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FINAL REPORT

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

The State Center for Health Statistics at
Office of New Mexico Vital Records and Health Statistics
Public Health Division
New Mexico Department of Health
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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>
<thead>
<tr>
<th>Linked to Vital Statistics Resident Births</th>
<th>Total Linked Medicaid</th>
<th>FFS</th>
<th>Salud!</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>26,600</td>
<td>7,441</td>
<td>19,159</td>
</tr>
<tr>
<td>Linked Medicaid Delivery and Newborn Claims</td>
<td>17,622</td>
<td>4,474</td>
<td>13,148</td>
</tr>
<tr>
<td>Medicaid Delivery Claims Only</td>
<td>5,655</td>
<td>1,015</td>
<td>4,640</td>
</tr>
<tr>
<td>Medicaid Newborn Claims Only</td>
<td>3,323</td>
<td>1,952</td>
<td>1,371</td>
</tr>
</tbody>
</table>

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.

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.
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. 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 2. New Mexico Resident Births by Maternal Characteristics and by Medicaid Status

<table>
<thead>
<tr>
<th>Selected Characteristics</th>
<th>Total Resident Births</th>
<th>Medicaid Services</th>
<th>Non-Medicaid</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number</td>
<td>Percent</td>
<td>Number</td>
</tr>
<tr>
<td><strong>Mother's Age</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;15</td>
<td>180</td>
<td>0.3</td>
<td>49</td>
</tr>
<tr>
<td>15-19</td>
<td>9,387</td>
<td>17.3</td>
<td>1,773</td>
</tr>
<tr>
<td>20-24</td>
<td>16,346</td>
<td>30.1</td>
<td>2,381</td>
</tr>
<tr>
<td>25-34</td>
<td>22,516</td>
<td>41.5</td>
<td>2,661</td>
</tr>
<tr>
<td>35 and older</td>
<td>5,822</td>
<td>10.7</td>
<td>575</td>
</tr>
<tr>
<td>Unknown</td>
<td>59</td>
<td>0.1</td>
<td>2</td>
</tr>
<tr>
<td><strong>Totals</strong></td>
<td>54,310</td>
<td>100.0</td>
<td>7,441</td>
</tr>
<tr>
<td><strong>Mother's Education</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt; 12 Years</td>
<td>14,745</td>
<td>27.2</td>
<td>3,228</td>
</tr>
<tr>
<td>12 Years</td>
<td>18,625</td>
<td>34.3</td>
<td>2,589</td>
</tr>
<tr>
<td>13 Years or More</td>
<td>18,747</td>
<td>34.5</td>
<td>1,213</td>
</tr>
<tr>
<td>Unknown</td>
<td>2,193</td>
<td>4.0</td>
<td>411</td>
</tr>
<tr>
<td><strong>Totals</strong></td>
<td>54,310</td>
<td>100.0</td>
<td>7,441</td>
</tr>
<tr>
<td><strong>Mother's Race/Ethnicity</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>White Non-Hispanic</td>
<td>18,161</td>
<td>33.4</td>
<td>954</td>
</tr>
<tr>
<td>White Hispanic</td>
<td>27,521</td>
<td>50.7</td>
<td>3,681</td>
</tr>
<tr>
<td>American Indian</td>
<td>6,868</td>
<td>12.7</td>
<td>2,681</td>
</tr>
<tr>
<td>Black</td>
<td>990</td>
<td>1.8</td>
<td>76</td>
</tr>
<tr>
<td>Asian or Pacific Islander &amp; Other</td>
<td>770</td>
<td>1.4</td>
<td>49</td>
</tr>
<tr>
<td><strong>Totals</strong></td>
<td>54,310</td>
<td>100.0</td>
<td>7,441</td>
</tr>
<tr>
<td><strong>Mother's Marital Status</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Single</td>
<td>24,626</td>
<td>45.3</td>
<td>4,794</td>
</tr>
<tr>
<td>Not Single</td>
<td>29,684</td>
<td>54.7</td>
<td>2,647</td>
</tr>
<tr>
<td><strong>Totals</strong></td>
<td>54,310</td>
<td>100.0</td>
<td>7,441</td>
</tr>
</tbody>
</table>

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. 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

<table>
<thead>
<tr>
<th>Grade</th>
<th>Age Range, in Years</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>10-11</td>
</tr>
<tr>
<td>5</td>
<td>10-12</td>
</tr>
<tr>
<td>6</td>
<td>11-13</td>
</tr>
<tr>
<td>7</td>
<td>12-14</td>
</tr>
<tr>
<td>8</td>
<td>13-15</td>
</tr>
<tr>
<td>9</td>
<td>14-16</td>
</tr>
<tr>
<td>10</td>
<td>15-17</td>
</tr>
<tr>
<td>11</td>
<td>16+</td>
</tr>
<tr>
<td>12</td>
<td>17+</td>
</tr>
</tbody>
</table>

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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**
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>
<thead>
<tr>
<th>Birth Characteristics</th>
<th>Total New Mexico Resident Births</th>
<th>Medicaid Services</th>
<th>Non-Medicaid</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number</td>
<td>Percent</td>
<td>Number</td>
</tr>
<tr>
<td>Year of Birth</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1999</td>
<td>27,129</td>
<td>50.0</td>
<td>3,106</td>
</tr>
<tr>
<td>2000</td>
<td>27,181</td>
<td>50.0</td>
<td>4,335</td>
</tr>
<tr>
<td>Total</td>
<td>54,310</td>
<td>100.0</td>
<td>7,441</td>
</tr>
<tr>
<td>First birth</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>First Birth</td>
<td>21,312</td>
<td>39.2</td>
<td>3,027</td>
</tr>
<tr>
<td>Not First Birth</td>
<td>32,998</td>
<td>60.8</td>
<td>4,414</td>
</tr>
<tr>
<td>Total</td>
<td>54,310</td>
<td>100.0</td>
<td>7,441</td>
</tr>
<tr>
<td>Spacing between births for mothers having 2nd or higher order birth</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Less than 18 Months</td>
<td>3,206</td>
<td>10.6</td>
<td>522</td>
</tr>
<tr>
<td>18 – 23 Months</td>
<td>3,605</td>
<td>11.9</td>
<td>490</td>
</tr>
<tr>
<td>24 or more months</td>
<td>23,418</td>
<td>77.4</td>
<td>2,825</td>
</tr>
<tr>
<td>Total</td>
<td>30,229</td>
<td>100.0</td>
<td>3,837</td>
</tr>
<tr>
<td>Multiples</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Singleton</td>
<td>53,029</td>
<td>97.6</td>
<td>7,272</td>
</tr>
<tr>
<td>Twin</td>
<td>1225</td>
<td>2.3</td>
<td>158</td>
</tr>
<tr>
<td>Triplet or More</td>
<td>56</td>
<td>0.1</td>
<td>11</td>
</tr>
<tr>
<td>Total</td>
<td>54,310</td>
<td>100.0</td>
<td>7,441</td>
</tr>
<tr>
<td>Repeat Births</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teens</td>
<td>1,818</td>
<td>5.9</td>
<td>290</td>
</tr>
<tr>
<td>20 Years Old and Older</td>
<td>28,411</td>
<td>94.1</td>
<td>3,547</td>
</tr>
<tr>
<td>Total</td>
<td>30,229</td>
<td>100.0</td>
<td>3,837</td>
</tr>
</tbody>
</table>

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) 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>
<thead>
<tr>
<th>Prenatal Care Access and Utilization Characteristics</th>
<th>Total New Mexico Resident Births</th>
<th>Medicaid Services</th>
<th>Non-Medicaid</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number</td>
<td>Percent</td>
<td>Number</td>
</tr>
<tr>
<td>Trimester Prenatal Care Began</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>First Trimester</td>
<td>34,533</td>
<td>63.6</td>
<td>4,011</td>
</tr>
<tr>
<td>Second Trimester</td>
<td>11,520</td>
<td>21.2</td>
<td>1,856</td>
</tr>
<tr>
<td>Third Trimester</td>
<td>3,980</td>
<td>7.3</td>
<td>811</td>
</tr>
<tr>
<td>No Care</td>
<td>965</td>
<td>1.8</td>
<td>255</td>
</tr>
<tr>
<td>Unknown</td>
<td>3,312</td>
<td>6.1</td>
<td>508</td>
</tr>
<tr>
<td>Total</td>
<td>54,310</td>
<td>100.0</td>
<td>7,441</td>
</tr>
</tbody>
</table>

| 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   |

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, 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. 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.

### Table 6

<table>
<thead>
<tr>
<th>Risks</th>
<th>Total New Mexico Resident Births</th>
<th>Medicaid Services</th>
<th>Non-Medicaid</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total number</td>
<td>Percent</td>
<td>Fee for Service</td>
</tr>
<tr>
<td>All Medical Risks</td>
<td></td>
<td></td>
<td>Number</td>
</tr>
<tr>
<td>Any Medical Risks</td>
<td>9,854</td>
<td>18.1</td>
<td>1,560</td>
</tr>
<tr>
<td>None noted</td>
<td>44,456</td>
<td>81.9</td>
<td>5,881</td>
</tr>
<tr>
<td>Total</td>
<td>54,310</td>
<td>100.0</td>
<td>7,441</td>
</tr>
<tr>
<td>Select Medical Risks: Diabetes, Hypertension and Previous Preterm Delivery</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High Medical Risk</td>
<td>2,416</td>
<td>4.4</td>
<td>487</td>
</tr>
<tr>
<td>None Noted</td>
<td>51,894</td>
<td>95.6</td>
<td>6,954</td>
</tr>
<tr>
<td>Total</td>
<td>54,310</td>
<td>100.0</td>
<td>7,441</td>
</tr>
<tr>
<td>Behavioral Risks: Tobacco and/or Alcohol Use</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alcohol and/or Tobacco</td>
<td>7,042</td>
<td>13.0</td>
<td>830</td>
</tr>
<tr>
<td>None Noted</td>
<td>47,268</td>
<td>87.0</td>
<td>6,611</td>
</tr>
<tr>
<td>Total</td>
<td>54,310</td>
<td>100.0</td>
<td>7,441</td>
</tr>
</tbody>
</table>

---


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

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Total New Mexico Resident Births</th>
<th>Medicaid Services</th>
<th>Non-Medicaid</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number</td>
<td>Percent</td>
<td>Number</td>
</tr>
<tr>
<td>Fetal Monitoring</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fetal Monitoring</td>
<td>12,289</td>
<td>22.6</td>
<td>1,562</td>
</tr>
<tr>
<td>None noted</td>
<td>54,310</td>
<td>100.0</td>
<td>7,441</td>
</tr>
<tr>
<td>Ultrasound</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ultrasound</td>
<td>22,019</td>
<td>40.5</td>
<td>3,267</td>
</tr>
<tr>
<td>None Noted</td>
<td>54,310</td>
<td>100.0</td>
<td>7,441</td>
</tr>
</tbody>
</table>

Table 8
Infant Health Outcome Characteristics by Medicaid Status

<table>
<thead>
<tr>
<th>Selected Outcomes</th>
<th>Total Resident Births</th>
<th>Medicaid Services</th>
<th>Non-Medicaid</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number</td>
<td>Percent</td>
<td>Number</td>
</tr>
<tr>
<td>Preterm Births</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Preterm Births</td>
<td>5,618</td>
<td>10.3</td>
<td>992</td>
</tr>
<tr>
<td>Term Gestation</td>
<td>48,692</td>
<td>89.7</td>
<td>6,449</td>
</tr>
<tr>
<td>Totals</td>
<td>54,310</td>
<td>100.0</td>
<td>7,441</td>
</tr>
<tr>
<td>Low Birth Weight</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low Birth Weight</td>
<td>4,249</td>
<td>7.8</td>
<td>742</td>
</tr>
<tr>
<td>Not Low Birth Weight</td>
<td>50,061</td>
<td>92.2</td>
<td>6,699</td>
</tr>
<tr>
<td>Totals</td>
<td>54,310</td>
<td>100.0</td>
<td>7,441</td>
</tr>
<tr>
<td>Very Low Birth Weight</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Very Low Birth Weight</td>
<td>670</td>
<td>1.2</td>
<td>162</td>
</tr>
<tr>
<td>Not Very Low Birth Weight</td>
<td>53,640</td>
<td>99.8</td>
<td>7,279</td>
</tr>
<tr>
<td>Totals</td>
<td>54,310</td>
<td>100.0</td>
<td>7,441</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>New Mexico Resident Births</th>
<th>Non-Medicaid</th>
<th>Medicaid</th>
<th>Difference between Medicaid/Non-Medicaid</th>
</tr>
</thead>
<tbody>
<tr>
<td>% Teen Births</td>
<td>17.6</td>
<td>9.4</td>
<td>26.2</td>
<td>24.5</td>
</tr>
<tr>
<td>% Single Mothers</td>
<td>45.3</td>
<td>28.0</td>
<td>63.4</td>
<td>64.4</td>
</tr>
<tr>
<td>% Mothers with &lt;12 Years Education</td>
<td>27.2</td>
<td>16.5</td>
<td>38.2</td>
<td>43.4</td>
</tr>
<tr>
<td>% Low level of Prenatal Care</td>
<td>13.2</td>
<td>11.8</td>
<td>14.7</td>
<td>20.5</td>
</tr>
<tr>
<td>% First Trimester Prenatal Care</td>
<td>63.6</td>
<td>68.2</td>
<td>58.8</td>
<td>53.9</td>
</tr>
<tr>
<td>% Select Medical Risks</td>
<td>4.4</td>
<td>4.2</td>
<td>4.7</td>
<td>4.0</td>
</tr>
<tr>
<td>% Behavioral Risks</td>
<td>13.0</td>
<td>9.5</td>
<td>16.6</td>
<td>11.2</td>
</tr>
<tr>
<td>% Preterm Births</td>
<td>10.3</td>
<td>9.5</td>
<td>11.2</td>
<td>13.3</td>
</tr>
<tr>
<td>% Low Birth Weight Births</td>
<td>7.8</td>
<td>6.9</td>
<td>8.8</td>
<td>10.0</td>
</tr>
</tbody>
</table>

* p ≤ .01  
** p ≤ .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**

<table>
<thead>
<tr>
<th></th>
<th>Delivery Claims</th>
<th>Medicaid Records</th>
<th>Newborn Claims</th>
<th>Total</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2000</td>
<td>1999</td>
<td>99-00</td>
<td>2,000</td>
<td>1999</td>
</tr>
<tr>
<td>Matched Medicaid Newborns-Delivery Claims</td>
<td>9,334</td>
<td>8,407</td>
<td>17,799</td>
<td>9,334</td>
<td>8,407</td>
</tr>
<tr>
<td>Unmatched Delivery or Newborn Claims</td>
<td>3,302</td>
<td>3,437</td>
<td>6,681</td>
<td>1,891</td>
<td>1,937</td>
</tr>
<tr>
<td>Percent Matched Newborns-Delivery Claims</td>
<td>73.9%</td>
<td>71.0%</td>
<td>72.7%</td>
<td>83.2%</td>
<td>81.3%</td>
</tr>
<tr>
<td>Total New Mexico Births Reported</td>
<td>27,839</td>
<td>27,790</td>
<td>55,629</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Births to Residents Reported</td>
<td>27,206</td>
<td>27,133</td>
<td>54,339</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Matched Medicaid Newborns-Delivery claims and Births</td>
<td>9,312</td>
<td>8,361</td>
<td>17,673</td>
<td>9,312</td>
<td>8,361</td>
</tr>
<tr>
<td>Unmatched Delivery or Newborn claims</td>
<td>2,778</td>
<td>2,897</td>
<td>5,675</td>
<td>1,636</td>
<td>1,697</td>
</tr>
<tr>
<td>Matched to New Mexico Births</td>
<td>546</td>
<td>586</td>
<td>1,132</td>
<td>274</td>
<td>286</td>
</tr>
<tr>
<td>Percent Medicaid Claims matching Births</td>
<td>95.7%</td>
<td>95.1%</td>
<td>95.4%</td>
<td>97.6%</td>
<td>97.2%</td>
</tr>
<tr>
<td>Percent Medicaid Births of Births – Direct Link</td>
<td>39.3%</td>
<td>36.2%</td>
<td>37.8%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Matched Delivery Claims and Births – Indirect</td>
<td>2,778</td>
<td>2,897</td>
<td>5,675</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Direct and Indirect Medicaid Births</td>
<td>13,726</td>
<td>12,955</td>
<td>26,681</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Percent Direct and Indirect Medicaid Births of All New Mexico Births</td>
<td>49.3%</td>
<td>46.6%</td>
<td>48.0%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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.
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.
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.

<table>
<thead>
<tr>
<th>Table 12. Unadjusted and Adjusted Medicaid Related Odds Ratios for Low Birth Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Low Birth Weight</strong></td>
</tr>
<tr>
<td>Effects</td>
</tr>
<tr>
<td>----------</td>
</tr>
<tr>
<td>Unadjusted</td>
</tr>
<tr>
<td>FFS</td>
</tr>
<tr>
<td>Salud!</td>
</tr>
<tr>
<td>non-Medicaid Referent</td>
</tr>
<tr>
<td>Adjusted, modeled</td>
</tr>
<tr>
<td>FFS</td>
</tr>
<tr>
<td>Salud!</td>
</tr>
<tr>
<td>Salud!xBehavioral Risk Factors</td>
</tr>
</tbody>
</table>

**Figure 6**
Low Birth Weight Odds Ratios and Confidence Intervals
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.

\(^5\) 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.


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

- Collaborate with Medicaid staff to design and evaluate studies.