THE EFFECT OF INSURANCE ON INFANT HEALTH: A CASE STUDY OF LOW-INCOME WOMEN IN NEW JERSEY

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Abstract (233 Words)

Background: There have been relatively few evaluations of the effect of private insurance and Medicaid on infant health, and results from previous studies are inconclusive.

Objectives: The objective of this study if to estimate the effect of private insurance coverage and Medicaid participation on birth weight and the incidence of low-birth weight controlling for non-random selection of insurance status.

Research Design: Our data consist of vital records that have been linked to hospital discharge records and Medicaid claims for all births to women in New Jersey in the years 1989 and 1990. We use ordinary least squares regression and instrumental variables procedures to obtain estimates of the effect of insurance status on birth weight.

Subjects: We limit our analysis to low-income women as this is the population most at risk of an adverse birth outcome and the target of Medicaid.

Results: The results indicate that Medicaid has a small effect on the incidence of low-birth weight for black women, but has little effect on average birth weight for low-income women. Our preferred estimates suggest that Medicaid participation reduces the incidence of low-birth weight for black women by between 5 and 10 percent. A similar finding was found with regard to private insurance. Private insurance had little effect on average birth weight for both black and white women, and reduced the incidence of low-birth weight for black and white women by between 15 and 25 percent.

Introduction

One of the most important correlates of infant health in the United States is income. The most obvious explanation for this relationship is that high-income women are more likely to be covered by insurance, and as a result have greater access to health care and healthier infants than do low-income women. Indeed, much prior research has demonstrated that insurance status is strongly related to health care utilization. Thus, public programs that provide women greater access to health care are expected to improve infant health. Clearly, this reasoning is one of the primary motivations behind the Medicaid program, particularly the recent eligibility expansions that were targeted at pregnant women and children.

There are at least two reasons, however, why this simple logic may be faulty. First, income and insurance status are also correlated with several lifestyle factors such as smoking that affect infant health. Thus, the correlation between insurance status and infant health used to justify expanding Medicaid eligibility may be spurious and confounded by the relationship between income and lifestyle factors. For example, privately insured women may receive more health care services and be less likely to smoke than low-income women. Thus, better infant health outcomes among privately insured women may be the result of their lower rates of smoking and not because of their greater utilization of health care services. In this case, expanding Medicaid eligibility to increase health care utilization will not necessarily improve infant health. Second, increasing access to, and utilization of, health care services may do little to improve infant health among poor families if prenatal care is relatively ineffective. Recent evidence has suggested that greater prenatal care utilization may not necessarily result in better infant health.[1-3]

These considerations lead us to question whether the recent Medicaid expansions have had the desired effect of improving infant health. Medicaid expenditures on low-income children increased by 100 percent ($5.8 billion) between 1988 and 1991 and the federal government has recently allocated another $24 billion to expand publicly provided health insurance for children.[4] Given the size and growth of expenditures associated with the Medicaid expansions, it is important from a public policy perspective to answer whether Medicaid is having the desired effect.

Surprisingly, there have been relatively few evaluations of the effect of the Medicaid program on infant health, and results from previous studies are mixed. Just how few studies exist can be ascertained by comparing the number of prior studies related to the effect of Medicaid on infant and child health versus health care utilization. A single keyword search of Medline using three words "Medicaid", "Child" and "Access" resulted in 65 entries for the 1985-1996 period. In contrast, our extensive literature review of studies related to the effect of Medicaid on infant and child health found only 11 studies, two of which are unpublished. More importantly, only two previous studies have actually evaluated the effect of Medicaid participation on infant health. Most past studies have focused on the effect of Medicaid eligibility, or eligibility rules, on infant health.[5-11]

While these studies may provide information about the potential success of the program, they produce estimates of the effect of Medicaid on infant health that are confounded by decisions to participate in the program. These analyses do not address the most critical question of whether women who participate in the Medicaid program have healthier babies than similar women who are uninsured. In other words, past studies do not measure the effect of "treatment on the treated," but rather the effect of the "intention to treat." The success of

Medicaid, however, depends on two factors: the effect of the program on those that participate, and the number and types of individuals who participate in the program. Each of these components can be altered to affect the program's success. Thus, from a policy design standpoint it is important to have information about the impact of each component. Studies that examine the effect of Medicaid eligibility on infant health provide only limited information about each component, and are of limited use to policy makers.

In this study, we estimate the effect of Medicaid participation on infant health, or the effect of 'treatment on the treated." Only two previous studies have examined this question, and both failed to account for the potential non-random selection of women into Medicaid.[12,13] We address this empirical problem in a number of ways including the use of an instrumental variables methodology that takes advantage of cross-sectional and time-varying Medicaid enrollments during the period of our study. Our data consist of vital records that have been linked to hospital discharge records and Medicaid claims for all births to women in New Jersey in the years 1989 and 1990. We limit our analysis to the Medicaid target population of poor and near-poor women. Our focus on low-income women is important since Medicaid affects only about one-third of the population. Analyses that include all women and infants unnecessarily introduce sample heterogeneity and potential sources of bias.

Methods

The goal of the empirical analysis is to estimate the effect of Medicaid participation on birth weight. Accordingly, we estimate a model in which birth weight depends on insurance status, sex of child, and maternal characteristics. The model is specified as follows:

(1) $BW_{it} = \alpha_0 + \alpha_1 MED_{it} + \alpha_2 PRIV_{it} + \sum_k \alpha_k X_k + \nu_{it}$,

where BW is birth weight, MED is a dummy variable indicating that mother is Medicaid participant, $PRIV$ is a dummy variable indicating mother is covered by private insurance, and the X_k are exogenous characteristics that affect infant health such as sex of child, mother's age and mother's medical risk factors (e.g., anemia). Insurance status is a proxy for the price of medical care, and exogenous maternal characteristics are a proxy for lifestyle behaviors, income and mother's health endowment.

The primary statistical problem associated with equation (1) is selection bias. Participation in Medicaid and private insurance may not be random, and unobserved factors that affect insurance status may also affect infant health. For example, women with a poor health endowment who expect an adverse birth outcome may be more likely to have some type of insurance.

We address this issue in several ways. First, we limit the sample to unmarried women, age 18 or older with 12 or less years of education. This group represents a significant portion of the Medicaid population, and is more homogenous than more broadly defined samples. This is important since the selection problem is most severe when there is significant unobserved heterogeneity in the sample. Limiting the sample on the basis of age, education and marital status will tend to reduce the unobserved sample heterogeneity and the potential magnitude of the sample selection problem.

A second potential solution to the selection issue is to add maternal smoking and alcohol consumption to the basic model. Although maternal smoking and alcohol use may be endogenous, they are empirically important determinants of birth outcomes that may be correlated with unobserved factors that also determine insurance status. The addition of maternal smoking and alcohol use may reduce unobserved heterogeneity, and reduce the

magnitude of the selection bias. For example, smoking and drinking during pregnancy may be correlated with poor maternal health, and a higher expectation of an adverse birth outcome. As a result, these women may be more likely to be privately insured or on Medicaid. Other possible relationships between these two maternal behaviors and insurance status exist, but in each case, smoking and drinking during pregnancy may be correlated with unobservable factors that also affect insurance status. Thus, the inclusion of these two variables in the model reduces unobserved heterogeneity and the magnitude of the selection problem.

The third strategy we use to address the selection problem is similar to the first, and involves using only part of our sample.[14] In this case, we limit the sample to women who started prenatal care in either the first or third trimester of the pregnancy, and estimate separate models for each of these two sub-groups. For the sample who started care in the third trimester, we drop women who received no care. Separating the sample in this way is appropriate because Medicaid and private insurance affect infant health primarily through greater utilization of medical care. Limiting the sample to women who initiated prenatal care at approximately the same time reduces the extent to which Medicaid or private insurance can affect birth outcomes. Consequently, Medicaid and private insurance should have a smaller impact on infant health among these samples of women than among the total sample of women who started prenatal care at various points during the pregnancy. If the impact of Medicaid and private insurance on birth outcomes is not reduced in these samples, then this is evidence that the selection problem is empirically important. However, limiting the sample by when care was initiated may introduce a different type of selection bias. For example, uninsured women who initiate care in the first trimester may be the most motivated and concerned women among the uninsured. Thus, the birth outcomes for these women may be better than expected. Similar

arguments apply to the third trimester sample. Thus, the results of these analyses need to be interpreted with caution.

Our final approach to the selection problem is instrumental variables. We exploit cross-sectional and time variation in the number of Medicaid providers to instrument for insurance status. During the 1989 and 1990 period, there was a significant increase in the number and outreach efforts of Medicaid providers offering enriched prenatal services through New Jersey's HealthStart program, and other changes (e.g., presumptive eligibility) in the Medicaid program that would affect Medicaid enrollment.[15] In addition, there is significant cross-sectional county variation in the number of Medicaid providers reflecting provider practice style differences and concentrations of poverty. As a consequence, there are significant differences in insurance status (e.g., Medicaid and uninsured) by county, and an increase in the number of women participating in Medicaid in 1990 than 1989 primarily because of the greater access to a Medicaid provider and greater community outreach. Depending on where a woman lived, and in what year she was pregnant, her chances of being on Medicaid will differ because of differences in provider availability. Therefore, we use the following variables as instruments for Medicaid participation: the number of HealthStart providers in a woman's city of residence six months prior to delivery, county dummy variables, a year dummy variable, and county-year interactions. The county-year interaction terms measure the differential growth in the number of providers by county. An appendix presents mean insurance participation by county between 1989 and 1990, and illustrates the significant amount of cross-sectional and time variation in insurance status for our sample.

Data and Descriptive Analysis

The data set used in this analysis consists of 1989 and 1990 files that link Vital Statistics birth/death records and uniform billing hospital discharge data collected by the New Jersey Department of Health. Of all single live births in New Jersey to state residents, linkage of records from all three sources was achieved for over 95 percent of all births.[15]

We use two measures of infant health in the analysis: birth weight measured in grams, and the incidences of low-birth weight (i.e., birth weight < 2500 grams). Explanatory variables include insurance status at time of delivery—Medicaid, private insurance, and uninsured; maternal characteristics—age, ethnicity, education, number of previous spontaneous or induced terminations, presence of hypertension, diabetes and anemia; mother's age; and size of city. We obtain insurance status from hospital discharge records at the time of delivery. Since there is no presumptive eligibility for Medicaid at the time of delivery in New Jersey, those women on Medicaid at the time of delivery must have been enrolled in Medicaid prior to delivery during the prenatal care period. Some women who were uninsured at the time of delivery may have been eligible for Medicaid and subsequently enrolled in Medicaid because of hospital outreach efforts related to billing. A small number (204) of women with other types of insurance are included among the uninsured.

Table 1 presents mean birth weight and prenatal care utilization by race and insurance status. All analyses were done separately by race after preliminary tests indicated that pooling of the data by race was inappropriate. For both black and white mothers, there are significant differences in both prenatal care utilization and birth outcomes by insurance status. For both races, women who are uninsured initiate prenatal care later, have fewer prenatal care visits, and lower birth weight infants than women who have either Medicaid or private insurance. For both racial groups, the magnitude of the differences are substantial in the case of low-birth

weight: women covered by Medicaid and private insurance have, respectively, approximately a 20 and 35 percent lower incidence of low-birth weight than uninsured women. The figures in Table 1 strongly support the conventional wisdom justifying the Medicaid program. Providing greater access to care appears to result in greater utilization and better infant health outcomes. While this conclusion seems reasonable, as we have noted previously, there are reasons to question its correctness. We spend the remaining part of the paper examining whether the simple descriptive relationship between insurance status and birth outcomes observed in Table 1 persists in a multivariate context, and when problems associated with selection are addressed.

Multivariate Analysis

Table 2 presents the results for the sample of black women. Each column in Table 2 contains the estimates of the effect of Medicaid and private insurance from a different analysis. An appendix provides a complete set of estimates for a representative model. Estimates in column 1 of Table 2 are obtained using a simple Ordinary Least Squares regression of birth weight on insurance status and maternal characteristics for the full sample of black women. Since this dependent variable is a binary measure, we correct the standard errors for heteroscedasticity.[16]

Estimates in column 1 of the top panel of Table 2 indicate that black women covered by Medicaid had infants that were 101 grams heavier than uninsured black women, and black women covered by private insurance had infants that were 168 grams heavier than uninsured black women. Both estimates are significantly different from zero, and quite similar to the unadjusted mean differences presented in Table 1. Similarly, estimates of the effect of Medicaid and private insurance on the incidence of low-birth weight, presented in column 1 of

the bottom panel of Table 2, are very close to the unadjusted mean differences presented in Table 1. The incidence of low-birth weight is 4.2 percentage points lower among black women covered by Medicaid than among uninsured black women, and 6.5 percentage points lower among privately insured black women than among uninsured black women. Again, both estimates are significantly different from zero.

There are a few points to note about the estimates in column 1 of Table 2. First, controlling for observed characteristics of the mother had little effect on estimates of the effect of Medicaid and private insurance on birth outcomes even though many of these factors were significantly related to birth weight (see the appendix). This suggests that insurance status is not strongly related to observed maternal characteristics (e.g., age and education) in this sample. This would be good news with regard to the issue of selection if the observed characteristics explained a large part of the variation in birth weight. However, the R-square statistics for the regressions in column 1 of Table 2 are less than 0.03. Thus, the observed characteristics explain very little of the variation in birth weight.

Second, estimates of the effect of Medicaid and private insurance on the incidence of low-birth weight are very large. Medicaid coverage reduces the incidence of low-birth weight by 24 percent, and private insurance coverage reduces the incidence of low-birth weight by 36 percent among black women. The large difference in the incidence of low-birth weight between black women covered by Medicaid and those who are uninsured are difficult to reconcile with the much smaller differences in prenatal care utilization between these two groups. Black women covered by Medicaid received approximately 0.58 more visits than uninsured black women, and started care approximately 0.37 months sooner than uninsured black women (Table 1). The large difference in the incidence of low-birth weight combined

with the relatively small difference in prenatal care utilization suggests that non-random selection into Medicaid may be a problem.

Table 3 contains the results for the sample of white women, and is organized similar to Table 2. Estimates in column 1 of Table 2 indicate that Medicaid and private insurance coverage increase average birth weight and reduce the incidence of low-birth weight among white women. Similar to the results for the sample of black women, the estimates in column 1 of Table 3 are close in size to the unadjusted differences in Table 1, and indicate that Medicaid and private insurance are not strongly correlated with observed characteristics. The estimates of the effect of Medicaid and private insurance on the incidence of low-birth weight are large. White women covered by Medicaid have a 28 percent (2.6 percentage points) lower incidence of low-birth weight than uninsured white women, and privately insured white women have a 36 percent (3.4 percentage points) lower incidence of low-birth weight than uninsured white women. We note again that the difference in the incidence of low-birth weight between Medicaid and uninsured women is large relative to the difference in prenatal care utilization between these two groups. White women on Medicaid received approximately 0.75 more visits, and began care approximately 0.45 months earlier than uninsured white women (Table 1). These differences do not appear to justify the large differences in the incidence of low-birth weight and suggest significant selection effects.

Selection

For both black and white women, there appears to be some evidence of selection, particularly with regard to Medicaid coverage. Our first attempt to gauge the magnitude of the selection problem is to add variables measuring maternal smoking and alcohol consumption to

the model. Estimates from this expanded model are contained in column 2 of Tables 2 and 3. In all cases, the addition of maternal smoking and alcohol consumption reduces the effect of Medicaid and private insurance on birth weight and the incidence of low-birth weight. The largest reductions are of an order of magnitude of 20 to 25 percent and are related to estimates of the effect of private insurance. Much smaller changes are observed for estimates of the effect of Medicaid.

The addition of maternal smoking and alcohol consumption may have made the estimates in column 2 of the effect of private insurance more credible than the estimates in column 1. For example, black women covered by private insurance received 2.78 more prenatal care visits on average, and started care 1.3 months earlier than uninsured black women. Thus, it may seem reasonable that privately insured black women have an incidence of low-birth weight that is 26 percent (4.7 percentage points) lower than uninsured black women. Similar inferences do not pertain to the effects of Medicaid on low-birth weight. Even after the addition of maternal smoking and alcohol consumption, the estimates of the effect of Medicaid on the incidence of low-birth weight appear to be unreasonably large given differences in prenatal care utilization.

Our second approach to address the selection issue is to separate the sample by timing of prenatal care. We use two samples: women who initiated care in the first trimester, and women who initiated care in the third trimester. Medicaid and private insurance can affect birth outcomes only through the quantity and quality of prenatal care. Thus, grouping women according to when they began prenatal care, and implicitly by the number of prenatal care visits, reduces the extent to which Medicaid and private insurance can influence birth outcomes. Accordingly, we would expect the effect of Medicaid and private insurance to be smaller

among these samples than among the full sample. Estimates from these specifications are found in columns 3 and 4 of Tables 2 and 3.

In Table 2, estimates of the effect of Medicaid and private insurance on birth weight and the incidence of low-birth weight in columns 3 and 4 are smaller than estimates in columns 1 and 2. For example, among black women who began prenatal care at the same time, those covered by Medicaid had infants approximately 54 to 60 grams heavier than uninsured women, and the incidence of low-birth weight for Medicaid women was 2.4 to 3.0 percentage points lower than it was for uninsured women. The estimates of the effect of Medicaid in columns 3 and 4 are between 21 and 46 percent smaller than estimates in columns 1 and 2 of Table 2. For private insurance the estimates in columns 3 and 4 are between 2 and 53 percent smaller than those in columns 1 and 2. These results suggest that there is a dose-response relationship between prenatal care and birth outcomes since the difference in the number of prenatal care visits are smaller in the samples used in columns 3 and 4 than in the full sample (see Tables 1 and 4). A dose-response relationship is consistent with there being a true effect of Medicaid and private insurance since insurance coverage affects birth outcomes through prenatal care.

The estimates in columns 3 and 4 of Table 2 also suggest, however, that there are significant selection effects since the number of prenatal care visits are quite similar in the samples of women who start prenatal care at the same time. Among black women who started care in the first trimester, those covered by Medicaid had 0.18 more visits on average than uninsured women, and among black women who started prenatal care in the third trimester, those covered by Medicaid had 0.44 **less** prenatal care visits (see Table 4). Thus, it is surprising to find significant differences in birth weight and the incidence of low-birth weight between black women covered by Medicaid and black women who were uninsured. There

may be unobserved quality differences in prenatal care, but it is more likely that a significant portion of the estimates of the effect of Medicaid in columns 3 and 4 represent selection effects.

Larger differences in prenatal care utilization are found between privately insured black women and uninsured black women. In both the first trimester and third trimester samples, privately insured black women had approximately one more prenatal care visit than uninsured black women. This figure is still much smaller than the 2.78 difference observed for the full sample of black women. Thus, it is reasonable to assume that some portion of the estimates in columns 3 and 4 of the effect of private insurance represent selection effects.

For the white sample, the estimates in columns 3 and 4 of Table 3 are with one exception smaller than estimates in columns 1 and 2, although the differences are not great. For example, the largest decline is the 31 percent reduction in the estimate of the effect of Medicaid on the incidence of low-birth weight between columns 1 and 3. These results suggest that there is a much weaker dose-response relationship and a larger selection effect among the white sample than the black sample. As expected, the number of prenatal care visits among white women who began care at the same time do not differ substantially by insurance status. In these samples, white women covered by Medicaid had between 0.10 and 0.49 more visits than uninsured white women, and privately insured white women had between 0.68 and 1.05 more visits than uninsured white women.

The last method we use to address the selection problem is instrumental variables (IV). We use cross-sectional and time variation in the number of HealthStart prenatal care providers in a woman's city of residence, a year dummy variable, county dummy variables and county-year interaction terms to instrument for Medicaid and private insurance status. The results from this analysis are listed in columns 5 of Tables 2 and 3.

In both Tables 2 and 3, the IV estimates in column 5 tend to be very large and to have correspondingly large standard errors. This is a commonly observed problem with IV that is usually the result of having weak instruments in the sense that the instrument set does not predict the endogenous variable very well. We tested the significance of the instrument set in the first stage regressions, and in all cases they were highly significant. Based on the magnitude of the estimates and the standard errors, however, we believe that the IV estimates should be discounted.

Conclusions

The estimates of the effect of Medicaid and private insurance presented in Tables 2 and 3 appear to indicate that both types of health insurance coverage improve birth outcomes, and are a particularly important factor affecting the incidence of low-birth weight. Upon further evaluation, however, the estimates reveal that Medicaid and private insurance coverage are associated with significant decreases in the incidence of low-birth weight even when there are very small differences in prenatal care utilization. This fundamental paradox suggests that part of the observed association between health insurance coverage and low-birth weight may be due to unobserved factors that affect both insurance status and birth outcomes.

An important question is how much of the observed effect is selection and how much is a true effect. We address this issue in the following way with regard to Medicaid. First, we assume that the providers chosen by uninsured women are of the same quality as providers chosen by women covered by Medicaid. Indeed, evidence from the National Maternal and Infant Health Survey suggest that they are probably the same providers.[17] We also note that women on Medicaid and uninsured women have approximately the same number of prenatal

care visits once the timing of prenatal care is considered. Based on these considerations, we interpret the estimates in columns 3 and 4 of Tables 2 and 3 as estimates of the selection effect for Medicaid recipients. Accordingly we subtract the estimates in columns 3 and 4 from those in columns 1 and 2 to derive what we consider an approximate estimate of the true effect of Medicaid on birth outcomes. These calculations yield estimates of the effect of Medicaid on birth weight of between 36.0 and 46.8 grams for black women and between -6.5 and 29.2 grams for white women. Similar calculations yield estimates of the effect of Medicaid on the incidence of low-birth weight of between 0.8 and 1.8 percentage points for black women and 0.3 and 0.8 percentage points for white women. All of these estimates are relatively small, and for the white population of little practical importance. The largest estimate pertains to the black sample and the incidence of low-birth weight. In this case, Medicaid reduces the incidence of low-birth weight by between 5 and 10 percent.

In the case of private insurance, developing an estimate of the true effect of insurance on birth outcomes is more difficult because women who are privately insured have approximately one more prenatal care visit than do uninsured women even after controlling for the timing of care. Thus, it may not be appropriate to assume that estimates of the effect of private insurance on birth outcomes in columns 3 and 4 of Tables 2 and 3 represent pure selection effects. Some portion of these estimates may be a true effect, but exactly how much is not known. For the current exercise, we assume that 50 percent of the estimate represents the effects of selection, and we subtract this portion of the estimates in columns 3 and 4 from the estimates in columns 1 and 2. For birth weight, this yields an estimate of the true effect of private insurance of between 65.6 and 118.9 grams for black women, and 54.2 and 79.3 grams for white women. A similar calculation for the incidence of low-birth weight results in an estimate of between 2.8

and 4.9 percentage points for black women and 1.4 and 2.1 percentage points for white women. The estimates of the effect of private insurance on the incidence of low-birth weight are relatively large for both black and white women. For black women, private insurance reduces the incidence of low-birth weight by between 16 and 27 percent, and for white women private insurance reduces the incidence of low-birth weight by between 15 and 23 percent.

In summary, we believe that the evidence we have presented suggests that Medicaid participation has little effect on average birth weight and a small positive effect on the incidence of low-birth weight for black women. For black women, Medicaid participation reduces the incidence of low-birth weight by between 5 and 10 percent. Similarly, we believe that the evidence presented also leads to the conclusion that private insurance has little effect on average birth weight, and reduces the incidence of low-birth weight by between 15 and 25 percent for black and white women.

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