Caring for the Uninsured and Underinsured

Perinatal Outcomes Following Implementation of TennCare

Wayne A. Ray, PhD; Joseph Gigante, MD; Edward F. Mitchel, Jr, MS; Gerald B. Hickson, MD

ON JANUARY 1, 1994, Tennessee abruptly changed its Medicaid program from traditional fee-for-service reimbursement to a capitated system, or TennCare.1 Although Tennessee was not the first state to implement capitated Medicaid reimbursement, TennCare was notable for its attempts to nearly double the number of persons covered and to save an estimated $7.2 billion over 5 years through a very aggressive capitation rate.1 The rapid transition to TennCare was accompanied by confusion, controversy, and legal conflict.1,2 Press coverage noted problems with availability of physicians to provide services in many of the newly formed managed care organizations. Academic medical centers, heavily involved in provision of care to the disadvantaged populations targeted by TennCare, reported substantial revenue shortfalls; consequently, some centers reportedly curtailed services provided to the poor and uninsured.3 Despite this controversy, to date there has been no published quantitative evaluation of the effect of TennCare on health outcomes.

Perinatal outcomes are thought to be one of the more sensitive indicators of quality of care. In the United States, socioeconomic disparity in access to medical care during pregnancy and in the risk of premature birth had been widely perceived as a failure of health care policy.5 Thus, a major achievement of the Medicaid expansions of the late 1980s and early 1990s was substantially increased use of prenatal care among high-risk women.6 In recognition of the importance of perinatal outcomes as quality indicators, the Health Plan Employer Data and Information Set (HEDIS) 3.0 criteria for managed care quality assessment include items for early use of prenatal care and low birth weight.8

There was considerable speculation that the transition to TennCare had reversed recent gains in improving perinatal outcomes for high-risk populations. There were widely publicized disruptions of the presumptive eligibility program, which gives pregnant women rapid temporary enrollment while the permanent application is processed.7 A survey conducted in Davidson County in 1995 reported that 31% of women with presumptive eligibility had had problems finding a prenatal care provider because many providers refused to accept TennCare presumptive eligibility (unpublished data, Metropolitan Health Department, Nashville, Tenn, November 1996). When, after years of declining rates, the state infant mortality rate increased from 8.9 per 1000 in 1994 to 9.4 per 1000 in 1995, speculation in a local newspaper article attributed this to poorer coverage during pregnancy under TennCare.8

We thus evaluated the effect of the transition to TennCare on perinatal outcomes. The evaluation was based on vital records routinely collected and audited by the State Vital Statistics Registrar that were unaffected by the change to TennCare. Thus, our methods did not depend on the quality of information provided by the managed care organizations that delivered services to TennCare enrollees.

METHODS

Study Population

The study population was identified from a database of birth and death certificates registered in Tennessee and 7 of the 8 bordering states that is linked with Medicaid10 and US Census11 files. The source of the study population was all live births between 1990 and 1995 to Tennessee residents for which the certificates had a plausible birth weight (500-5000 g) and gestational age (≥23 weeks) and had complete information on maternal demographic characteristics (99.1% of resident births). We then focused on births to women enrolled in Medicaid/TennCare at delivery, including those in 1993, the year preceding the transition, and in 1995, the first year following the transition in which a woman’s entire pregnancy would be covered under TennCare. For prenatal care and birth weight outcomes, we analyzed Medicaid singleton births (to avoid counting a pregnancy more than once) with information on prenatal visits (95.1% of all study Medicaid births). For deaths in the first 60 days of life, we analyzed Medicaid births that occurred before November 1, 1995 (92.1% of study Medicaid births for 1993 and 1995), because for later births...
the first 60 days of life extended into 1996 and death certificates for this year were not available. Mortality analyses included multiple births and those with missing prenatal care data, because such births are often high risk.

### Population Characteristics

Infant birth weight and maternal race, age, education, marital status, number of prior pregnancies, date of last menstrual period, and number and timing of prenatal care visits were obtained from birth certificates. In Tennessee, these data elements had good to excellent reliability when compared with maternal and infant hospital records. When the date of the last menstrual period was missing or implausible (12% of all certificates), we estimated it from birth weight, using the race and calendar year-specific distributions of gestational age in the population for whom both gestational age and birth weight were known. When the last menstrual period day of the month was missing, we imputed a value of 15. Maternal neighborhood income, a surrogate for individual income, was defined as the block group mean annual per capita income from 1990 US Census files11-12 and had been linked with birth certificates. Maternal enrollment status during pregnancy was determined from Medicaid and TennCare enrollment files13 linked to birth certificates.10

### Study Outcomes

Use of prenatal care was measured with indices by Kotelchuck,16 which classify prenatal care by whether it began late (after the fourth month of pregnancy) or included an inadequate number of visits for gestational age. Gestational age was the number of complete weeks from the last menstrual period to the date of the birth. Low birth weight and very low birth weight were defined as births less than 2500 g or 1500 g, respectively. Early infant deaths were those among study births that occurred in the first 60 days of life. We used this outcome rather than the more traditional neonatal mortality rate to avoid introducing bias from “shifting” mortality through intensive neonatal care.13 We did not study later infant deaths because these are less plausibly influenced by perinatal care.

### Analysis

Unconditional multivariate logistic regression was used to compare outcome proportions in 1995 with those for 1993 (the reference category). This analysis adjusted for potential changes in the characteristics of pregnant women covered by Medicaid following implementation of TennCare. The logistic regression models included terms for maternal age, race, education, marital status, neighborhood income, prior pregnancies, and birth weight (only models for death). (All regressions were performed with SAS Version 6.12 PROC GENMOD, running under WINDOWS NT 4.0 on an Intel P6 computer.)

### RESULTS

Prior to the implementation of TennCare, Medicaid coverage of pregnant women had been steadily increasing in Tennessee, the result of a series of Medicaid expansions.1 The proportion of all births with maternal Medicaid enrollment at delivery increased from 44.4% in 1990 to 52.1% in 1993 (Table 1). Of the Medicaid births, the proportion with maternal Medicaid enrollment in the first trimester also increased from 63.5% in 1990 to 73.2% in 1995. Following implementation of TennCare, the proportion of all births covered by Medicaid decreased, falling to 49.4% by 1995. However, the proportion of Medicaid births with maternal enrollment by the first trimester increased, rising to 77.8% by 1995. To determine if high-risk women had a more pronounced decrease in Medicaid coverage during pregnancy, we repeated this analysis for subgroups defined by maternal demographic characteristics, with essentially identical findings.

Mothers enrolled in Medicaid at delivery had demographic characteristics associated with high risk of adverse perinatal outcomes.13 The mothers of 36% of births were African American, 12% were younger than 18 years, 42% did not complete high school, 23% resided in neighborhoods with a mean annual per capita income of less than $7500, 57% were unmarried, and 38% were primigravidas. Maternal characteristics changed little following the transition to TennCare (Table 1). There were slight decreases in the proportions of births with mothers who were African American (36% in 1993 to 35% in 1995) or with neighborhood income less than $7500 (23% to 21%) and a slight increase in the proportion of primigravid mothers (38% to 39%). In 1993, immediately preceding the implementation of TennCare, Medicaid births had high risk of adverse perinatal outcomes: 16% had prenatal care delayed until after the fourth month of pregnancy, 6% had an inadequate number of prenatal care visits, 9% were less than 2500 g at birth, 1.6% were less than 1500 g, and 0.6% died by the 60th day of life (Table 2). None of these outcomes changed following the transition to TennCare (Table 2). When outcome proportions for 1995 were compared with those for 1993, the odds ratios, adjusted for maternal characteristics, were all between 0.97 and 1.01.

To determine if these outcomes changed for the highest-risk women following the transition to TennCare, we repeated this analysis for births to women who were African American, younger than 18 years, with mean neighborhood per capita income less than $7500, or who were primigravidas (Table 3). For each of these groups, there was no evidence that outcomes in 1995 differed from those in 1993. Among women who had 1, 2, or 3 or more of these high-risk characteristics, outcomes in 1995 were unchanged from 1993. One possible adverse effect of the implementation of TennCare was poorer outcomes among previously eligible women who, because of the changes in policies, did not enroll during pregnancy. Our

### Table 1.—Number of Births in Tennessee, Medicaid Births, and Maternal Characteristics for Medicaid Births

<table>
<thead>
<tr>
<th>Year</th>
<th>Total Tennessee births</th>
<th>Medicaid births, % of all state births</th>
<th>Medicaid births, N</th>
<th>Enrolled first trimester, %</th>
<th>African American, %</th>
<th>Age &lt;18 y, %</th>
<th>Education &lt;12 y, %</th>
<th>Neighborhood income &lt; $7500, %</th>
<th>Unmarried, %</th>
<th>Primigravida, %</th>
</tr>
</thead>
<tbody>
<tr>
<td>1990</td>
<td>74,017</td>
<td>32,853</td>
<td>63.5</td>
<td>37.8</td>
<td>12.6</td>
<td>46.6</td>
<td>25.8</td>
<td>57.3</td>
<td>38.0</td>
<td></td>
</tr>
<tr>
<td>1991</td>
<td>73,543</td>
<td>36,429</td>
<td>68.5</td>
<td>36.5</td>
<td>12.2</td>
<td>44.4</td>
<td>24.3</td>
<td>56.3</td>
<td>37.9</td>
<td></td>
</tr>
<tr>
<td>1992</td>
<td>72,617</td>
<td>37,249</td>
<td>72.9</td>
<td>35.4</td>
<td>11.5</td>
<td>42.3</td>
<td>23.5</td>
<td>55.9</td>
<td>37.3</td>
<td></td>
</tr>
<tr>
<td>1993</td>
<td>72,014</td>
<td>37,543</td>
<td>73.2</td>
<td>36.0</td>
<td>11.3</td>
<td>39.8</td>
<td>23.1</td>
<td>56.7</td>
<td>38.0</td>
<td></td>
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<tr>
<td>1994</td>
<td>72,238</td>
<td>36,494</td>
<td>74.9</td>
<td>34.0</td>
<td>11.5</td>
<td>39.4</td>
<td>21.6</td>
<td>56.8</td>
<td>39.0</td>
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<tr>
<td>1995</td>
<td>72,278</td>
<td>35,707</td>
<td>77.8</td>
<td>33.2</td>
<td>11.3</td>
<td>38.5</td>
<td>21.0</td>
<td>56.9</td>
<td>39.4</td>
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</tr>
</tbody>
</table>

### Table 2.—Perinatal Outcomes for Medicaid Births

<table>
<thead>
<tr>
<th>Year</th>
<th>Late prenatal care</th>
<th>Inadequate prenatal care visits</th>
<th>Low birth weight</th>
<th>Very low birth weight</th>
<th>Death in first 60 days</th>
</tr>
</thead>
<tbody>
<tr>
<td>1993</td>
<td>16.2</td>
<td>15.8</td>
<td>1.00 (0.96-1.04)</td>
<td>5.9</td>
<td>5.6</td>
</tr>
<tr>
<td>1994</td>
<td>16.2</td>
<td>15.8</td>
<td>1.00 (0.96-1.04)</td>
<td>5.9</td>
<td>5.6</td>
</tr>
</tbody>
</table>

*There were 73,250 total Medicaid births in 1993 and 1995. For prenatal care and birth weight outcomes, analysis is based on 69,664 births that were singleton and had date of last menstrual period and month of first prenatal care visit recorded. For early infant deaths, analysis was based on the 67,478 of the total Medicaid births prior to November 1, 1995.

Model included terms for maternal race, age, education, marital status, neighborhood income, prior pregnancies, and birth weight (only models for death). The reference category for odds ratios (ORs) was 1993. CI indicates confidence interval.

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mary analysis, based on the population of enrolled mothers, would not detect such access effects. We thus performed an alternative analysis for a population of women with demographic characteristics associated with a high likelihood of Medicaid enrollment. These women were unmarried, or were younger than 24 years, and less than 12 years of education, and had mean annual per capita neighborhood income of less than $12,500 per year. In 1993 and 1995, there were 28,237 and 27,401 births in this group, with maternal Medicaid enrollment for 58% and 55%, respectively. Among these women, the adjusted proportions of births with study perinatal outcomes in 1993 and 1995 and were essentially identical.

**COMMENT**

In contrast to the speculation and anecdotal reports linking TennCare to poorer perinatal outcomes, our quantitative study found no changes in outcomes among Medicaid enrollees following the transition to TennCare. There was no decrease in the proportion of Medicaid women enrolling in the first trimester, no change in the proportion receiving early prenatal care, and no change in the adequacy of care as measured by number of prenatal care visits recorded. For early infant deaths, analysis was based on 67,478 births prior to November 1, 1995.

There were several limitations of our study. First, we did not have access to medical records. Only one of the 12 TennCare managed care organizations that served Tennessee enrollees supplied medical records for analysis. Second, because our data could not identify women with intercurrent medical conditions, we do not know if outcomes for these high-risk pregnancies were affected by the implementation of TennCare. Perinatal outcomes may have differed between the TennCare managed care organizations that served Tennessee enrollees; further research is in progress to address this question. We studied outcomes for pregnancies that began shortly following the implementation of TennCare and thus did not assess the longer-term effects of this transition. Careful, ongoing monitoring of perinatal outcomes in TennCare is essential to assure that high-risk pregnant women continue to have access to medical care during pregnancy.

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**References**