

Method of Linking Medicaid Records to Birth Certificates May Affect Infant Outcome Statistics

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ABSTRACT

Objectives. This study assessed how different methods of matching Medicaid records to birth certificates affect Medicaid infant outcome statistics.

Methods. Claims paid by Medicaid for hospitalization of the newborn and for the mother's delivery were matched separately to 1995 North Carolina live birth certificates.

Results. Infant mortality and low-birthweight rates were consistently lower when Medicaid was defined by a matching newborn hospitalization record than when results were based on a matching Medicaid delivery record.

Conclusions. Studies of birth outcomes in the Medicaid population may have variable results depending on the method of matching that is used to identify Medicaid births. (*Am J Public Health*. 1999;89:564-566)

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There has been considerable interest in birth outcome statistics for the Medicaid population. Given the general lack of a family income measure on birth certificates in the United States, Medicaid enrollment may be used as a surrogate measure of low income. Also, with the expansions of Medicaid since the late 1980s to cover pregnant women and children at higher income levels, there has been keen interest in tacking Medicaid infant mortality and low birthweight as a means of evaluating the effectiveness of these expansions of the program.¹⁻⁴

Researchers have frequently had to rely on matching birth certificates to Medicaid data files to identify "Medicaid births." Experience with such matching in North Carolina indicates that the method of matching has a substantial impact on the birth outcome measures produced.

In Tennessee, Piper et al.⁵ found, for the period 1984 through 1987, that the method of identifying Medicaid births affected birth outcome measures. In particular, they found that for births where there was a matching Medicaid delivery record for the mother but there was no matching Medicaid record for the newborn, the neonatal mortality rate was extremely high. It was suggested that the method of matching Medicaid records to birth certificates may produce serious bias in Medicaid birth outcome statistics. Little information has been available to validate these earlier findings from Tennessee. Also, the findings apply to a time period before the substantial expansions of Medicaid.

The present study used 1995 matched Medicaid/birth files developed in North Carolina to examine these issues for a more current time period. Medicaid and non-Medicaid infant mortality and low-birthweight rates were compared via 3 different matching methods to identify Medicaid births.

Methods

We independently matched the following to 1995 birth certificates: (1) claims paid by Medicaid for the newborn's initial hospital stay and (2) claims paid by Medicaid for the mother's delivery. Although Medicaid status was measured at the time of birth, it was expected that low birthweight and mortality throughout the infant period would generally

be higher for Medicaid families (relative to non-Medicaid families) owing to their lower socioeconomic status. On the other hand, the receipt by many of these women of prenatal services paid for by Medicaid may help improve birthweight and reduce mortality.

Newborn paid claims records were matched to birth certificates by hospital of birth, baby's name, baby's date of birth, gender, and county of residence. Maternal delivery claims were matched to birth certificates by mother's name, mother's date of birth, and county of residence. Each matching process took place in several iterations, and various combinations of the matching variables were used in a deterministic manner. (Information on the details of the matching process is available from the author on request.) Approximately 90% of maternal delivery claims were successfully matched to a birth certificate; for newborn claims, approximately 95% were successfully matched.

Infant death (death at less than 1 year of age), neonatal death (death at less than 28 days of age), and postneonatal death (death at 28 days to 1 year of age) rates and low-birthweight (<2500 g) and very-low-birthweight (<1500 g) percentages were compared for Medicaid and non-Medicaid births as defined by the 2 matching methods. In addition, these outcomes were measured for a third group of Medicaid births defined by either a matching newborn record or a matching maternal record. The results were also stratified by race (White/minority). In North Carolina, more than 90% of minority births are to African Americans.

Results

Table 1 shows the numbers of births by race that were classified as Medicaid births according to the 3 matching methods. Overall, approximately 45% of North Carolina resident live births in 1995 were classified as Medicaid. For Whites, about one third of

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TABLE 1— Infant Mortality and Low-Birthweight Rates for Medicaid vs Non-Medicaid Births, By Method of Medicaid Matching and Race: 1995 North Carolina Resident Live Births

	Infant's Matching Medicaid Record		Mother's Matching Medicaid Record		Mother's or Infant's Matching Medicaid Record	
	Medicaid	Non-Medicaid	Medicaid	Non-Medicaid	Medicaid	Non-Medicaid
No. of births						
All races	44 756	56 799	41 014	60 541	47 954	53 601
White	24 709	46 621	21 990	49 340	26 460	44 870
Minority	20 047	10 178	19 024	11 201	21 494	8 731
Infant mortality rate ^a						
All races	8.7	9.2	11.2	7.5	10.9	7.3
White	7.1	6.6	8.7	5.9	8.6	5.7
Minority	10.7	21.1	14.0	14.6	13.0	15.0
Neonatal mortality rate ^b						
All races	5.0	7.5	7.4	5.7	7.2	5.7
White	3.8	5.1	5.4	4.4	5.2	4.4
Minority	6.5	18.3	9.8	11.6	9.6	12.6
Postneonatal mortality rate ^c						
All races	3.7	1.8	3.8	1.8	3.8	1.5
White	3.2	1.5	3.4	1.6	3.4	1.4
Minority	4.2	2.8	4.2	2.9	4.3	2.4
Birthweight <2500 g, %						
All races	11.0	6.9	11.3	7.0	11.2	6.5
White	8.6	5.9	8.6	6.0	8.7	5.7
Minority	13.9	11.8	14.4	11.2	14.3	10.5
Birthweight <1500 g, %						
All races	2.2	1.6	2.5	1.4	2.4	1.3
White	1.5	1.2	1.7	1.1	1.7	1.0
Minority	3.0	3.7	3.4	3.0	3.4	2.9

^aInfant deaths per 1000 live births.

^bDeaths at least 28 days of age per 1000 live births.

^cDeaths at 28 days to 1 year of age per 1000 live births.

births were paid for by Medicaid; for minorities, about two thirds of births were paid for by Medicaid.

Table 1 also presents birth outcome statistics by matching method and race. For all races combined, the infant mortality and neonatal mortality rates were lower for Medicaid births than for non-Medicaid births when Medicaid was defined on the basis of a matching newborn hospitalization claim. However, when Medicaid was defined on the basis of a matching maternal delivery claim, Medicaid infant mortality and neonatal mortality rates were higher than the non-Medicaid rates. This latter result is what would be expected given the generally lower socioeconomic status of the Medicaid population. When Medicaid was defined by either a matching newborn or matching maternal record, the findings were generally intermediate between the results of the other 2 methods (but closer to the results based on a matching maternal record).

The lower Medicaid infant and neonatal mortality rates when Medicaid was defined by a matching newborn claim were especially pronounced among minority births. When a maternal claim was used to define Medicaid, the minority infant and neonatal mortality rates for Medicaid births were still lower than the rates

for non-Medicaid births, but the differences were much less pronounced. The percentage of birthweight less than 1500 g among minorities was lower for Medicaid (relative to non-Medicaid) when defined by a matching newborn claim but higher for Medicaid when defined by a matching maternal claim.

Table 2 provides information to help explain these findings. The neonatal mortality rate is shown for births where both, none, or only 1 of the newborn and maternal Medicaid claims matched. Among the births where the maternal Medicaid claim matched but the newborn Medicaid claim did not, the neonatal mortality rate was 36.9 per 1000, or about 7 times as

high as the other 3 neonatal mortality rates shown. About two thirds of all neonatal deaths (and half of all infant deaths) in North Carolina occur during the first day of life. Further investigation of the results in Table 2 shows that the very high neonatal mortality rate of 36.9 is due almost entirely to a much higher rate of first-day mortality within this group.

This suggests that some babies who are potentially eligible for Medicaid (the mother's delivery was paid for by Medicaid) but die very soon after birth are never enrolled in Medicaid, and therefore there is no Medicaid payment for the newborn's hospitalization. This results in a serious underestimation of Medic-

TABLE 2—1995 North Carolina Neonatal Mortality Rates, by Type of Matching Medicaid Record

Mother's Matching Medicaid Record	Infant's Matching Medicaid Record			
	Yes		No	
	Rate ^a	No. of Births	Rate ^a	No. of Births
Yes	4.9	37 816	36.9	3 198
No	5.6	6 940	5.7	53 601

^aPer 1000 live births.

aid infant mortality rates when Medicaid is defined only by the presence of a matching infant record.

Discussion

These results indicate that the method of matching Medicaid records to birth certificates can have a strong influence on the resulting infant outcome statistics. If only infant Medicaid records are linked to birth certificates to define the Medicaid population, the resulting Medicaid statistics for outcomes such as infant mortality and very low birthweight will probably be understated. There may be less bias in studies that compare infant outcome rates among subgroups only within the population of Medicaid births,³ although the absolute level of Medicaid rates will probably be too low.

If there is a choice between matching newborn or maternal Medicaid records to define Medicaid births for purposes of examining birth outcomes, using the maternal records is the better choice. Providers are more likely to bill Medicaid for the mother's delivery. If the in-

fant dies immediately after birth, there may be no billable infant charges. Such practices may, however, vary from state to state. The method of using either a matching newborn record or a matching maternal record to define "Medicaid" may provide the least biased results. Another approach would be to match maternal Medicaid enrollment records (rather than paid claims) to birth certificates.⁴

It is noteworthy that the bias described here in comparing Medicaid and non-Medicaid birth outcomes is much stronger among births to minority women. This may be due in part to the much higher rate of preterm delivery among African American women and to the much higher percentage of minority births that are paid for by Medicaid.

This study has implications for any effort to evaluate birth outcomes in the Medicaid population. If Medicaid births are defined by linking Medicaid records to birth certificates, careful attention must be given to the method of matching to reduce bias in the results. Studies reporting findings from linked databases involving Medicaid records should state explicitly the method of matching used. □

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