounding, percentages may not add to 100.

Table 8 reports birth outcomes by Medicaid Status. Births paid by Medicaid were more likely to be preterm (<37 weeks gestation) and low birth weight (<2500 grams) than were births not paid by Medicaid. Births covered under FFS had the highest percentages of preterm and low birth weight births.

Table 9 notes characteristics differing between Medicaid and non-Medicaid births. Using chi-square analysis, differences between the two populations were tested for statistical significance. The two populations were found to be significantly different for each of the characteristics presented, with less than a 1% chance of random error.

The next step in this study was to investigate the relationships between demographic characteristics and birth outcomes to determine if differences between FFS, Salud! and non-Medicaid births were due to differences in services or in the populations served.

Table 9. Selected Differences Between Medicaid and non-Medicaid

Characteristics	New Mexico Resident Births	Non-Medicaid	Medicaid			Difference between Medicaid/ Non-Medicaid	
			All	FFS	Salud	x^2	p
% Teen Births	17.6	9.4	26.2	24.5	26.8	2,637.6	**
% Single Mothers	45.3	28.0	63.4	64.4	62.9	6,837.6	**
% Mothers with <12 Years Education	27.2	16.5	38.2	43.4	36.2	5,557.4	**
% Low level of Prenatal Care	13.2	11.8	14.7	20.5	12.4	96.6	**
% First Trimester Prenatal Care	63.6	68.2	58.8	53.9	60.6	524.3	**
% Select Medical Risks	4.4	4.2	4.7	6.5	4.0	8.67	*
% Behavioral Risks	13.0	9.5	16.6	11.2	18.8	620.6	**
% Preterm Births	10.3	9.5	11.2	13.3	10.4	42.2	**
% Low Birth Weight Births	7.8	6.9	8.8	10.0	8.4	71.2	**

$* \ p \le .01$
$** \ p \le .0001$

Methodology

Overview: A two-step process was used. The first step was linking the Medicaid files with the registered births files. The second-step was analyses of predominant indicators with basic and advanced statistical tools. The advanced statistical tool was multivariate logistic regression.

Medicaid claims data were provided for the years 1999 – 2000 by the Human Services Department's Medical Assistance Division (HSD). SAS software was used to manage, manipulate and analyze the data. Delivery claims files for both years were combined for linkages, as were Newborn claims files. The files were then prepared and investigated for matching variable contents and quality.

Linkage: Strict deterministic criteria for exact matches were used at each step of a five-stage linkage process. Multiple passes were used at each stage of the merging, as were a handful of standard techniques for matching that helped overcome some of the inherent conflicts in exact match criteria and common problems in data files.

The strategy was to stage the linkages. Stage one was to match the Medicaid newborn claims records and mother's delivery claims records and then link with vital registered births. Experience indicates that optimal linking is achieved by using date-of-birth, child's first name and mother's first name. Unfortunately, not all Medicaid

newborn claims records were matched to deliveries. Consequently, there were residual unmatched newborn and unmatched delivery records. Subsequent stages utilized similar multiple pass deterministic criteria to link vital births with each of the three Medicaid files resulting from stage one:

1) Matched newborns and mother's deliveries,
2) Unmatched mother's deliveries,
3) Unmatched newborns.

Stage two was the process of linking the matched Medicaid newborn and delivery records with the New Mexico registered births. Stages three and four were the linkage of the unmatched delivery and unmatched newborn records with New Mexico registered births. Finally, stage five linked all separately matched/linked Medicaid records back together with complete birth records in order to append Medicaid information onto birth records to distinguish linkage types (1 – 3 above), Medicaid eligibility and provider type (FFS and Salud!), and medical service information. Table 10 illustrates the results of the linking process of Medicaid records to all New Mexico registered birth records.

Table 10. Matching Medicaid Newborn and Delivery Claims to Registered Births

	Delivery Claims		Total	Newborn Claims		Total
	2000	1999	99-00	2,000	1999	99-00
Medicaid Records	12,636	11,844	24,480	11,225	10,344	21,569
Matched Medicaid Newborns-Delivery Claims	9,334	8,407	17,799	9,334	8,407	17,799
Unmatched Delivery or Newborn Claims	3,302	3,437	6,681	1,891	1,937	3,770
Percent Matched Newborns-Delivery Claims	73.9%	71.0%	72.7%	83.2%	81.3%	82.5%
Total New Mexico Births Reported				27,839	27,790	55,629
Births to Residents Reported				27,206	27,133	54,339
Matching Vital Records Births	12,090	11,258	23,348	10,948	10,058	21,006
Matched Newborn-Delivery claims and Births	9,312	8,361	17,673	9,312	8,361	17,673
Unmatched Delivery or Newborn claims Matched to New Mexico Births	2,778	2,897	5,675	1,636	1,697	3,333
Unmatched	546	586	1,132	274	286	563
Percent Medicaid Claims matching Births	95.7%	95.1%	95.4%	97.6%	97.2%	97.4%
Percent Medicaid Births of Births – Direct Link				39.3%	36.2%	37.8%
Matched Delivery Claims and Births – Indirect				2,778	2,897	5,675
Total Direct and Indirect Medicaid Births				13,726	12,955	26,681
Percent Direct and Indirect Medicaid Births of All New Mexico Births				49.3%	46.6%	48.0%

Note: New Mexico Vital Records data presented in this table include all registered births, including births to non-residents.

Logistic Regression Analysis: In addition to descriptive statistical methods involving cross tabulations and chi-square statistics, logistic regression was used to address Medicaid status and infant health outcomes. Logistic regression techniques allowed the examination of infant health outcomes as functions of:

- Mother's demographic characteristics (education, marital status, age, race/ethnicity),
- Prenatal care access and utilization (G-index),
- Selected medical risk factors of the mother,
- Birth characteristics (spacing), and
- Obstetric procedures.

The model regression equations provide estimates for Medicaid's contribution, holding constant other items in the model.

Results

When multiple variables and significant interaction effects were included, there were two similar "final" logistic models for predicting preterm and low weight births. Two models were found containing parameters that were common in both models as well as unique to the specific birth outcome.

Preterm Births

The unadjusted and adjusted odds ratios are both presented in Table 11. The unadjusted odds ratios were those derived with only Medicaid status effects in a regression model. Adjusted refers to the parameters drawn from the "final" models, inclusive of other factors, such as age, education status, race/ethnicity and marital status.

Table 11. Unadjusted and Adjusted Medicaid Related Odds Ratios for Preterm Birth		
	Preterm Birth	
	Effects	**Odds Ratios**
Unadjusted	FFS	1.5
	Salud!	1.1
	non-Medicaid	Referent
Adjusted, modeled	FFS	1.3
	FFSxBehavioral Risk Factors	1.6
	FFSxBehavioral & Medical Risk Factors	0.4

Eleven measures were included in the "final" model for predicting preterm births. Elements of these measures include design (dummy) variables and interaction terms. Design variables were created for each Medicaid status (FFS, Salud! and non-Medicaid). The final model included a number of significant effects (shown in Figure 5). FFS, compared to non-FFS (including Salud! and non-Medicaid), was the only Medicaid status variable found to significantly predict preterm births as a main effect. FFS also interacted with behavioral risks and with selected medical risks.

Controlling for other factors, the model for preterm births, with regard to Medicaid, indicates that Medicaid's FFS births were 1.3 times as likely to be preterm as non-FFS births. FFS mothers who smoke and/or drink (behavioral risk factors) faced higher odds of preterm births (1.6 times). Medicaid-FFS mothers who had both behavioral and medical risks were less likely (0.4) than non-FFS mothers to have a preterm birth.

The elevated odds for preterm births among the FFS population needs to be interpreted in the context of the other factors affecting preterm delivery. Figure 5 shows the odds ratios for other significant factors affecting preterm births. The odds ratios for the factors are ordered by their magnitude. On the left side is the effect of select medical risk factors, with an odds ratio of 2.2. On the right side is the intercept—indicating that all other things being equal, preterm birth is a relatively infrequent event. The axis is set to one — odds greater than one have a higher likelihood of outcome while odds below one are less likely.

Figure 5
Preterm Births Odds Ratios
and Confidence Intervals

Medicaid-related effects are not the largest magnitude effects, as illustrated in Figure 5. In predicting preterm births, FFS births had a slightly elevated likelihood compounded by behavioral risk factors. When both behavioral and medical risk factors were present, the chance of preterm birth declined.

Low Birth Weight

Variables used in the analysis of Low Birth Weight mirror those used in the previous examination of preterm birth. However, FFS and Salud! were both found significant indicators of Low Birth Weight (as shown in Table 12). In addition, behavioral risk factors of smoking and drinking were mediated by the effect of Salud!. Other significant effects of the model are presented in Figure 6.

The model for low birth weight with regard to Medicaid indicates that FFS-paid births were 1.5 times and that Salud!-covered births were 1.2 times as likely to be low birth weight than non-Medicaid births. The model further indicates that when reported behavioral risk factors were present, the chances of low birth weight for the Salud! group were 0.8 times lower than for either FFS or non-Medicaid mothers. This may indicate that mothers at risk from Behavioral factors fared better under Salud! than either the FFS or the non-Medicaid mothers.

Table 12. Unadjusted and Adjusted Medicaid Related Odds Ratios for Low Birth Weight		
	Low Birth Weight	
	Effects	**Odds Ratios**
Unadjusted	FFS	1.5
	Salud!	1.2
	non-Medicaid	Referent
Adjusted, modeled	FFS	1.5
	Salud!	1.2
	Salud!xBehavioral Risk Factors	0.8

Figure 6
Low Birth Weight Odds Ratios
and Confidence Intervals
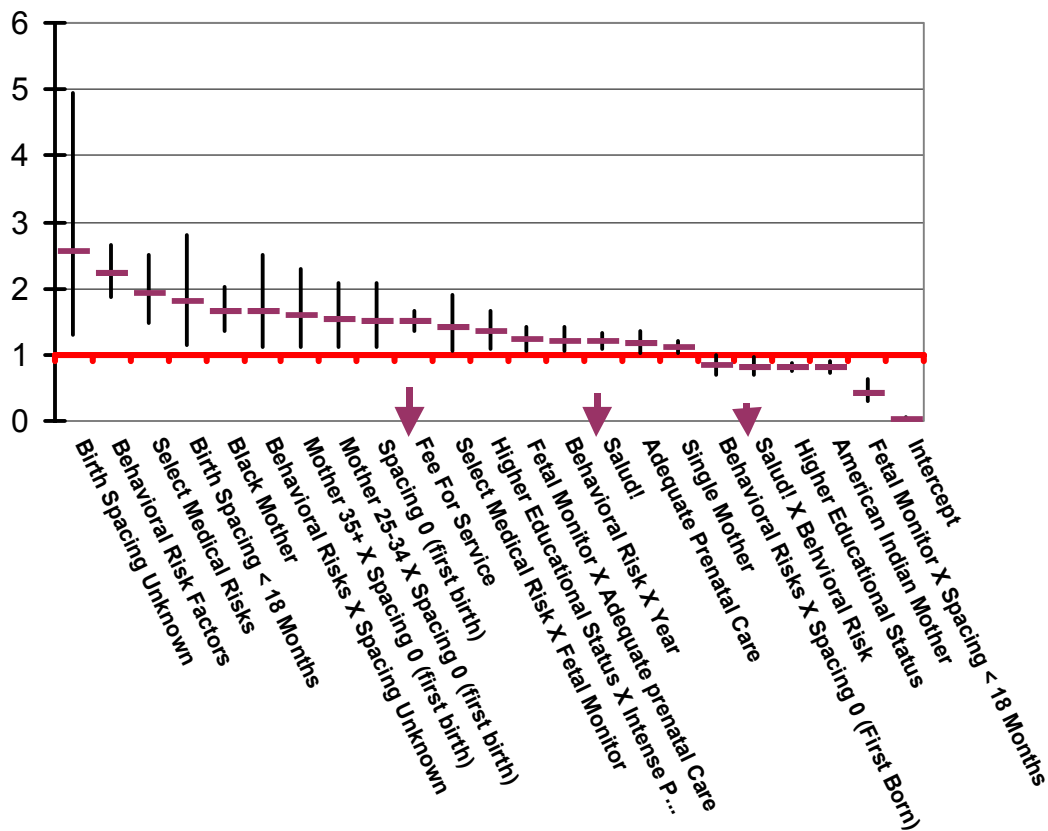
Figure 6 illustrates the array of 23 parameters to predict low birth weight as odds ratios. The largest and best understood deleterious effects were behavioral and select medical risk factors. The intercept indicates the overall likelihood of a low birth weight is 0.04, essentially 4% of births. Again, the Medicaid-related effects are small, relative to other effects.

Discussion

Salud!-Medicaid and FFS-Medicaid provided 49% of the services for births to New Mexico residents. Salud!-Medicaid covered 72% of those Medicaid related births. Both Salud!- and FFS-Medicaid providers not only covered disproportionate numbers of young single mothers, but also higher proportions of mothers with medical risks factors. The relationship may be due to the economic status of women who had medical risks. The Medicaid population was also disproportionately more likely to include women who had behavioral risks (alcohol and smoking), which may be related to the younger age of this population.

There appear some paradoxes with the study findings:

- Medicaid mothers tended to begin prenatal care later than non-Medicaid mothers.[5]
- Medicaid mothers tended to receive somewhat less adequate prenatal care.
- Salud!-Medicaid mothers were more likely to receive ultrasounds.
- Medicaid mothers were more likely to have fetal monitoring.
- There was no difference between Salud! and non-Medicaid for preterm births.
- FFS births had slightly higher odds of preterm outcomes, particularly if behavioral risks were involved.
- However, FFS births had substantially better outcomes with regard to preterm birth if select medical risk and behavioral risk factors were both present.
- Salud! births fared better than either FFS or non-Medicaid births when behavioral risk factors were present, with regard to low birth weight.

One of the interests in this research was the contrast of birth outcomes for FFS and Salud! participants. The driving question was whether the populations or the services were different. It appears that the difference was in the populations served.

The models, which included only effects that were deemed to provide the best fit, examined the relationship Medicaid has to birth outcomes in the complex context of mother's characteristics, birth characteristics, prenatal care, risk factors and obstetric procedures. These factors and the Medicaid interactions with those factors were found more predictive of birth outcomes than Medicaid status alone.

With regard to preterm births, the most predictive factors were select medical risks, birth spacing, behavioral risk factors, and intense prenatal care. The effect of intense prenatal care is most likely a surrogate for another medical risk factor or condition which resulted in higher than normal prenatal care. Low birth weight births were also more strongly driven by factors other than Medicaid status, such as behavioral risk factors and spacing between births.

Mothers who did not receive Medicaid services fared best in birth outcomes. Medicaid provides a valuable safety net for New Mexico births. Compared to FFS mothers, mothers participating in Salud! fared better in their odds of low birth weight outcomes, while mothers participating in FFS fared better when compound medical and behavioral risks were involved.

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[5] FFS mothers may have been new to Medicaid, often because they applied for Medicaid as a result of being pregnant.

Recommendations

Two goals of this project were to assess Medicaid and birth outcomes and those outcomes over time, particularly contrasting pre- and post- Salud! implementation and address the potential expansion in the growth of births covered by Medicaid. While the first goals has been met, in order to complete to the second goal, the following recommendations are made:

➢ Continue linkage and analysis using updated data for 1994-5 (preferably 1990-95) to establish a well understood pre-Salud! benchmark for Medicaid and birth outcomes.

➢ Continue linkage and analysis using data for 2001-2002, determine post-Salud!-Medicaid birth outcome trends.

➢ Retain the current linked data for inclusion in further analyses.

➢ Collaborate with Medicaid staff to design and evaluate studies.