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Restrictions on Medicaid Funding for Abortions: A Literature Review

Stanley K. Henshaw, Theodore J. Joyce, Amanda Dennis, Lawrence B. Finer and Kelly Blanchard

HIGHLIGHTS

- The Hyde Amendment bans the use of federal Medicaid funds for abortions except in cases of life endangerment, rape or incest. In addition, as of 2008, 32 states and the District of Columbia had prohibited the use of their state Medicaid funds for abortions except in the limited cases allowed under the Amendment.
- A literature search identified 38 studies of the impact of these laws on a range of outcomes.
- Approximately one-fourth of women who would have Medicaid-funded abortions instead give birth when this funding is unavailable.
- Medicaid restrictions lead to a reduction in the proportion of teenage pregnancies that end in abortion, but the long-term effect on the birthrate is less clear.
- Such restrictions appear to delay some women having abortions by 2–3 weeks and Medicaid-eligible women having first-trimester abortions by a few days on average; the net impact on second-trimester procedures is unclear.
- Studies have found little evidence that lack of Medicaid funding has resulted in illegal abortions, although one death was directly related to the restrictions and two were indirectly related.
- Studies of the impact of Medicaid restrictions on other outcomes—sexual behavior, prematurity, low birth weight, fatal injuries to children, late or no prenatal care, suicide and number of abortion providers—suffer from methodological limitations and are inconclusive, although there is some evidence of adverse effects on child health.
- The additional public cost of prenatal care, delivery services and welfare totals 4–5 times the amount saved by not paying for Medicaid abortions.
- Many studies were limited by the weakness of data sources and inability to control for unmeasured factors that influence trends in abortion rates and birthrates. Although short-term impacts of Medicaid restrictions have been demonstrated, the long-term impact is less clear and difficult to measure.

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Background

After abortion became legal nationally in the United States as a result of the *Roe v. Wade* decision, medically necessary abortions were covered in all or most states under Medicaid, the joint federal and state health insurance program for eligible low-income families. In 1976, Congress passed the Hyde Amendment, which bans federal funding of abortion in all but the most extreme circumstances. Named after longtime Rep. Henry Hyde (R-IL), who retired in 2006, the first version of the Hyde Amendment forbade the expenditure of federal funds for abortion services except in cases where the continuation of the pregnancy threatened the woman's life, under all programs administered by the Department of Health, Education and Welfare (now the Department of Health and Human Services). The measure primarily affected Medicaid (Title XIX of the Social Security Act).

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Congress has renewed the Hyde Amendment every year since, albeit with some modifications. The current version of the Amendment, established in 1997, allows federal funding for abortion in cases of rape and incest, as well as life endangerment, but tightens the life exception to permit payment only when the woman's life is threatened by a "physical disorder, physical injury, or physical illness, including a life-endangering physical condition caused by or arising from the pregnancy itself."

At least at the federal level, challenges to the legality of the Hyde Amendment were put to rest more than 20 years ago. In June 1980, the Supreme Court held in *Harris v. McRae* that under the U.S. Constitution, the federal and state governments have no obligation to provide funds for the exercise of the right to abortion even when they pay for prenatal and maternity care for poor women. The federal government could choose to "encourage childbirth over abortion" by paying for the former and not the latter—even if, as Justice Potter Stewart suggested in the Court's majority opinion, to do so might not be "wise social policy."

At the state level, the issue has been somewhat more fluid. Currently, 17 states* have a policy to use their own funds to pay for all or most medically necessary abortions (those necessary to protect a woman's health) sought by Medicaid recipients[1]—a list that has fluctuated slightly over the past 25 years. Of these states, four (Hawaii, Maryland, New York and Washington) adopted such a policy voluntarily. The remainder were ordered to do so by their courts under their individual state constitutions. In addition, the policy of 32 states† and the District of Columbia is to pay for abortions only in those circumstances permitted under the federal Hyde Amendment, and one state (South Dakota) is in violation of federal Medicaid law because it pays for abortions only in cases of life endangerment.

Over the years, researchers have studied various possible impacts of funding restrictions, including changes in the number or rate of abortions, births and pregnancies; delayed timing of abortions; resort to illegal abortions (ones not performed by a physician); an increase in complications after an illegal abortion; the consequences for women of having to raise money to pay for an abortion; changes in sexual behavior, suicide rates and the availability of abortion services; and the potential public costs or savings.

This report assesses the strengths and weaknesses of each study and draws conclusions based on the most reliable research. To frame the discussion, we first present an overview of the methodological challenges facing

*Alaska, Arizona, California, Connecticut, Hawaii, Illinois, Maryland, Massachusetts, Minnesota, Montana, New Jersey, New Mexico, New York, Oregon, Vermont, Washington and West Virginia.

†Alabama, Arkansas, Colorado, Delaware, Florida, Georgia, Idaho, Indiana, Iowa, Kansas, Kentucky, Louisiana, Maine, Michigan, Mississippi, Missouri, Nebraska, Nevada, New Hampshire, North Carolina, North Dakota, Ohio, Oklahoma, Pennsylvania, Rhode Island, South Carolina, Tennessee, Texas, Utah, Virginia, Wisconsin and Wyoming.

researchers who analyze the impact of Medicaid restrictions. This includes a discussion of the expected outcomes, strengths and limitations of the data, and efforts to reduce the effect of unknown or uncontrolled influences. We review the data by first looking at the reproductive outcomes evaluated from a national perspective, in which researchers used data from all or most states or from population surveys. Research addressing the impact among all women of reproductive age and among minors specifically is discussed. Next, we critique literature that examines reproductive outcomes in groups of states, in single states and finally, in cities and individual clinics. We examine the literature within these sets chronologically. We then review the literature that focuses on infant health outcomes, sexual behavior, suicide rates and economic impact.

Methods

We conducted a search of literature published between 1979 and 2008 and identified studies on the impact of Medicaid funding laws. We used four search engines: Google Scholar, PubMed, Popline and Web of Science. In Google Scholar and PubMed, we limited our search to English-language reports. In Popline, we imposed no restrictions on types of articles searched. In the Web of Science, we searched all databases with reports from 1900, restricting results to those in English. The search terms used were "abortion AND Medicaid."

We initially scanned the titles of the articles returned from the database searches and eliminated ones that were obviously not relevant. We then collected and reviewed abstracts of the remaining articles in order to identify those that were eligible for inclusion in the review. We selected articles that were published in English, focused on the United States, demonstrated original research and provided details on the impact of restrictions on the use of Medicaid funds for abortion. We carefully examined the citations in the articles selected in order to identify additional papers to be considered for inclusion in the review. We also consulted with experts in the field.

After collecting and reviewing the articles, we evaluated each study on five measures of quality. Our first measure assessed the reasonableness of the assumptions built into the study's statistical model. Second, we determined if the population(s) of interest and the outcome(s) of interest were accurately measured. Third, we assessed whether the researchers adequately controlled for possible confounding variables. Fourth, we considered the adequacy of the statistical methods, with attention to the robustness of the results. The reliability of statistical approaches was assessed by comparing the results of studies using the same methods. Finally, we considered longitudinal studies to be preferable to cross-sectional ones because the former control for unmeasured state characteristics that are constant over time. We provide brief discussions of the quality, strengths and weaknesses of each study reviewed.

Our search of the four databases yielded 436 possible articles for this review. We eliminated 413 because they were not relevant, did not present original research or repeated an analysis included in another paper. We identified 15 additional studies through citation reviews and expert interviews. In all, 38 studies, shown in Table 1, were included in the review.

Methodological Challenges in Assessing the Impact of Medicaid Funding Restrictions on Abortion

Data limitations present a major challenge for evaluators of the impact of Medicaid funding restrictions on the number of abortions. A straightforward strategy would be to compare abortion rates and birthrates of Medicaid-eligible women with those of women just above the income eligibility threshold for Medicaid both before and after a funding restriction was put into place. A similar comparison could be made in states without funding restrictions. Contrasts across the two types of states and eligibility groups would provide an estimate of the funding restriction's impact on Medicaid-eligible women adjusted for ongoing trends in reproductive choices among poor and near-poor women. Unfortunately, for most states and years, neither the number of abortions provided to women just above the Medicaid income threshold nor the number of Medicaid-eligible women of reproductive age in the population is available.

A less convincing design is to measure trends in the abortion rates of all women or of those most likely to qualify for Medicaid. To this end, researchers can use several sources of data, although each data set has certain strengths and weaknesses. One major source of data is the Guttmacher Institute. The Institute's periodic survey of abortion providers yields the most widely accepted estimate of the number of abortions by state of occurrence; however, these data are not collected by characteristics of the patients.[2] For most years, the Institute also estimates the number of abortions obtained by residents of each state. Since state Medicaid programs pay only for services for residents of the state, the abortion rate of residents is most relevant for studies of Medicaid policy. Studies using abortion rates by state of residence are more credible than those based on state of occurrence.

A second major source of data is the series of annual abortion surveillance reports published by the Centers for Disease Control and Prevention (CDC). The CDC collects data from state health departments and reports abortions by state, year and several demographic factors: age, race, marital status, gestational age, type of procedure, parity and previous induced abortions. This would appear to be an improvement over the Guttmacher data, except that the total number of abortions as reported by the CDC is approximately 15% lower than that reported by the Guttmacher Institute, and the degree of undercounting varies substantially by state.[3] Further, not all states report abortions to the CDC; California, a populous state, is a notable example. Finally, the limited cross-tabulation of the data available from the CDC prevents analyses by age and race or by race and marital status, two stratifications that would be useful in an analysis of Medicaid financing restrictions.

The third major source of data is state health departments. The CDC uses tabulations provided by the states of these same data in its surveillance reports. The major advantage is that they contain data on individual procedures, if the state is willing to release them. Individual-level data allow for a more refined aggregation than is available using the CDC reports. With these data, researchers could compare, in principle, changes in abortion rates of young and less educated women in an effort to broadly identify women most likely to be eligible for Medicaid. Often, however, the proxies for socioeconomic status, such as completed schooling, are poorly reported in these files.[4]

Because of the limitations of population-based abortion data, researchers have evaluated the effect of Medicaid financing restrictions on births and abortions by using a fourth data source, information from surveys of women. Surveys have detailed information on income, education, marital status and family composition that enable researchers to more accurately assess Medicaid eligibility. Their greatest drawback, however, is that women are reluctant to report induced abortions. Women in surveys underreport abortions by as much as 60% when their reports are compared with Guttmacher's national data, and underreporting tends to be worse among women more likely to be eligible for Medicaid.[5] In addition, most analyses based on surveys are essentially cross-sectional because sample sizes are inadequate to assess the effect in specific states before and after a policy change. In sum, the lack of adequate data from any of these sources is a discouraging aspect to investigating the impact of Medicaid restrictions.

On a positive note, research on the impact of Medicaid funding restrictions is unlikely to be confounded by out-of-state travel, a factor affecting research on the impact

of other restrictions such as parental involvement laws or mandatory counseling and waiting period statutes.* Medicaid recipients have no incentive to go out of state for an abortion in an effort to bypass the state's funding restriction. The state Medicaid system in New York, for example, will not cover an abortion for a woman who is enrolled in Pennsylvania's Medicaid program. In other words, the imposition of a funding restriction on abortions in Pennsylvania in 1985, for example, should not have encouraged Medicaid recipients there to seek abortion in a nearby state. The only exception is if women who would have had Medicaid abortions in Pennsylvania turned to a neighboring state for less expensive (self-paid) services. Therefore, lack of data on women who cross state lines to have their procedures is likely to be a minor source of bias, unlike the case when evaluating the impact of parental involvement laws or mandatory counseling and waiting period laws.

Another area of uncertainty is the classification of states according to their Medicaid abortion funding policies. No studies have dealt explicitly with the problem of states wherein policies differ from practice. For example, Medicaid theoretically covered abortion in almost all states for most of 1980, but many states actually reimbursed providers for few or no abortions.[6] Similarly, in 2001, Idaho, Illinois, Indiana and Montana were under court order to pay for most or all medically necessary abortions, but in fact paid for none or almost none.[7] It would seem that an evaluation of the effect of Medicaid abortion funding should count these states as restrictive, but as far as can be determined, all but two studies[8,9] treated them as states that fund abortions.

The most common research design in the evaluation of Medicaid funding restrictions involves a multivariate regression of annual state abortion rates on an indicator of whether the state financed Medicaid abortions. Such regressions typically include indicator variables for each state and year, often referred to as state and year fixed effects.† The advantage of using a panel of states over time is that variation in the timing of Medicaid funding restrictions increases the statistical power of the analysis to distinguish effects of the policy from ongoing changes in abortion rates and birthrates due to other factors.

However, the aggregate nature of the data and the timing of the restrictions greatly diminish the statistical power of this design. One challenge is that state data on abortion rates pertain to all women. Yet women eligible for Medicaid comprise a relatively small proportion of all women, and this was especially so in the early 1980s. This fact makes it difficult to distinguish changes in the total abortion rate due to changes among Medicaid-eligible women from changes resulting from factors that affected all women.

A second challenge is the limited variation in the imposition of Medicaid funding restrictions across states and over time. Essentially all states funded abortions for Medicaid-eligible women between 1973 and August 1977. During enforcement of the Hyde Amendment between August 1977 and February 1980, only 14 states funded abortions to Medicaid recipients without interruption.[10] The Amendment was enjoined from February 1980 to September 1980, during which time federal Medicaid funding was once again available. However, not all states took advantage of the availability of matching federal funds. As a result, the actual number of publicly funded abortions during this period in states that had not provided funding between August 1977 and February 1980 was substantial in only a few of the states.[6] Thus, a good argument can be made that Medicaid funding for abortions became unavailable after August 1977 in 34 states, with some exceptions in 1980 and a few additions during the 1980s.

The lack of variation in the timing of Medicaid financing restrictions limits an analysis across 50 states to essentially a before-and-after design with a group of experimental states (states restricting funding) and comparison states (states not restricting funding). This is often referred to as a difference-in-differences analysis. As straightforward as this design appears, it rests critically on the credibility of the comparison group. Both the pre-restriction level of and trend in the abortion rate of women in experimental states should be as similar as possible to those in the comparison states. Differences in both rate and trend would suggest potential confounding factors. However, Medicaid financing restrictions are not randomly assigned across states: They are concentrated in states that are politically more conservative and more likely to impose other measures to limit access to abortion. Thus, California, New Jersey, New York, Oregon and Washington fund abortions to women on Medicaid, whereas most states in the South and Midwest do not. This raises the difficult

*Dennis et al. present a detailed overview of the methodological challenges associated with the evaluation of parental involvement laws, and Joyce et al. present a detailed overview of the methodological challenges associated with the evaluation of mandatory counseling and waiting period laws (sources: Dennis A et al., *The Impact of Laws Requiring Parental Involvement for Abortion: A Literature Review,* New York: Guttmacher Institute, 2009 and Joyce T et al., *The Impact of State Mandatory Counseling and Waiting Period Laws on Abortion: A Literature Review,* New York: Guttmacher Institute, 2009).

†State fixed effects are used to control for unmeasured state characteristics. Year fixed effects are used to control for unobserved differences in abortion rates that are common across all states over time, such as the potential effect of national economic trends.

question of whether the change in abortion rates in the nonrestrictive states is a good counterfactual—a reasonable estimate of the change in the restrictive states that would have been observed had they not cut off Medicaid funding for abortions. Alternatively, it may be the case that abortion rates in restrictive states were falling or would have fallen even without the funding restriction because of a more negative climate toward abortion that had been intensifying over time. These are challenging issues that confront researchers in the evaluation of Medicaid financing restrictions.

In the end, the best research designs are the most transparent. Researchers should present data for the restricted and nonrestricted groups graphically so that readers can assess the prima facie credibility of the comparison group. Effort should be made to identify women most likely eligible for Medicaid so that changes in abortion rates and birthrates among these women after imposition of a funding restriction can be compared with changes among women unlikely to be eligible for Medicaid. Researchers should also discuss the plausibility of the magnitude of the estimated effects, especially when analyzing state-level abortion rates and birthrates. For instance, assume that only 20% of women in a state are eligible for Medicaid, and that researchers find that Medicaid financing restrictions are associated with a 10% decline in the abortion rate. This implies that abortion rates among Medicaid-eligible women fell by 50% (–0.10/0.20). This would appear to be an extremely large decrease, and it should force analysts to present additional evidence to support such a change. Another reason to focus on the magnitude of the estimates is because too often researchers concentrate on statistical significance. Recent econometric studies have shown that analysts tend to underestimate the variance of estimated regression coefficients when evaluating the impact of state policies.[11,12] As a result, analysts reject the null hypothesis of no association too often and incorrectly conclude there exists a significant association between state laws and reproductive outcomes. (In this review, the term *significant* specifically refers to statistically significant.) The combination of simple plots, well-defined experimental and comparison groups, and thoughtful discussion as to the magnitude of the estimated effects can enhance the credibility and validity of study findings.

National-Level Studies of Reproductive Outcomes

Eighteen of the 38 articles in this review evaluated the impact of Medicaid restrictions on reproductive health behaviors among minors or all women using data from most or all states. The outcomes of interest included the abortion rate and ratio, gestational age at the time of an abortion, the pregnancy rate and the birthrate. National studies can be classified as those that analyzed the general policy determinants of abortion (including Medicaid restrictions as one determinant) and those that focused primarily on Medicaid restrictions.

Studies of Impact Among All Women of Childbearing Age

Hansen[13] conducted a path analysis* using state-level data to study the impact of Medicaid abortion funding on abortion rates in 1976. The analytical model included population demographic characteristics, legislative support for and religious opposition to abortion within a state, Medicaid expenditures on abortion, and the presence of medical facilities to perform abortions. The model was estimated using a series of regression equations. Hansen concluded that demographic factors such as race, poverty and religion explained very little of the variance in abortion rates between states. The path coefficient for Medicaid in the model was 0.43, which indicated that Medicaid expenditures for abortion were strongly positively related to abortion rates. However, the association virtually disappeared when controls for the population of the state were introduced, reflecting the fact that abortion rates are higher in populous states such as California and New York, which also have a high level of abortion funding.

A positive aspect of the study was the author's attempt to apply path analysis to capture the complicated interplay between factors related to state abortion rates. However, despite use of this approach, the study was still cross-sectional, and the author was unable to control for many variables associated with differences in state-level abortion rates. In addition, the author used Medicaid expenditures for abortion per 1,000 women of reproductive age as a measure of a state's abortion policy. This approach is confusing since there were periods during which all states theoretically paid for Medicaid abortions.

Haas-Wilson[14] analyzed data from 36 states to determine the effect that Medicaid restrictions had on abortion rates and on the availability of abortion providers. She calculated the 1987 abortion rates for all women and for minors using CDC data. She found that the abortion rate was 16.4 per 1,000 women of reproductive age in states that restricted Medicaid funding for abortions, compared with 24.1 in states that did not. She found similar differences among minors and for the ratio of births to pregnancies.

The major shortcoming of this study is the cross-sectional design, which should not be used to draw causal interpretations. Abortion rates differ between states for many reasons—socioeconomic factors, demographics, religiosity and political sentiment, to name a few—and there were no statistical controls for such differences. As a result, differences in abortion rates that the researcher attributed to differences in Medicaid financing restrictions likely reflect other differences between the states. Another weakness of the study is the use of CDC data, which underreport abortions.

Wetstein[15] analyzed the national trend in the ratio of abortions to births to see whether discontinuities in these measures occurred with policy changes, specifically *Roe v. Wade* in 1973 and the Hyde Amendment in 1978, the first full year of its impact. No discontinuity was found in either year. In 1978, a long-term increase in the abortion ratio continued. However, the study is essentially a pre-post analysis at the national level with no comparison group. Moreover, the proportion of women nationally affected by the funding cutoff was relatively small considering that California, New York and other states with high abortion rates continued to fund Medicaid abortions, and the discontinuity in 1978 would have been diluted because 1977 was also affected as of August 4. The author correctly concluded that the effect of policy changes is best studied at the state level.

Meier and McFarlane[8] conducted a pooled time-series analysis with partial fixed state effects using data from all states for 1982–1988. The outcome variables were the abortion rate among all women and the birthrate among

*A path analysis is a means of estimating models in which numerous variables are determined simultaneously.

teenagers. The researchers used the rate of publicly funded abortions per 1,000 women in the state as the independent variable rather than using a variable indicating the official state policy on Medicaid funding for abortions. They controlled for socioeconomic variables including race and ethnicity, income, state family planning expenditures and access to abortion providers. The researchers found that restricting Medicaid abortion funding was associated with a 42% decrease in the number of abortions that would have been funded through the program. Medicaid restrictions were also associated with an increase in the teenage birthrate.

The authors acknowledged that the possibility that state-level factors other than Medicaid restrictions may have affected overall abortion rates. The use of the Medicaid funding rate may introduce a spurious correlation in that states with a high abortion rate are likely to have a high rate of Medicaid-funded abortions. Fixed effects of some but not all states were controlled, and there were no controls for state-specific trends in the abortion rate. Because Medicaid funding changed in only three states between 1982 and 1988, the study was to a large extent a comparison of states with and without Medicaid abortion funding and was vulnerable to confounding from hard-to-measure differences between the two groups of states.

Currie et al.[16] used individual-level data for 1980–1989 from the National Longitudinal Survey of Youth (NLSY) to examine the probability that a pregnancy would be carried to term in states with Medicaid restrictions compared with states without them. (They also examined infant health outcomes, as discussed in a later section of this review.) The researchers combined the NLSY data with state- and county-level information from other sources. They tabulated results separately for whites, Hispanics and African Americans and for low-income and high-income women. The regression analyses controlled for both community variables (availability of medical facilities, proportion of births to unmarried women) and individual variables (age, religion and other demographic characteristics). The study's results indicated that restricting Medicaid funding for abortions was associated with a significant increase in the probability of a pregnancy being carried to term—by 3% for white women and 10% for their African American peers, and by 4% for high-income women and 5% for their low-income peers. The authors further examined whether the effects of restrictions differed according to their legal status (enforced vs. enjoined). They found that among African American and low-income women, enforced restrictive laws led to an increase in the probability of birth when compared with enjoined ones, which had no effect. Among white and high-income women, enjoined laws had no significant effect, but their effect was not significantly less than that of enforced laws. When the number of available abortion providers was removed from the model, enforced laws were associated with an increase in the birth probability and enjoined laws were not in all racial and income groups, although the coefficients for African American and low-income women were higher than those for their white and high-income counterparts. The authors concluded that restrictive laws may increase birth probabilities among white and high-income women indirectly by reducing the number of abortion providers.

The study has several limitations. First, abortions are underreported in all surveys, including the NLSY. Moreover, underreporting is greater among minorities and the poor.[5] Second, given the nature of the data, the authors were unable to control for state fixed effects; thus, they are using cross-state variation to identify effects of the law. Third, key falsification tests fail. For instance, Currie et al. also found that enjoined laws were associated with a significant reduction in birth weight, especially among high-income women, whereas enforced laws were not. In addition, enforced funding restrictions led to increases in the birth probability of four percentage points among high-income women and five percentage points among low-income women. The authors speculate that the restrictions may have decreased the number of abortion providers in the state, which in turn affected all women. However, they could have tested this directly by simply regressing the number of abortion providers per capita on the state's Medicaid restriction status. Indeed, Blank et al.[17] (discussed below) regressed the number of abortion providers per state on an indicator of Medicaid financing restrictions and found no association.

Using the abortion rates of 49 states and the District of Columbia published by the Guttmacher Institute for 1974–1988, Blank et al.[17] estimated the impact of Medicaid funding restrictions on abortion rates of all women (not just low-income women) by using a multivariate regression model with state and year fixed effects. They included many variables in their estimation equation to control for a range of factors that might influence abortion rates. They also attempted to address the simultaneous relationship between abortion rates and the number of abortion providers, the latter of which they estimated using an instrumental variables approach.*

The researchers found that the inclusion of state and year fixed effects had a significant impact on their results and often diminished the explanatory power of the economic or demographic variables in their model. They concluded that enforced Medicaid funding restrictions are associated with a 3% or 5% decline in the abortion rate

of state residents, depending on the estimation method, relative to the rate in states without restrictions. Neither estimate was significant, however. Enjoined restrictions were associated with a 6% increase in abortion rates. Abortion rates according to state of occurrence were reduced by 13% when restrictions were enforced and by 6% when they were enjoined. The authors hypothesized that, given the effect of nonenforced restrictions in their models, there are other omitted variables that are correlated with the implementation of Medicaid funding restrictions such as availability of abortion providers or cultural changes occurring at the state level, or both. However, in a regression analysis reported in the article's appendix, a state's policy on Medicaid funding for abortions was not associated with the number of abortion providers. The authors speculated that women's perceptions about the availability of abortion or increased public opposition to the procedure may play, if not a causal role, then a concurrent role in the reduction in abortion rates seen after the enactment of funding restrictions, but they provide no evidence to support this suggestion. The researchers note that they could look at the impact of the laws on aggregate abortion rates only and were unable to directly determine how the results apply to the Medicaid-eligible population.

This study had two strengths: It covered the period before restrictions took effect and it controlled for state and year fixed effects. Although the decline in the resident abortion rate of 3–5% was not significant, this finding plus the increased abortion rate associated with enjoined laws lends support to the hypothesis that Medicaid funding restrictions reduce the abortion rate of low-income women. However, the finding that such restrictions were strongly associated with abortions by state of occurrence (compared with state of residence) is hard to explain. In addition, the attempt to correct for the simultaneous determination of abortion rates and abortion providers was not successful, as indicated by the lack of robust findings. Nevertheless, to the authors' credit, they presented a wide range of findings even if the findings tended to contradict their basic theory.

Meier et al.[9] used a pooled time-series design with data for all states for the years 1982–1992 to estimate the effect of 23 policies related to abortion. The rate of Medicaid-funded abortions, included as a control variable in the regression analyses, was significantly associated with the abortion rate. As in an earlier study,[8] the use of the Medicaid funding abortion rate may have introduced a spurious correlation in that states with a high abortion rate are likely to have a high rate of Medicaid-funded abortions. The authors also attempted to control for hard-to-measure state factors that affect abortion by including the lagged abortion rate (i.e., that of the previous year) in the regression analyses. Doing so was inappropriate because the lagged rate should be associated with changes in other variables rather than with their absolute values.†

Levine et al.[18] investigated whether state Medicaid restrictions affect the likelihood of getting pregnant, having an abortion and bearing a child. The authors analyzed abortion rates and birthrates in 50 states from 1977 through 1990 using a simple before-and-after design as well as multivariate regression models with state and year fixed effects. To account for trends within each state, they included interactions between a time trend and state fixed effects in some models.

The researchers found the abortion rate decreased in states where Medicaid restrictions were enacted by about 6% during 1977–1988; when state-specific trend variables were included, the decline was 3%, indicating that some of it was due to other factors. The effect of Medicaid restrictions on the birthrate varied across models. A significant reduction in birthrates was found using models that included state and year fixed effects, but the reduction was not significant when state-specific trends were added. In models that included only state and year fixed effects, funding restrictions appeared to significantly reduce births in the year after they were enacted, and this effect appeared to grow over time. The authors noted that the diverse results across the different models indicated that the impact on birthrates was dependent on the sta-

*The instrumental variables approach is a two-step procedure. Consider its use by Blank et al. In the first step, the authors regressed the number of abortion providers on a set of variables or "instruments" that are strongly correlated with abortion providers, but that are presumed to have no direct effect on abortion rates. In the second step, the natural logarithm of abortion rates was regressed on the *predicted* value of abortion providers obtained in the first stage. The authors used the total number of non–obstetrician-gynecologist physicians and the total number of hospitals in each state and year as instruments. The validity of the procedure rests critically on the assumption that the number of physicians and hospitals in a state has no association with abortion rates except through the number of abortion providers. This seems doubtful since states with large numbers of physicians and hospitals, such as California, Massachusetts, New Jersey and New York, tend to be states that use public funds for abortions to poor women. In other words, leaving these variables out of the abortion rate equation may not be appropriate.

†Including the lagged abortion rate on the right-hand side of the regression analysis is almost equivalent to regressing year-to-year changes in the abortion rate on a set of determinants. In this formulation, the authors are asserting that changes in the abortion rate are correlated with the level in the other determinants. This is difficult to justify; for example, how can a state's policy toward Medicaid-financed abortions in 1980 explain changes in the abortion rate between 1979 and 1980? If the authors wanted to analyze changes in abortion rate—a perfectly appropriate outcome—they should have regressed changes in the abortion rate on changes in Medicaid policy.

tistical adjustments; they concluded that birthrates either remain unchanged or fall slightly in response to funding restrictions on abortions.

Because they used state aggregate data, Levine et al. were unable to calculate abortion rates or birthrates for specific populations, such as Medicaid-eligible women. In an effort to refine the analysis, the researchers analyzed self-reported data from the NLSY to compare abortions and births among women living in states that allowed Medicaid funding for abortions in 1981 with those among women living in states that restricted such funding in that year. They then compared fertility behaviors among women whose family income was below the poverty line with those of the rest of the population. The authors acknowledged the limitations of using data from a survey that had been shown to have substantial underreporting of abortions. Since they could not use state fixed effects because of the limited sample size of women in each state and year, they included dummy variables for the nine census divisions. They found that restrictions had no significant impact on births for the overall population, but births for women in poverty fell relative to those of women whose family income was above the poverty line (this finding was significant at the $p<.10$ level). Additionally, they found that in relation to higher-income women, those in poverty appeared less likely to get pregnant in states with restrictions on abortion in effect. In sum, the NLSY data support the authors' initial aggregate-level findings that Medicaid restrictions had little impact on births, were associated with a reduction in the abortion rate and therefore must have led to a drop in the pregnancy rate. These effects were concentrated among women in poverty. The authors found that although both of their data sets had limitations, the relatively similar results obtained from them supported their conclusions.

The study by Levine et al. is widely cited. One of its strengths is that the authors present basic time-series plots of birthrates and abortion rates for states with and without restrictions on Medicaid-funded abortions. This allows readers to assess the comparability of the two groups. The transparency is important because Figures 2–4 reported in the article raise important questions about experimental design. First, the baseline abortion rate among the nonrestrictive (control) states was approximately 70% greater than that among the restrictive ("treatment") states. As Meyer[19] points out, large differences in the level of the outcome between a treatment group and a control group may reflect important differences that vary with time between the two groups.*

Second, there is no sharp discontinuity associated with the restriction. According to the authors, " … 27 states virtually immediately instituted definitive and enforceable Medicaid funding restrictions" by the beginning of 1981. Yet the abortion rate in the states that did so shows a smooth upward trend from 1977 to 1980 that just as smoothly returns to its 1977 level by 1985.

Third, the authors assume that Medicaid funding was available in the restrictive states during 1977–1980. But data from the Guttmacher Institute and the detailed analysis by Merz et al.[10] strongly suggest otherwise. There were approximately 70,000 publicly funded abortions in fiscal year 1977 in the 27 states that Levine et al. coded as having first restricted funding in 1981, but in fiscal year 1979, 16 of these states funded fewer than 20 abortions each, six funded 20–60 of them and only two funded more than 60. The number funded in the remaining three states is unknown, but none of those states funded as many as 20 abortions in fiscal year 1978 (as shown by Henshaw et al.[20(Table VIII-1)]). This introduces a potentially important source of misclassification that would tend to bias the estimates of Levine et al. toward the null of no effect. The authors contend that the uncertainty as to funding between 1977 and 1980 would have made it difficult for women on Medicaid to predict whether public funding would be available. Why this reasoning should lead them to code these years as a pre-restrictive period in these 27 states is unclear. The misclassification of states could account for the lack of a clear difference in the trend between 1977 and 1981 in the abortion rates of the restrictive and nonrestrictive states.

Fourth, the authors estimate that the fall in the birthrates after the funding restriction was roughly equal to or greater than the fall in the abortion rate. This is particularly evident in their analysis with the NLSY data (see Table 7 in the article). This implies strong behavioral responses to the restriction even among women whose decisions regarding abortion and birth would not have changed had funding remained in place. For instance, assume that Medicaid funding restrictions reduce the abortion rate by one per 1,000 women 15–44 years of age. If all these women carry to term, the birthrate should increase by approximately one per 1,000. If all these women avoid pregnancy in response to the restriction, then the birthrate will remain unchanged. However, in order for the birthrate to fall by more than one per 1,000, as reported by Levine et al., an even larger segment of the Medicaid-eligible population who would have given birth had Medicaid funding for abortions *not* been restricted must have also

*In the literature on evaluating research, a key assumption is that the "treatment," in this case the Medicaid funding restriction, should be uncorrelated with the baseline level of the outcome in the treatment and control groups, in this case states that did and did not impose funding restrictions. This is clearly violated in Figure 2 of the article.

decided to avoid pregnancy.* Such behavior is difficult to document, and the reduction in the birthrate is implausibly large. A simpler explanation is that the negative association between Medicaid funding restrictions and birthrates is spurious because of inadequate control for hard-to-measure factors, incorrect coding of Medicaid funding status and inadequate comparison states.

Unlike other analyses at the state level, the analysis of Levine et al. also used individual-level data from the NLSY to confirm the results obtained with aggregate data. Although this survey grossly underreports abortion, it contains a rich set of controls, including household income. Thus, the authors were able to assess the effect of Medicaid funding restrictions on both poor and nonpoor women. There should be little effect on the latter group since Medicaid in the 1970s and 1980 was tightly linked to welfare participation through the Aid to Families with Dependent Children (AFDC) program. The income eligibility thresholds for this program were often well below the federal poverty level, especially in the states that restricted Medicaid funding of abortions.

Levine et al. found that Medicaid funding restrictions lowered the abortion rate for poor relative to nonpoor women, but the difference was not significant. However, among poor women, the decline in birthrates was more than three times greater than the fall in abortion rates. As noted above, this is very difficult to explain. Finally, the authors did not use state fixed effects because the number of women for each combination of state and year was too small. This is a considerable limitation since there are no controls for differences between funding and nonfunding states. Based on the large differences in abortion rates and birthrates between states that restricted Medicaid funding and those that did not (see Figures 2 and 3 in the paper), cross-state comparisons are vulnerable to confounding.

In sum, the findings of Levine et al.[18] are consistent with those of Blank et al.[17] and Matthews et al.[22] (discussed below). In each study, Medicaid financing restrictions were associated with a decline in the abortion rate of 3–5%, although estimates were not significant in numerous models. The study by Levine et al. also suggests that birthrates are not increased by Medicaid restrictions, and in fact may fall, but the power of the time-series analysis is insufficient to detect the small effect that might be expected. Furthermore, the notion that birthrates would fall more than abortion rates after the cutoff of publicly funded abortions lacks convincing evidence. Given the questionable coding of when the Medicaid funding restriction effectively began, the decline in birthrates is likely spurious.

Haas-Wilson[23] examined national changes in abortion rates and birthrates during 1978–1992 (excluding 1983, 1986, 1989 and 1990†) using a multivariate analysis of pooled time-series data (including measures of state and year fixed effects) in order to determine the impact of Medicaid funding restrictions during a period when six states changed their policies. She used a framework that postulated that abortion rates and birthrates are "a function of the determinants of the optimal number of children (such as family income, marital status and employment status), the cost of contraception and the cost of abortion." To control for unmeasured state-specific factors that may impact abortion rates and birthrates and vary over time, she included measures of general state-level attitudes toward women (including the proportion of state legislators that are women) and toward nonmarital sex and abortion (the proportion of the year in which a parental involvement law was enforced and the proportion of the year in which such a law was enacted but not enforced). She used the proportion of the population living below the poverty line as an approximation for the Medicaid-eligible population. Finally, the number of abortion providers per 1,000 women of childbearing age was included to account for the differences across states and over time in the costs and time involved in traveling to obtain an abortion. Most models included a factor for state-specific linear time trends.

In all models, the absence of Medicaid funding was associated with either no change or a significant reduction in the abortion rate of 2% or less. Similarly, no effect on the birthrate was found. When the supply of abortion providers and demographic characteristics of the state population were included in the model, the differences between funding and nonfunding states were no longer significant. Inclusion of measures of overall state-level attitudes did not alter the results. The author concluded that women's reproductive decisions are not significantly influenced by abortion funding restrictions and theorized that the lack of effect may be due to reduced-cost abortions available to some low-income women through abortion funds or other loans. Further, she found that the magnitude of the

*Levine and Staiger contend that women use abortion as an "option" with which to evaluate a partner's potential to be a father and support a family (source: reference 21). Many of these women go on to give birth. When the price of abortion rises, this option becomes too expensive. Women who would have given birth when abortion was relatively inexpensive instead avoid pregnancy altogether. Evidence for such behavior is the decline in birthrates as the cost of abortion rises. The results presented by Levine et al. imply that such behavior is so prevalent that it dominates the first-order effect of fewer abortions leading to more births (source: reference 18).

†The Guttmacher Institute did not conduct surveys in those years, rendering the number of abortions and abortion providers unavailable.

effect of the restriction decreased gradually over time after the immediate effect of enforcing the restriction. She concluded that this was due to Medicaid-eligible women being prepared and able to find alternate sources of funding (such as abortion funds or family/friends) and not due to changes in sexual or contraceptive behavior.

An important limitation of the study is the lack of variation in the Medicaid funding of abortions. The study period included the years 1978–1992. As noted before, however, the vast majority of states that decided not to fund abortions for Medicaid-eligible women effectively made that decision before 1978. Between 1978 and 1988, only three states had several years with and without funding restrictions, eleven states had only a fraction of a year without restrictions in 1978–1979, and two states funded abortions except for short periods in 1978–1981. The analysis, therefore, lacks experimental variation with which to identify effects of the funding restriction. This may explain the lack of any decline in the abortion rate associated with the Medicaid policy.

Matthews et al.[22] used state-level data from the Guttmacher Institute and national vital statistics for the years 1978–1988 to analyze the social and economic determinants of abortion rates and birthrates of women aged 15–44. They included Medicaid funding restrictions as one policy variable and examined abortion rates and birthrates in regression analyses incorporating state and year fixed effects. The authors found that Medicaid funding restrictions were sensitive to the inclusion of state-specific trends. Without state trends, these restrictions were associated with a 6% decline in state abortion rates ($p<.05$), but with their inclusion, a nonsignificant 3% decline was found. The same pattern emerged for birthrates. Without state trends, Medicaid financing restrictions were associated with a 2% decline in state birthrates, but with these trends, this estimate fell to less than a 1% decline; neither estimate was significant.

This study is appealing for its straightforward approach. The authors used abortions by state of residence instead of by state of occurrence, and they controlled for a large set of state characteristics. They also analyzed birthrates. Additionally, they showed results with and without state-specific trends, and they did not try to oversell marginally significant estimates. However, as with the studies by Haas-Wilson[23] and Levine et al.,[18] there was limited variation in the Medicaid funding measure over the study period. In models with state and year fixed effects, the impact of the Medicaid policy was estimated from correlations between abortion rates and the funding restriction within each state. If only a few states experience a change in policy and if the change is in effect for only a short time, then it is very difficult to credibly estimate the impact of the funding restriction. In the end, their estimates are very close to those from Blank et al.[17] and Levine et al.[18]

Bitler and Zavodny[24] also used a pooled time-series analysis with data from 29–40 states, depending on the year, during 1974–1997 to assess changes in abortion rates and the timing of abortions in states that were due to Medicaid restrictions. They examined the effects of both enforced and enjoined Medicaid funding restrictions. The authors included measures of women's demographic characteristics, state economic conditions and the state political climate as independent variables in the analysis, and controlled for state and year fixed effects. They did not control for the number of abortion providers in the state because those data were not available for all states for all years. Bitler and Zavodny, like Blank et al.[17] and Levine et al.,[18] controlled for the number of non–obstetrician-gynecologist physicians per 100 state residents and the number of hospital beds per million people (because the number of obstetrician-gynecologists might be endogenous to the model), since private doctors who perform abortions are likely to belong to this specialty.*

Bitler and Zavodny estimated the impact of Medicaid restrictions using several different models, both with and without state- and time-trend variables, and found that the results were sensitive to the model assumptions, for example, whether the model was corrected for autocorrelation and whether it was based on CDC or Guttmacher data. Two of the models showed significant reductions of 1% or less in the percentage of abortions occurring after the first trimester when Medicaid restrictions were enforced. One model found increased abortion rates in states where Medicaid restrictions were enjoined using CDC data but not using the more complete data from the Guttmacher Institute. Other models showed no effect on abortion rates. Similarly, enjoined restrictions—but not enforced ones—appeared to be associated with increases in the rate and proportion of abortions after the first trimester. The authors also found that enforcement of

*Economists believe regression of the abortion rate on the number of abortion providers leads to biased estimates of the effect of the availability of abortion services on abortion rates. The reason is that abortion providers presumably tend to locate where demand for their services is stronger; as a result, a positive association between abortion rates and providers does not necessarily mean that more providers cause a higher abortion rate. If we assume that obstetrician-gynecologists are the physicians most likely to perform abortions, then regressing the abortion rate on the number of these physicians is likely to suffer from the same bias. As an alternative, these researchers use all non–obstetrician-gynecologist physicians and hospital beds as proxies for medical services that are likely correlated with abortion providers, but are less directly related to abortion rates. We refer to these as instrumental variables.

Medicaid restrictions in neighboring states was associated with an increase in the percentage of abortions after the first trimester in the index state, without reducing the total number of procedures. They suggested that the number of abortion providers in a state may fall after the enactment of a restriction, leading to a rise in later abortion in nearby states because of the increased cost to women who have to travel for their procedures. An alternative explanation is that Medicaid pays for expensive second-trimester abortions in hospitals, but when Medicaid is unavailable, women travel farther for less expensive clinic services that may be in neighboring states.

Because of the conflicting results from the various models, the authors concluded that Medicaid restrictions generally do not affect the timing of abortions. Nevertheless, the finding in two models that restrictions reduced the proportion of abortions past the first trimester is plausible if the higher cost of these later procedures was beyond the means of some women. None of the models detected a change in the overall abortion rate, except one that paradoxically showed an increase associated with restrictions. This model may be misleading because it incorporated a correction for within-state time trends that might not be appropriate for trends that are curvilinear instead of linear. Also, it is based on CDC data, while a model using more complete data from the Guttmacher Institute showed a nonsignificant decrease in the abortion rate. A strength of the study is that it covered a period starting in 1974 before Medicaid restrictions took effect, but a weakness is that it extended over a very long period, 24 years, during which abortion rates first rose sharply and then fell, and other factors may have affected restrictive and nonrestrictive states differently.

Medoff[25] conducted a pooled time-series analysis of 1982, 1992 and 2000 state data that differed somewhat from most earlier analyses in that it used three separate points in time, attempted to account for varying charges for abortion services and controlled for six demographic and economic variables rather than state fixed effects. He concluded that Medicaid restrictions were associated with a reduction in the proportion of pregnancies ending in abortion from about 26% to 23%.

However, the study's research design was not convincing. First, the author compared differences in abortion rates over an 18-year span and assumed the adjusted differences reflected the effect of variation in Medicaid policy. In essence, he claimed to have uncovered the long-term effect of Medicaid-financed abortions, which is a strong and unrealistic assertion because so many other factors could have been changing over the 18-year span. For instance, welfare reform was fully implemented in 1996 and many states began to enforce parental involvement laws and mandatory counseling and waiting period statutes during these 18 years. However, by not examining changes in abortion just before and after each policy, the author could not convincingly distinguish the separate effect of each policy. Second, his model lacked state fixed effects. In other words, he was examining long-term differences in state abortion rates associated with the state policies toward Medicaid-financed abortions by comparing abortion rates in states like California, New Jersey, New York, Oregon and Washington, for instance, with those in Georgia, Mississippi, Missouri, Texas and Utah. Although the author adjusted for the usual set of socioeconomic factors, differences in abortion rates between these states are profound. The danger is that he attributed this difference to differing Medicaid policies when in fact it related to deep-seated differences in attitudes toward abortion. Finally, there was relatively little change in Medicaid funding over this time period. Thus, Medoff could not take advantage of any meaningful shift in policy in order to identify its effect.

In a subsequent analysis, Medoff[26] used a similar methodology to examine the effect of various policies including Medicaid funding restrictions on the pregnancy rate. No significant effect was found among all women or among teenage women. The limitations of the study were the same as those in his earlier study.[25]

Studies of Impact Among Teenagers Only

Lundberg and Plotnick[27] examined the influence of state policies on adolescent pregnancy, abortion and nonmarital pregnancy. This analysis was based on NLSY data from 1,181 white females who were aged 14–16 in 1979 and were followed over a seven-year period (1979–1986). The authors used a nested logit model to capture sequential decision making among teenagers from pregnancy to birth to marriage. The model included controls for abortion availability, family structure and other background characteristics of the young women. The researchers coded the Medicaid funding variable by the severity of the restriction in the state: funding of all or most medically necessary abortions voluntarily, funding under court order, funding in cases of life endangerment only and no funding under any circumstances. Medicaid restrictions were found to be negatively related to the probability that a pregnant teenager would have an abortion.

The study is innovative for its use of a nested logit model to allow for correlation among the three equations pertaining to pregnancy, birth and marriage. However, the analysis has several limitations. First, the sample included slightly more than 1,000 teenagers but only 318 pregnancies, 88 abortions and 191 births. It is hard to believe that the authors had sufficient statistical power to detect the

effect of state policies on so few outcomes. In addition, they rely on cross-state variation in state policies, which means the association between Medicaid funding of abortions and teenagers' behavior is based on comparisons of teenagers in New York and California with those in much more conservative states. It is not clear, therefore, if the association represents the effect of the policy or differences in attitudes toward abortion among teenagers in culturally different states. Despite these limitations, the study is important as an application of a potentially promising statistical methodology rather than as a rigorous evaluation of Medicaid funding for abortions.

Haas-Wilson[28] used a pooled time-series analysis of cross-sectional CDC data from 1978–1990 to determine the effect of Medicaid funding restrictions on demand for abortions among minors. To account for differences in state attitudes toward abortion and changes in legislation over time, the author used a fixed-effects model with dummy variables for each state and included proxy measures for abortion sentiment (the proportion of state legislators who were women, the number of persons who belonged to a religious denomination that had published a restrictive statement on abortion per 1,000 women aged 15–44, the number of abortion restrictions not including parental involvement laws or Medicaid restrictions, and antiabortion resolutions enacted by state legislatures in each state between 1973 and 1989). She stated that including these variables in the model controlled for state effects that vary over time while also investigating the role of state sentiment in abortion demand. Women aged 18 or older were used as a control group. The author specified the amount of time the Medicaid restriction had been in place in individual states, and used the ratio of abortion providers to women of childbearing age to account for the time and costs of traveling to a provider.

Haas-Wilson found that Medicaid funding restrictions were associated with a 15% reduction in the ratio of minors' abortions to births and a 9% reduction in abortions to minors per 1,000 women aged 15–19. Surprisingly, Medicaid funding restrictions were not associated with abortion rates or ratios for older women.

It is important to note that Haas-Wilson relied on the CDC's reports of abortions, which, as pointed out above, are generally believed to be incomplete, and she included all minors and not just those who were Medicaid eligible. The finding that Medicaid restrictions affected minors but not adult women suggests problems with the model or missing confounding variables. There is minimal theoretical reason to believe that such restrictions would affect minors more than adults. In addition, the study period included only a few changes in Medicaid policy, since most states cut off Medicaid abortion coverage in 1978, the first year of the study period.

Kane and Staiger[29] analyzed teenage birthrates for all U.S. counties from 1973 to 1988 (excluding two years when data were unavailable) to estimate the effect of Medicaid funding restrictions on teenage birthrates and used county data to investigate the differential effect on birthrates in poorer counties. Using county-level data also allowed the researchers to control for underlying changes in state or local attitudes toward abortion. The authors hypothesized that teenagers, presumably aware of Medicaid restrictions, may alter their sexual behaviors because of the perceived increase in the costs associated with abortion. Kane and Staiger used multivariate models and controlled for county-level demographics, economic conditions and year effects; they also presented results separately for whites and nonwhites and for married and unmarried teenagers.

With county fixed effects included in the model, Medicaid restrictions were associated with a reduction in the white birthrate of 7% among women aged 15–17 and of 1% among women age 18–19, but they had no effect on birthrates for older women. When state and year fixed effects rather than county fixed effects were included in the model, Medicaid restrictions were associated with larger reductions in white teenage birthrates. Results for whites and nonwhites appeared to differ, but the authors were unable to calculate precise or robust estimates for the latter group. Results according to marital status also varied by specification: Overall restrictions either reduced or had no impact on the birthrate among married teenagers, and reduced the birthrate among their unmarried peers. In sum, although some specifications showed that teenage birthrates fell with restriction of Medicaid funding for abortions, the researchers found that such restrictions had no clear effect on the teenage birthrate, as their impact was hard to distinguish from a general downward trend in this measure.

Using counties as the unit of analysis is a potentially valuable approach. However, other studies have found that results were strongly affected by allowing for unit-specific linear trends (in this case, county-specific trends). Although county trends would have been almost impossible to estimate in this study, it seems possible that trends in rural counties, which make up most of those in the restrictive states, could differ from those in the more urban counties in the Medicaid-funding states.

Medoff[30] conducted two analyses—a cross-sectional analysis of 1992 state-level data and a pooled analysis of data from all 50 states for 1980 and 1992—to investigate the effect of Medicaid restrictions on abortion demand among adolescents 15–19 years of age. In the cross-sectional analysis, he included a range of state characteristics

to attempt to measure the cost of abortion, broadly defined, including the numbers of physicians and of nurses per 100,000 people, the number of abortion clinics and the average weekly wage of employees in physicians' offices. He found that the abortion demand among teenagers was significantly positively related to state Medicaid funding in 1992: Teenage women had 54 more abortions per 1,000 pregnancies in states that funded Medicaid abortions. The findings of the pooled analysis, which included a variable to control for the year, were similar: Teenage women had 46 more abortions per 1,000 pregnancies in states with Medicaid funding for abortions.

A limitation of this study is that despite the inclusion of a number of variables associated with abortion, cross-sectional studies cannot adequately control for factors associated with both abortion rates and policies to restrict abortion. In addition, the author used the number of abortions obtained by teenagers from the Guttmacher Institute, which estimated these numbers for several states (eight in 1992) that do not collect information on abortions by age.

In another study, Medoff[25] conducted a pooled time-series analysis of 1982, 1992 and 2000 state data somewhat different from most earlier analyses in that it used three separate points in time, attempted to account for varying charges for abortion services and controlled for five demographic and economic variables rather than state fixed effects. He found that Medicaid funding restrictions were associated with a reduction in the abortion ratio: There were 33–38 fewer abortions per 1,000 pregnancies among all women, depending on the model, and 61–69 fewer per 1,000 pregnancies among minors.

The absence of controls for fixed effects could be a weakness of the study, considering that other studies have found that such controls changed the results dramatically. In the same model, laws requiring parental involvement in minors' abortions were found to reduce the abortion ratio for all women by about 11%, which is impossible since only 7–11% of all abortions were obtained by minors in the years studied. An effect that large would not occur even if parental involvement laws eliminated all minors' abortions. Such anomalies suggest that uncontrolled variables affected Medoff's analysis.

New[31] performed multiple regression analyses to examine the impact of Medicaid restrictions on the abortion rate among minors. He analyzed CDC data on the abortion rate in this age-group from most states for the years 1985–1999. A number of economic and demographic variables, as well as fixed effects, were controlled for in the analyses. Medicaid funding restrictions were associated with an average decrease in the abortion rate of 2.34 abortions per 1,000 women aged 13–17 (a drop of approximately 23%). The author hypothesized that this large reduction may have been a result of abortion clinics shutting down or moving out of state in the absence of public funding, which would in turn reduce the state abortion rate.

Although New's results are plausible, they are based on only six states that changed their funding policies and had data available. Two of these, Idaho and Montana, paid for very few abortions but were counted as funding states for certain years.

State-Level Studies of Reproductive Outcomes

Four of the 38 articles examined in this review analyzed reproductive health outcomes among women after Medicaid restrictions were put into place using data from groups of 2–15 states. One of these articles focused on how Medicaid restrictions affect minors.

Multistate Studies

Cates et al.[32] evaluated the effect of Medicaid restrictions on illegal (non–physician-induced) abortions. In this study, the researchers prospectively reviewed hospital charts to determine trends in abortion complications at 24 hospitals in 14 states and Washington, D.C., during 1977–1978. Several of the hospitals were in states where Medicaid funding of abortions had been discontinued. Analyses were based on 3,157 women treated for complications of induced or spontaneous abortions. The authors found that there was no significant difference in the percentage of women who had had induced versus spontaneous abortions between the hospitals with and without Medicaid abortion funding. Ten of the women had complications due to illegal abortions; most of these women were seen in hospitals along the Texas-Mexico border and none were Medicaid eligible. However, the authors noted that it was difficult to measure and control for total state funding levels for abortions because some hospitals in states with Medicaid restrictions on abortion subsidized the cost of the procedure, thereby potentially mitigating the effect of state and federal restrictions. Additionally, the small numbers of hospitals located in restrictive states and of women served in these hospitals limited the power of the study. Nevertheless, it is unlikely that a large number of complications of illegal abortions would have gone undetected.

Bragonier et al.,[33] in an analysis of the same data analyzed by Cates et al.,[32] reported that the Medicaid-eligible women who were treated for complications in the restrictive states had a 2.4-week later mean gestational age than non–Medicaid-eligible women in the same states; in funding states, gestational ages did not differ between Medicaid-eligible and -noneligible women. In addition, the CDC abortion mortality surveillance reported three deaths of Medicaid-eligible women in states where funding was restricted. One of these was directly related to the absence of public funds and the other two were indirectly related. One of the latter women approached abortion clinics, but on learning the cost of the procedure attempted to induce an abortion herself, which resulted in her death from a pulmonary embolism. The other woman died after delaying her abortion.

Trussell et al.[34] sought to determine the number of Medicaid-eligible women who were unable to obtain an abortion because of funding restrictions in Georgia and Ohio. For comparison, data were also collected for Michigan, which continued to fund Medicaid abortions. For each state, the authors calculated the proportion of pregnancies to Medicaid-eligible women that ended in abortion in 1977, before the funding cutoff, and again in 1978, after the cutoff. For all three states, the number of Medicaid births was obtained from the state Medicaid offices for both years, and the number of abortions paid for by Medicaid was available from Ohio for 1977 and from Michigan for both years. The Georgia Medicaid office was unable to provide accurate figures, so the researchers used the number of abortions for which providers reported Medicaid reimbursement in 1977. To determine the number of Medicaid-eligible women who had abortions in 1978 in Ohio and Georgia, they administered questionnaires to abortion patients and interviewed abortion providers.

The authors found that 23% of Medicaid-eligible women in Ohio and 18% of those in Georgia who would have obtained an abortion if funding were available were unable to do so. The researchers also found evidence that Medicaid restrictions encouraged delays in obtaining abortions in Ohio, with an estimated average delay due to the restrictions of three days in 1978. By contrast, there was no evidence of a delay in obtaining an abortion in Georgia, possibly because a large hospital in that state subsidized the cost of the procedure for poor women. Trussell et al. also found some evidence of financial hardship for women seeking abortions, but they were unable to estimate its extent.

The counts of Medicaid-eligible women who obtained abortions after the cutoff in Ohio and Georgia were based on questionnaires distributed to patients, and when the response rate was too low because of refusals or admin-

istrative oversight, they relied on providers' estimates. There remains substantial uncertainty as to the accuracy of these estimates. The more accurate figure is the number of Medicaid-financed births in each state, since this comes directly from Medicaid administrative data. The study could have been strengthened considerably if the authors had been able to estimate the change in Medicaid-financed births in more depth. To understand why, note that the authors estimated there were 769 fewer abortions to Medicaid-eligible women in Ohio in the period after the cutoff. This represents 23% of the expected number of abortions and 13% of actual births to Medicaid-eligible women. However, births to such women in Ohio fell from 6,156 to 5,932 from the pre-restrictive period to the post-restrictive one. This implies that without the funding restriction, births would have fallen by approximately (769 + [6,156 – 5,932]) or 950, which represents more than 15% of the pre-restriction total. Although this is possible because the number of Medicaid-eligible women fell in 1978, it would appear to be an unusually large decline for one year. If the authors had been able to analyze trends in the Medicaid population and birthrates, they would have had a better sense of whether a decline of 15% was plausible.

In sum, the study by Trussell et al. was one of the first to evaluate the impact of the Hyde Amendment. Although similar findings for the two states lend credibility, the study's findings depend on the accuracy of data collected from abortion providers, the assumption that the funding cutoff did not cause women to make greater efforts to prevent pregnancy and the assumption that decreases in births to Medicaid-eligible women would have been substantially greater than the observed decline in the absence of the funding cutoff.

Korenbrot et al.[35] examined changes in the number of reported births and reported abortions during 1982–1987 in Colorado, North Carolina and Pennsylvania, states that restricted public funding for abortions in 1985. After years of decline in the proportion of pregnancies resulting in live births, the researchers found that between 1984 and 1987, the percentage of pregnancies ending in birth increased by six percentage points in Colorado, two percentage points in North Carolina and three percentage points in Pennsylvania. Nationally, the increase between 1984 and 1985 was much less than that in the three states; national data for later years were unavailable at the time the article was written. Among teenagers, the proportion of pregnancies ending in birth rose by eight percentage points in Colorado between 1984 and 1987, three percentage points in Pennsylvania and one percentage point in North Carolina. A disaggregated analysis suggested that in Colorado, the increase in the live birth proportion was largest for black women (five percentage points for white non-Hispanics, seven percentage points for white Hispanics, eight percentage points for blacks and other nonwhites), but data from North Carolina did not show similar results.

The impact of the restriction in North Carolina may have been small because the state abortion fund continued to pay for some procedures after 1984. Similar to the study by Haas-Wilson[23] noted above, Korenbrot and colleagues looked at aggregate birth and abortion data for all women in these three states, potentially masking and underreporting the effects of the restriction on the population of Medicaid-eligible women, who were most likely to be affected. The authors defended this approach, asserting that abortion providers received a substantial proportion of their income from procedures to Medicaid-eligible women before the enforcement of the Medicaid restriction. Once a restriction on funding is in place, they reasoned, abortion providers close down because of financial difficulties, and access to abortions for all women is therefore limited, which leads to changes in birthrates and abortion rates at the aggregate level.

A strength of the study is that it reported trends over the three years immediately spanning the policy change rather than over a longer period during which other factors could have affected trends in births and abortions. However, a major limitation is that the authors lacked a comparison group and thus could not identify changes in births or abortions associated with Medicaid funding from ongoing trends in these outcomes due to other factors. In addition, the authors relied on abortion reporting by state health departments, which is often incomplete, because abortion data were unavailable from the Guttmacher Institute at the time of the study. A comparison of health department reporting in 1984 and 1987 with more complete data from the Guttmacher Institute indicates that health department statistics became less complete in Colorado, slightly less complete in North Carolina and slightly more complete in Pennsylvania. Therefore, the increase in births as a proportion of pregnancies in Colorado may have been less than reported in the article.

Single-State Studies

Four of the 38 articles examined in this review evaluated the impact of Medicaid restrictions on reproductive health outcomes in a single state. We found no single-state studies that addressed the impact on minors.

Texas

In a CDC study conducted in Texas after the enactment of restrictions on Medicaid funding of abortions, Chrissman et al.[36] found little evidence of women seeking illegal abor-

tions, but noted that one woman died of complications from such an abortion in the year after the restrictions were put in place. Additionally, by measuring the proportion of pregnancies among women who had an abortion before and after the restrictions went into effect, the authors estimated that 35% of Medicaid-eligible women who would have obtained an abortion in Texas in 1978 had public funding been available were not able to do so. They also found an increase in the birthrate of Medicaid-eligible women that was consistent with the decrease in the number of abortions. Between 1976 and 1978, the birthrate of Medicaid-eligible women increased 17%, compared with an increase of 2% among women not eligible.

This report, similar to that of Cates et al.[32] described above, relied on chart reviews from hospitals, compared the incidence of abortion-related complications before and after Medicaid restrictions were put into place, and looked at deaths reported to the CDC. Both studies acknowledge limitations in (a) measuring the number of women who may have obtained illegal self-induced or nonphysician abortions overall and (b) measuring the number of women who may have obtained such abortions who had complications that they did not report to a hospital. Women seeking care at a hospital for abortion-related complications may not have disclosed that they had an illegal procedure, and women who had an illegal abortion without complications would not be included in hospital admissions. The impact on Medicaid births is persuasive because the authors knew both the numbers of Medicaid-funded births and the size of the Medicaid-eligible population of reproductive age.

Illinois

Sheier and Tell[37] estimated the number of privately funded abortions among Medicaid-eligible women and the number of additional births attributed to the restriction of Medicaid funding in Illinois using state-level data for the years 1976–1978. The authors assumed that the pregnancy rate (including births, abortions and miscarriages) among Medicaid-eligible women increased at the same rate as the overall pregnancy rate of the state (2%) in the year after funding restrictions were put in place. They estimated that there were 47,776 pregnancies to Medicaid recipients, consisting of 30,369 Medicaid-funded births and miscarriages, 8,972 Medicaid-funded abortions and 8,435 pregnancies that presumably ended in self-paid abortions. The Medicaid birthrate rose by 12%. If the same proportion of pregnancies had ended in abortion as in 1976, there would have been 2,707 fewer births; thus, an estimated 2,707 additional births occurred as a result of the cutoff of funding. Viewed another way, of the 11,142 women (2,707 + 8,435) who could not get Medicaid abortions, about 24% continued their pregnancies. Key to these calculations was that the researchers knew the number of Medicaid-eligible women, Medicaid-funded births and Medicaid-funded abortions—information that is generally unavailable.

A strength of this study is the clear increase in the Medicaid birthrate. Among the important assumptions is that the Medicaid pregnancy rate increased at the same rate as the state's and that women did not make greater efforts to prevent pregnancy in response to the Medicaid cutoff.

North Carolina

Cook et al.[38] used individual-level data to examine the impact of the episodic lack of availability of a state abortion fund for indigent women in North Carolina during 1980–1993. The researchers compared birthrates in the state during specific time periods in which state abortion funding was not available with those during times when it was. They collected individual birth and abortion records, and identified the month of conception to determine if it took place during times of funding restrictions. They first analyzed variations in the monthly count of abortions. To estimate the effect of funding availability, they used a multivariate model and controlled for seasonality, trends and individual characteristics.

The researchers found a decrease in abortion rates and an increase in birthrates when funds were unavailable, and concluded that 37% of women who would have had an abortion if funding were in place were unable to do so when it was not. Analyzing the effects of variations in funding by race, the researchers found that when funding was available, there were 10% more abortions among black women and about 1% more abortions among white women. The estimated birthrate (calculated using the same methods as for the abortion rate) increased among women eligible for state funding—by 2% among whites and 5% among blacks—when this funding was unavailable. The increase in births was concentrated among black women aged 18 or older and women with less than a high school education.

The study by Cook et al. is one of the strongest evaluations of Medicaid financing restrictions on abortion in the literature. Although it involved only one state, the funding cutoff occurred five times between 1977 and 1992. The on-off nature of the restriction provided multiple "natural experiments." Second, the funding cutoff was plausibly exogenous, meaning that it was caused by factors unrelated to the pregnancy rate; the fund was depleted five times but in four different calendar months, which would have made it hard to anticipate. Third, the authors had excellent data on abortions at the individual level and were

able to analyze subgroups most likely affected by the law. In addition, they knew a woman's date of conception and could link exposure to the cutoff precisely. (A major limitation of the studies that used state abortion rates for all women is that a relatively small proportion of the population is affected by the restriction on Medicaid funding for abortions. In addition, researchers can link abortions or births in a year only to the year in which funding was restricted. The lack of data on subgroups and misclassification of exposure reduces statistical power, as evidenced by the marginally significant results in several national analyses.[17,18,22])

Our one criticism of the study by Cook et al. is the lack of visual evidence. For instance, it would have been useful to have plotted the number of abortions in the months just before and after the funding cutoff, especially for minorities and women with low levels of education. The data may have been "noisy," fluctuating randomly to some extent, but the authors could have combined data from the five years in which Medicaid funding became unavailable during the year to reduce noise.

Morgan and Parnell[39] looked at the same state cutoffs in funding in North Carolina and added administrative data from fiscal years 1991–1994, with analyses mainly focused on 1988–1995. The researchers examined two additional components of the program: coverage (defined as "the proportion of all abortions that are state funded when there was funding") and substitutability (defined as "the proportion of state-funded abortions that would have been births in the absence of the state program"). Examining these components allowed them to investigate racial differences in greater detail than could Cook et al.[38] Morgan and Parnell measured the impact of the state abortion fund by comparing the ratio of abortions to births when the state funding program was cut off to those when it was fully operational. Multivariate models were estimated in 12 age-by-race subgroups and included controls for seasonality and other period effects.

The investigators found consistent but small effects across these models. Approximately 3% of white women and 5% of black women would not have been able to access abortion and would have carried their pregnancy to term without public assistance. The magnitude of the increase is similar to that found by Cook et al.[38] The researchers note, however, that the entire population was not eligible for the funding program. Among whites, the proportion of eligible women who carried their pregnancies to term in the absence of public funding ranged from 29% among those younger than age 18 to 68% among those aged 30 or older; among blacks, it was higher among younger women (26–29% among those younger than age 22) than among women aged 30 or older (20%).

In sum, Morgan and Parnell[39] agreed with Cook et al.[38] and reported that funding cutoffs were associated with an increase in the proportion of pregnancies ending in birth for a substantial number of poor women, yet their findings differed in terms of which demographic groups were most affected by funding restrictions. The authors noted that women may have been influenced by a social service network that referred poor women to abortion services as well as by the financial assistance.

City- and Clinic-Level Studies of Reproductive Outcomes

Two of the 38 articles examined in this review analyzed the reproductive health outcomes of women in a single city or a single clinic after Medicaid restrictions were put into place. Neither focused specifically on how the restrictions affected minors.

Rubin et al.[40] analyzed trends in live births and abortions in a Texas metropolitan area in the year before and the year after funding restrictions were put into place. They collected data for the last five months in 1977, after funding had been cut off, and for the same five months of 1976 from the four abortion clinics and two hospitals that provided more than 100 induced abortions in the earlier year. The abortion providers were questioned by phone interview or mail survey regarding the number of procedures performed during the study period, the charges and funding arrangements made for low-income women and the type of subsidies provided to them.

The researchers found that the number of abortions performed in the facilities rose 9% from 1976 to 1977; meanwhile, the total number of subsidized abortions decreased 31%. In the restricted year, it was clinic policy to provide subsidies to women who were eligible for Medicaid, so the number of subsidized abortions was taken to be a measure of the number of Medicaid-eligible women who had abortions. With subsidies, women were allowed to pay a reduced fee for their procedure ($75–125 for a first-trimester abortion) or received other financial assistance. The authors calculated that if the need for abortion among low-income women increased by the same amount as the total number of abortions, then 36% of "expected" abortions were not performed. However, they found no change in birth patterns in the public hospital in the year after the cutoff compared with the previous year. They also did not find any increase in the number of reported complications from illegal abortions.

A limitation of this study is that it is not clear that subsidized abortions were an accurate measure of the number of women having abortions after the Medicaid cutoff. In addition, the details of the analysis of trends in births were not shown, so there is no way to estimate the power of the calculation. A 31% drop in the number of subsidized abortions would have a relatively small impact on the number of births even if all the pregnancies had been carried to term because this amounted to only about 6% of the total number of abortions or about two abortions per 1,000 women of reproductive age, a small number compared with the birthrate.

Henshaw and Wallisch[41] compared the experiences of low-income women who had Medicaid-funded abortions at a clinic in St. Louis, Missouri, in 1977 (when funding was available) with those in 1982 (when public funding was generally not available). The researchers also compared similar data from women having higher incomes who attended the same clinic in both study years. In 1977, Medicaid-eligible women seeking abortions experienced no delay in obtaining them compared with women not on Medicaid. In comparison, low-income women who sought an abortion in the St. Louis clinic in 1982 experienced a delay of about three days on average compared with other women. The authors estimated that 22% of Medicaid-eligible women who had second-trimester abortions were delayed into that period by the absence of Medicaid funding. They also found evidence of financial hardship among low-income women seeking abortions when public funding was not available; 42% of Medicaid-eligible women, compared with only 10% of ineligible women, said they delayed either their pregnancy test or their abortion for financial reasons. Among those who said they had to postpone their procedure in order to acquire funds to pay for it, the average delay was 2–3 weeks. Medicaid-eligible women reported that they obtained funding for the abortion by having others pay for it (22%), sacrificing payment for bills, food and other daily necessities (22%) or borrowing the money (31%).

Although this study was based on data from only one clinic, its finding of a three-day delay supports the similar finding of Trussell et al.[34]

Studies of Other Outcomes

The remaining studies that we reviewed assessed somewhat less direct potential impacts of laws restricting the use of Medicaid funds for abortion. Five of them evaluated effects on infant health and child abuse, on the assumption that Medicaid restrictions would cause more women to continue unwanted pregnancies. Four hypothesized that restrictions might cause women to reduce their levels of sexual activity or use contraception more effectively. One investigated effects on women's suicide rates; three, the influence on the prevalence of abortion providers; and two, the impact of additional births on public finances.

Infant and Child Well-Being

In the study by Meier and McFarlane[8] (described in detail in the section on national outcomes), the researchers reported that for each increase of one funded abortion per 1,000 women of childbearing age, there was a 0.024–percentage point reduction in the percentage of low-birth-weight babies, a 0.027–percentage point reduction in the percentage of premature births and a 0.263–percentage point reduction in the percentage of births with late or no prenatal care. There was no effect on neonatal or infant mortality. As mentioned previously, this study had only incomplete controls for fixed state effects, and the results may have been influenced by differences between restrictive and nonrestrictive states.

Currie et al.[16] used individual-level NLSY data from 1980–1989 (as described above) to estimate multivariate regression models with birth weight and proportion of births with low birth weight as the outcome variables, and Medicaid restrictions as a key predictor. The models included controls for maternal age at birth, highest school grade completed, prior pregnancy losses, presence of a spouse or partner, religious attendance, smoking and drinking. They also attempted to control for changes due to the aging of the sample and shifts in attitudes toward abortion over time by including dummy variables for the year of the pregnancy.

The authors reported that restrictive laws had no effect on birth weight among women overall, but among African American women and high-income women, they were associated with reduced birth weights in comparison with no law. However, among high-income women, *enjoined* laws were also associated with reduced birth weights. As there was no significant difference between the effect of restrictive laws and enjoined laws, the authors concluded that restrictions had no effect on birth weight. Similarly, there was no evidence of an effect on the proportion of low-birth-weight births.

The authors hypothesized that the effect of enjoined laws could be due to an effect on the number of abortion providers, and they did find that the number of providers was positively associated with birth weight among African American women and low-income women, and negatively associated with restrictive laws. When the number of providers was removed from the model, restrictive laws were associated with significant reductions in birth weight among African American and high-income women. They concluded that laws restricting funding "matter" regardless if they are implemented and that they "matter more" for high-income women than for their low-income peers. The limitations of this research are noted in the section on national studies of reproductive outcomes.

Currie et al.[16] suggest that these counterintuitive results mean that restrictive laws "reduce birth weight because they proxy for characteristics of states that are associated both with the passage of such laws and with lower birth weights." If unmeasured variables can influence results to this extent, the methodology is evidently unable to measure the impact of Medicaid funding. In sum, although the findings differ somewhat from those of Meier and McFarlane,[8] neither study is conclusive because of methodological limitations.

Bitler and Zavodny[42] used annual state-level data on the number of reports of abuse and neglect of children aged 0–17 from 1976–1996 to test for an association with enforced and enjoined Medicaid restriction laws. The authors theorized that unwanted or unplanned children may be more subject to maltreatment by parents or caretakers; if an abortion restriction leads to more births of such children, it may be associated with child maltreatment. A population-weighted regression analysis was performed; the model controlled for state and year fixed effects, state-specific trends and demographic and political factors. In addition, the model contained variables that controlled for economic factors that may influence child abuse (current and previous year's unemployment rate,

the log of real average income per capita and the log of real welfare payments).

The authors found that the results were somewhat inconsistent across different types of child abuse reports and the timing of exposure to Medicaid restrictions. When the reports were viewed in relation to restrictions at the time of conception (as opposed to the time of the abuse), enjoined restrictions were associated with a reduction in age-specific substantiated reports of abuse in comparison with an absence of restrictions, and enforced restrictions had no effect in comparison with no restrictions. Bitler and Zavodny concluded that the effects of Medicaid restrictions were unclear. Some data limitations may have affected the results. As the authors noted, not all instances of child maltreatment are reported, and reporting requirements differ across states and could vary over time. The age range of the children extends beyond the point when most abuse occurs.

Another study conducted by Bitler and Zavodny[43] also examined the relationship between abortion availability and economic factors at the time of a child's conception on the one hand and maltreatment of children aged 0–17 years on the other. State-level rates of reports of actual and possible child abuse and neglect, the fraction of children receiving social services and child deaths and murders were the measures of child maltreatment. The study time frame was 1976–1996 (excluding 1988 and 1989 for deaths by cause, when data were not available). The authors constructed a regression model with state and year fixed effects and state-specific linear time trends. The model controlled for economic conditions and various demographic variables (both at the time of conception and at the time of the outcome).

The authors found that both enforced and enjoined Medicaid restrictions were associated with an increase in substantiated reports of child abuse in comparison with an absence of restrictions. Enforced restrictions were also associated with an increase in murder by parents and murder by relatives or unknown persons. No significant effects were found for abuse reports generally (including unsubstantiated reports), receipt of social services or incidents indicating possible abuse.

Bitler and Zavodny concluded that Medicaid restrictions were associated with an increase in child maltreatment rates. However, their evidence is weak. The finding that both enforced and enjoined restrictions were associated with abuse suggests a role for uncontrolled confounding variables or faulty data. On the other hand, child homicide, which was associated with Medicaid restrictions, is measured more accurately than other types of abuse, so this finding strengthens their conclusion.

Sen[44] tested the hypothesis that state-level restrictions on abortion were linked to increases in rates of fatal injury among children. Her reasoning, similar to that of Bitler and Zavodny,[42,43] was that abortion restrictions might disproportionately increase the birth of unwanted children, as well as births to young, single and low-income women, which might in turn lead to adverse child outcomes. Like those researchers, she used state-level fatal injury data for all 50 states for a range of years (1981–2002), but she analyzed white and black fatalities separately and limited them to children aged 0–4 (because past analyses had suggested that children this age are the most vulnerable to fatal injuries associated with abuse or neglect). In addition, she included as a control the number of fatal injuries among adults aged 25–65.

Three causes of injury-related deaths were considered: homicide, unintentional causes of any type and unintentional causes other than motor vehicle crashes in which the child was a passenger in the car. A count data model with state and year effects was used for estimation. Separate results for each type of fatal injury were presented by race of the child. In the most complete model, no significant effects of restrictions were found for white children, but for black children, the lack of Medicaid abortion funding was associated with a 15% increase in unintentional fatal injuries and a 17% increase in fatal injuries excluding motor vehicle accidents. The result for homicide was not significant.

An effect among black but not white children is plausible since black women tend to have lower incomes and are more affected by Medicaid policies. Nevertheless, the association between state policies and rare outcomes is vulnerable to spurious associations since only a few additional deaths in a state around the time of the policy can generate an association. In addition, it is not clear that the author estimated the standard errors correctly, which can also lead to a type I error (an unwarranted rejection of the null hypothesis).

Sexual Behavior and Sexually Transmitted Diseases

In a pair of studies, Sen[45,46] used state-level gonorrhea rates from 1975–1995 as an indication of unprotected sex. She hypothesized that a change in sexual behavior due to Medicaid restrictions would lead to a reduction in rates of this disease. In one study,[45] Sen used partially adjusted models and controlled for state and year fixed effects. In the other,[46] she again included as controls state and year fixed effects, as well as the percentage of the state population aged 15–19, the maximum level of monthly AFDC payments available to a family of three, the state's minimum drinking age and the percentage of the state

population eligible for Medicaid. In both analyses and in all model specifications, the author found no difference in gonorrhea rates between states with and states without Medicaid restrictions.

Gonorrhea rates, however, are incompletely reported, and the completeness of reporting fluctuates from year to year. Rates may be influenced by other biological or sexual-network factors that overshadow the effects of Medicaid laws. They are also an imperfect measure of pregnancy prevention behavior, which may involve nonbarrier contraceptive methods, such as hormonal methods, as well as condoms and abstinence.

A third study by Sen[47] used data from the 1997 NLSY to examine the relationship between sexual activity among never-married female respondents aged 15–17 and various state policies, including Medicaid abortion funding. Rates of sexual activity were compared between states with and without such funding. No significant association with Medicaid funding was found in any of several models that incorporated controls for numerous demographic and state characteristics. Although the results are plausible, the possibility of uncontrolled confounding state characteristics cannot be ruled out.

Averett et al.[48] estimated a bivariate probit model* using nationally representative data from the National Survey of Family Growth for unmarried women aged 15–19 in 1995 to examine the effects of government policies and neighborhood characteristics on adolescent female sexual behaviors. The study examined the association of Medicaid restrictions with the probabilities of teenagers being sexually active and having used contraception at last intercourse. The final sample in the study included data from 1,280 individuals. The authors found that Medicaid coverage of abortion, parental involvement requirements and the presence of an abortion provider in the county were not significant predictors of sexual activity or contraceptive use.

Although this study's results are plausible, the design is not convincing. The analysis is essentially cross-sectional, comparing states with and without Medicaid funding restrictions. Differences found in this comparison could reflect other differences between the states rather than the effect of Medicaid policy. Similarly, actual effects of the policy could be masked by other differences between restrictive and nonrestrictive states. Because only a fraction of teenagers are eligible for Medicaid, any effects of Medicaid policy on sexual behavior are likely to be small and difficult to detect.

*This model allowed for correlations to be made between two related decisions (the decision to have sex followed by the decision to use or not use contraception).

Suicide

Klick[49] analyzed suicide rates of women aged 25–64 in all states using a pooled time-series analysis of state-level data from 1981–1998. His regression models included controls for women's participation in the labor force, the unemployment rate, average state income, percentage of the state's population living in rural areas, education levels, religious identification and state and year fixed effects, as well as mandatory waiting period laws. To control for unobservable variables that might affect female suicide rates, some models included measures of male suicide rates.

The author found that Medicaid funding restrictions were associated with a significant 7% increase in female suicides. However, in the same regression analyses, mandatory counseling and waiting periods were associated with a 10% *reduction* in this outcome. These estimates were robust to the inclusion of state-specific linear trends. The author concluded that Medicaid-eligible women were ill equipped to deal with unplanned and unwanted pregnancies that they were unable to terminate.

Klick's finding that mandatory waiting periods protect against suicide but that Medicaid financing restrictions increase suicides is contradictory. The author was unable to provide a convincing explanation for this inconsistent result given that both policies decrease access to abortion. He speculated that Medicaid restrictions reduce abortions, but the resulting unwanted births among relatively poor women induce depression and suicide. Mandatory waiting period laws, on the other hand, may also reduce abortions and increase unwanted births, but they may affect nonpoor women, whose likelihood of taking their life decreases after an unintended birth.

Another weakness of the study is that Klick excluded teenagers and young women because they may also be affected by parental involvement laws. Such laws affect only minors, but the exclusion of women 18–24 years of age eliminates more than 40% of all women who have abortions. Controls for parental involvement laws could easily have been included in the regression analyses. At the same time, about half of the women in the suicide rate calculation, those aged 45–64, are unlikely to be affected by Medicaid policies, yet Klick gives no explanation for their inclusion. Since only a fraction of suicidal women are Medicaid recipients and of these, only a fraction are pregnant, it seems etiologically doubtful that Medicaid restrictions could have a measurable impact on suicide rates.

Availability of Abortion Providers

Using the location of abortion providers from the Guttmacher Institute's national surveys, Haas-Wilson[14] found that in 1988, the average number of providers per 10,000

women of childbearing age was more than twice as high in states that provided funding as in those that did not (0.76 vs. 0.35). The author also found that the states where funding was unavailable had fewer hospitals, small clinics and private practice physicians that provided abortions compared with states having such funding, and that services were concentrated in a few large clinics. Although she implied a causal relationship between Medicaid restrictions and provider availability, lack of controls for other differences between the states makes such inferences questionable, since aspects of a state's disposition could affect both restrictions and providers.

Currie et al.,[16] using data from the Guttmacher Institute, hypothesized that Medicaid restrictions may reduce the demand for abortion services among poor women and hence reduce the number of abortion providers. The researchers did not draw any conclusions about the effect of Medicaid restrictions on the number of providers, but they did note that only 18% of counties in states with restrictive laws in force had a provider, compared with 65% of counties in states with enjoined laws and 49% of counties in states without any restrictive laws.

In neither of these analyses did the authors control for other possible determinants of the number or distribution of abortion providers, and it is likely that states with and without Medicaid restrictions differ in attitudes toward abortion and in other ways. It is not surprising that states where opposition to abortion has led to Medicaid restrictions would provide difficult environments for abortion providers and would consequently have few physician practices and hospitals offering the service.

Blank et al.[17] also assessed whether Medicaid funding restrictions predict the number of abortion providers in a state. They found no association based on results from a multivariate regression analysis. This is the most convincing analysis of the three. The study period spanned 1974–1988, which include the years before and after Medicaid funding restrictions went into effect. The regression model also included a large number of other determinants in addition to a full set of state and year fixed effects.

Public Finances

Using results from several national health care surveys, Guttmacher Institute surveys and AFDC data for 1985, Torres et al.[50] estimated that permitting the use of state and federal funds to pay for abortions would result in savings in state and federal medical and social welfare expenditures of $435–540 million over two years—4.3–4.6 times more than the funding needed to cover abortions for Medicaid-eligible women during the same time period. This study was updated in 1993 with similar results.[51] A noteworthy assumption of the study was that 20% of the abortions that would have been funded by Medicaid are instead carried to term when funding is unavailable.

Evans et al.[52] assessed the potential increased public assistance and Medicaid costs resulting from Michigan's 1988 restriction on Medicaid funding of abortions. They first estimated the increase in births in the state resulting from the restriction, then the costs to the state and federal government that would be associated with these births. One of the estimates came from the Michigan Department of Social Services, which analyzed the birthrate of Medicaid-eligible women from 1980 to 1990 and found that Medicaid restrictions were associated with an increase of 2,120 births per year. Evans et al. estimated from the overall increase in the state's birthrate that the restrictions may have led to an increase of 5,800 births per year. Using low and high estimates for the numbers of additional children born as a result of the restrictions (2,120 and 5,800 births), and the likelihood of these children remaining on welfare, the 1991 cohort of infants was calculated to cost the state's taxpayers $23–63 million—a number much larger than the estimated costs of the abortions ($6–7 million). Including the federal share, the total cost of the births to taxpayers was roughly $50–137 million. The authors concluded that those who support restrictions on Medicaid funding for abortions in order to reduce government spending have ignored the much greater and more long-term costs that must be paid when those pregnancies are carried to term.

Discussion

Researchers have used a wide range of strategies to assess the impact of restricting the use of Medicaid funding for abortions on a number of different outcomes. Probably of greatest interest is the effect on abortion rates and birthrates. The best studies are the five that used detailed data from individual states and compared the ratio of abortions to births before and after Medicaid restrictions took effect.[34,36–39] These found that 18–37% of pregnancies that would have ended in Medicaid-funded abortions were instead carried to term when funding was no longer available.[34,38] The study with the best design, and that also had excellent birth and abortion data, is the one conducted of the natural experiment in North Carolina, where the state abortion fund ran out of money before the end of the fiscal year on five occasions over 14 years.[38] This study found that 37% of women who would have had subsidized abortions continued their pregnancies during the periods when funding was unavailable. This percentage may have been elevated, however, by the intervention of social workers who helped eligible women obtain abortions when funding was available. The other studies found that 18–23% continued their pregnancies in Georgia and Ohio,[34] 24% in Illinois[37] and 35% in Texas.[36] Considering the case studies collectively, a reasonable estimate is that lack of funding influences about a quarter of Medicaid-eligible women to continue unwanted pregnancies.

Several researchers performed regression analyses of data from all or most states, usually over time. A serious weakness of most of them is that they used state-level abortion rates for all women, not just those eligible for Medicaid, and therefore lacked the power to measure the impact of Medicaid restrictions accurately. The other major weakness is the lack of variation in Medicaid policy within states. In two studies,[22,28] the study period began in 1978, yet most states had either stopped funding or were committed to funding by 1977. Thus, there were scant "prepolicy" data and limited variation in the Medicaid measure. Only Blank et al.[17] used data from 1974 with a panel of states over time. This may explain, in part, why estimates of the impact of Medicaid funding restrictions lack robustness. Six studies found an effect of Medicaid restrictions ranging from 42% of the eligible pregnancies carried to term in restrictive states[8] to a very small effect.[16] Six studies of all or most states found no significant impact of Medicaid restrictions.[13,15,22–25]

Several of the state case studies measured the impact on the ratio of abortions to births among Medicaid-eligible women, but could not test whether pregnancy rates were reduced. That is, it is theoretically possible that the restrictions caused women to avoid unplanned pregnancy; this would lead to a decrease in abortions without necessarily an increase in births. None of the national-level studies found an increase in the birthrates of low-income women in relation to their higher-income counterparts.[16,18,23] Meier and McFarlane,[8] however, found an increase in teenage birthrates in states with Medicaid restrictions. These studies may not have had sufficient power to detect the relatively small increase that would be expected.* By contrast, the North Carolina,[38] Illinois[37] and Texas[36] studies did find increases in birthrates specifically among Medicaid-eligible women. Although these studies show that abortions are converted to births in the short term, over the long term, it is not clear whether unintended pregnancies are reduced in response to Medicaid restrictions or whether more unwanted pregnancies continue to be carried to term.

Several studies focused specifically on teenagers or compared the effect on teenagers with that on adult women. Analysis of the North Carolina data showed that white teenagers were less likely than adult white women to continue a pregnancy in the absence of funding, while black teenagers were slightly more likely than adult black women to do so.[39] Three less well-designed studies also found that Medicaid restrictions led to a reduction in the proportion of teenagers' pregnancies that end in abortion.[25,28,30] Meier and McFarlane[8] and Korenbrot et al.[35] found that restrictions were associated with an increase in

*Hypothetically, if 30% of abortion patients are Medicaid eligible and 25% of this group carry their pregnancies to term, the number of additional births is 7.5% of the number of abortions. In 1985, around the midpoint of the period covered by most studies, the abortion rate was 28 per 1,000 women aged 15–44. The additional births expected would have been about 7.5% of 28, or 2.1 per 1,000. The birthrate was 66 per 1,000, so the additional births would have caused an increase of about 3% in the birthrate. Changes this large occur randomly at the state level, so an effect of 3% is difficult to detect statistically.

the birthrate of teenagers, but Kane and Staiger[29] found no effect or possibly a decrease in teenage births. As among adults, it is clear that Medicaid restrictions reduce the proportion of teenagers' pregnancies that end in abortion, but the long-term effect on the birthrate is less clear.

Two state case studies found a three-day delay in abortions under restricted Medicaid coverage,[34,41] but this small average effect may be misleading because it combines a majority of women who are unaffected and a minority who may be seriously delayed. The study based on in-depth interviews in a clinic found that Medicaid-eligible women who were delayed by the time taken to acquire money were delayed by 2–3 weeks, and some were delayed into the second trimester.[41] Other studies have found that the time needed to raise money for an abortion is an important cause of delay.[53]

A pooled time-series analysis of all states with data found a slight decrease in the proportion of abortions past 12 weeks in some models and no effect in others.[24] Although the analysis produced anomalous results that make one question the methodology, a decrease in abortions past 12 weeks could be explained if some Medicaid-eligible women carried pregnancies to term because they were unable to pay for the more expensive later abortions or if they went to other states for less costly abortion services. On the other hand, some women are delayed into the second trimester by the need to acquire funds to pay for the abortion.

In summary, the evidence suggests that restrictions delay procedures among women who have first-trimester abortions, and it would be surprising if this were not the case. A minority of women may experience substantial delays. Although some women are delayed into the second trimester, the net impact on second-trimester abortions is unclear.

The effect of restricting Medicaid funding for abortions on infant birth weight is unclear, as the two studies reviewed reported somewhat different results. One study found no evidence that Medicaid restrictions affect average birth weight or the proportion of low-birth-weight births,[16] whereas the other study found that restrictions increased the proportion of such births.[8]

The three studies focused on child maltreatment or abuse also produced mixed results. The first study by Bitler and Zavodny[42] found that enjoined restrictions reduced the rate of child abuse, but enforced ones had no significant effect in comparison with an absence of restrictions. In a similar study two years later, these authors found that both enforced and enjoined laws were associated with increased abuse in comparison with an absence of restrictions and that enforced restrictions were associated with child homicide by parents and also by relatives and unknown persons.[43] A study by Sen[44] found no association of restrictions with child homicide but an increased rate of unintentional fatal injuries among black children. Results from these studies are too inconsistent to draw definite conclusions but suggest that Medicaid restrictions may adversely affect children.

Among the other possible impacts of Medicaid restrictions, studies found that the number of illegal abortions was relatively unaffected, although one death was directly related to restrictions and two were indirectly related.[32,33,36,40] Medicaid coverage of abortion is clearly associated with a higher number of abortion providers, but no causal relationship has been demonstrated.[14,17] Studies of impact on sexual behavior and sexually transmitted diseases found no effect but suffered from data limitations.[45–48] One researcher found an increase in suicide in states with Medicaid restrictions, but the result is implausible in view of the magnitude of the effect found and the low power of the research design.[49]

Finally, two studies indicated that the conversion of abortions to births through Medicaid restriction has unfavorable financial repercussions for state and federal Medicaid and social programs. Torres et al.[50] and Evans et al.[52] estimated that funding abortions would produce substantial public medical and welfare cost savings.

A recurring theme in this review is the weakness of data sources. It is often impossible to assess specific impacts on Medicaid-eligible women because detail on eligibility for this program is not publicly available or is not linked to data on births, abortions or both. Sources that do include individual-level income and other data (i.e., NLSY data) are in many cases known to underreport abortions and do not permit controls for unmeasured state characteristics (state fixed effects). Although short-term impacts of Medicaid restrictions have been demonstrated, the long-term impact is less clear and more difficult to measure because other correlated but unmeasured factors may influence trends in abortion rates and birthrates.

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TABLE 1. Selected characteristics of studies of the effects of restrictions on the use of Medicaid funds for abortion, 1979–2008

Author/ year	Area/study period	Outcome variables and data sources	Key findings	Summary assessment
Averett et al., 2002[48]	National; 1995	Probabilities of sexual activity and contraceptive use among women aged 15–19; NSFG	• Restrictions on Medicaid funding for abortions and other cost variables were not significant predictors of sexual activity or of contraceptive use at last intercourse.	• The study's cross-sectional design is subject to confounding by uncontrolled variables; that is, actual effects of the policy could be masked by other differences between restrictive and nonrestrictive states. • Because only a fraction of teenagers are eligible for Medicaid, effects of Medicaid policy on sexual behavior are likely to be small and difficult to detect.
Bitler and Zavodny, 2001[24]	All states with data; 1974–1997	Abortion rate; percentage and rate past 12 weeks; CDC	• Medicaid restrictions had little effect on the number or timing of abortions, although some specifications suggested that the restrictions were associated with a decrease in the percentage of second-trimester abortions.	• The findings regarding timing are plausible if the higher cost of these abortions forced women to continue their pregnancies. • The one model that found a paradoxical increase in the abortion rate associated with Medicaid restrictions incorporated a linear correction for within-state time trends that might not have been appropriate for trends that increased for several years and then decreased.

*Enjoined restrictions are legally prohibited from taking effect (i.e., are not enforced). *Notes:* Superscripted numbers refer to the reference list (see page 29). NSFG=National Survey of Family Growth. CDC=Centers for Disease Control and Prevention. AHA=American Humane Association. NCPCA=National Committee to Prevent Child Abuse. NLSY=National Longitudinal Survey of Youth. NCHS=National Center for Health Statistics. WISQARS=Web-based Injury Statistics Query and Reporting Systems. NAMCS=National Ambulatory Medical Care Survey. NHDS=National Hospital Discharge Survey. NNS=National Natality Survey. AFDC=Aid to Families with Dependent Children. WIC=Women, Infants and Children. DHEW=Department of Health, Education and Welfare.

Author/ year	Area/study period	Outcome variables and data sources	Key findings	Summary assessment
Bitler and Zavodny, 2002[42]	All states with data; 1976–1996	Reports of abuse and neglect of children aged 0–17; AHA and NCPCA	• Enjoined* Medicaid restrictions at the time of conception were associated with a decrease in substantiated reports of abuse in comparison with no restrictions. • Enforced restrictions had no effect in comparison with no restrictions.	• As the authors noted, the effects of restrictions are inconclusive. • Not all instances of child maltreatment are reported, and child abuse reporting requirements differ across states and could vary over time. • The age range, 0–17 years, extends past the age when most child abuse occurs.
Bitler and Zavodny, 2004[43]	All states with data; 1976–1996	Reports of abuse and neglect of children aged 0–17, receipt of social services, child deaths by cause; AHA, DHEW, NCHS and Uniform Crime Reports	• Both enforced and enjoined* Medicaid restrictions were associated with an increase in substantiated reports of child abuse in comparison with no restrictions. • Enforced restrictions were associated with child murder. • Restrictions were unrelated to unsubstantiated reports of abuse, use of social services or reports of possible abuse.	• The finding that both enforced and enjoined* restrictions were associated with abuse suggests uncontrolled confounding variables or faulty data. • Child homicide, which was associated with Medicaid restrictions, is measured more accurately. • The age range, 0–17 years, extends past the age when most child abuse occurs.
Blank et al., 1996[17]	49 states and District of Columbia; 1974–1988	Rate of abortion among female state residents aged 15–44; Guttmacher Institute	• Enforced Medicaid restrictions were associated with a 3% or 5% decline in the abortion rates of state residents, depending on the estimation method. Neither estimate was statistically significant. • Enjoined* restrictions were associated with a 6% increase in abortion rates. • Abortion rates according to state of occurrence were 13% lower in states with enforced restrictions and 6% lower in states with enjoined restrictions. • There was no association between a state's policy on Medicaid funding of abortion and the number of abortion providers.	• Two strengths of this study are that it covered the period before restrictions took effect and it controlled for state and year fixed effects. • Although the decline in the resident abortion rate of 3–5% was not significant, this plus the increased abortion rate associated with enjoined* laws lends support to the hypothesis that Medicaid restrictions reduce the abortion rate of low-income women. • Some findings were not robust or were difficult to explain.

Author/ year	Area/study period	Outcome variables and data sources	Key findings	Summary assessment
Bragonier et al., 1979[33]	24 hospitals in 14 states and District of Columbia; Oct. 1977–Jun. 1978	Deaths from CDC surveillance; reported abortion complications treated in the hospitals from hospital chart review before and after restriction	• One woman definitely died and two women probably died as a result of Medicaid restrictions. • Abortion complications did not increase in states that restricted Medicaid. • Medicaid-eligible women treated in nonfunding states had a 2.4-week later mean gestational age than non–Medicaid-eligible women; in funding states, there was no difference.	• A large increase in complications would have been detected. • The CDC surveillance indicated that some deaths occurred as a result of funding restrictions. • The authors found it difficult to measure and control for total state funding levels for abortions because some hospitals subsidized the cost of the procedure, thereby potentially mitigating the effect of state and federal restrictions. • The small numbers of hospitals in restrictive states and of women served in these hospitals limited the power of the study.
Cates et al., 1979[32]	24 hospitals in 14 states and District of Columbia; Oct. 1977–Jun. 1978	Reported abortion complications treated in the hospitals; hospital chart review before and after restriction	• Few women in states with Medicaid restrictions chose non–physician-induced or self-induced abortion. • Most of the women experiencing complications from such abortions were treated in hospitals along the Texas-Mexico border.	• The authors found it difficult to measure and control for total state funding levels for abortions because some hospitals subsidized the cost of the procedure, thereby potentially mitigating the effect of state and federal restrictions. • The small numbers of hospitals in restrictive states and of women served in these hospitals limited the power of the study.

Author/ year	Area/study period	Outcome variables and data sources	Key findings	Summary assessment
Chrissman et al., 1980[36]	Texas; 1975–1979	Abortion complications from hospital charts; number of Medicaid abortions and births in the state from the Texas Health Department	• After enactment of Medicaid restrictions, there was no increase in either the number or proportion of Medicaid-eligible women admitted to hospitals for abortion complications. • One woman died from complications of an illegal abortion. • An estimated 35% of women who would have had Medicaid abortions continued their pregnancies. • The birthrate increased 17% among Medicaid-eligible women and 2% among noneligible women.	• The authors acknowledged limitations in measuring the number of women who may have obtained illegal self-induced or non–physician-induced abortions. • The estimate of the percentage of Medicaid-eligible women who continued their pregnancies seems accurate.
Cook et al., 1999[38]	North Carolina; 1980–1993	Abortion rates and birthrates; individual abortion and birth records from state office of vital statistics	• Approximately 37% of pregnancies that would have resulted in an abortion had state funds been available were carried to term when these funds were cut off. • Abortion rates fell and birthrates rose. • The effect on these outcomes was greatest among black women aged 18–29.	• This study is one of the strongest evaluations of Medicaid financing restrictions on abortion in the literature. • The on-off nature of the restriction provided multiple "natural experiments." • The authors had excellent data on abortions and could link exposure to the funding cutoff precisely. • A limitation is that the study lacks visual evidence.

Author/ year	Area/study period	Outcome variables and data sources	Key findings	Summary assessment
Currie et al., 1996[16]	National; 1980–1989	Pregnancy outcomes; NLSY	• Medicaid restrictions were associated with a significant increase in the probability of a pregnancy being carried to term, by 3% for white women and 10% for their African American peers, and by 4% for high-income women and 5% for their low-income peers. • There was no effect of Medicaid restrictions on birth weight among women overall. • Enforced laws were significantly associated with reduced birth weight among African American women and high-income women. • Enjoined* laws were significantly associated with reduced birth weights among high-income women. • Only 18% of counties in restrictive states had an abortion provider, compared with 65% of counties in states with enjoined laws and 49% of counties in states without any restrictive policies.	• Abortions are underreported in all surveys, including the NLSY. Moreover, underreporting is greater among minorities and the poor. • There were no controls for state fixed effects. Thus, the authors used cross-state variation to identify effects of the law, and falsification tests suggest that unmeasured variables affected the results. • The magnitude of some of the effects is implausible.
Evans et al., 1993[52]	Michigan; fiscal year 1991	Births by Medicaid status, AFDC and Medicaid costs; Michigan Department of Social Services and Michigan Department of Public Health	• Infants born as a result of Medicaid restrictions cost the state's taxpayers $23–63 million, a number much larger than the estimated costs of abortions ($6–7 million).	• The estimates of additional births caused by Medicaid restrictions support the findings of other studies. • Even with a high margin of error, the calculations indicate that restricting Medicaid abortion funding is costly to the public.

Author/ year	Area/study period	Outcome variables and data sources	Key findings	Summary assessment
Haas-Wilson, 1993[14]	All states with data; 1985 and 1988	Abortion rates and ratios of minors and all women from CDC; abortion providers from the Guttmacher Institute	• The abortion rates per 1,000 births and per 1,000 women were much higher in states with Medicaid funding than in states that had restricted this funding, for both minors and adult women. • The average number of abortion providers per 10,000 women of childbearing age was more than twice as high in states that provided funding (0.76 vs. 0.35). • States where funding was unavailable had fewer hospitals, small clinics and private practice physicians that provided abortions compared with states having such funding, and services were concentrated in a few large clinics.	• The major shortcoming of the study is the cross-sectional design, which should not be used to draw causal interpretations. • Abortion rates may differ between states for many reasons; differences that the researcher attributed to differences in Medicaid financing restrictions likely reflected differences in other, hard-to-measure factors. • The use of CDC data likely led to an undercounting of abortions.
Haas-Wilson, 1996[28]	All states with data; 1978–1990	Abortion rates and ratios of minors and adult women; CDC	• Medicaid restrictions were associated with a 15% reduction in the ratio of minors' abortions to births and a 9% reduction in abortions to minors per 1,000 women aged 15–19. • By contrast, the restrictions were not associated with abortion rates or ratios for adult women.	• The author relied on the CDC's reports of abortions, which are generally believed to be incomplete, and she included all minors and not just those eligible for Medicaid. • There appear to be problems in the model or missing confounding variables. There is no theoretical reason to believe that Medicaid restrictions would affect minors more than adult women. • The period covered by the study included only a few changes in Medicaid policy, since most states cut off Medicaid abortion coverage in 1978, the first year of the study period.

Author/ year	Area/study period	Outcome variables and data sources	Key findings	Summary assessment
Haas-Wilson, 1997[23]	All states; 1978–1992 excluding 1983, 1986, 1989 and 1990	Abortion rate by state from the Guttmacher Institute; birthrate by state from NCHS	• In all models, Medicaid funding was associated with either no change or a statistically significant reduction in the abortion rate of 2% or less; there was no effect on the birthrate. • The magnitude of the effect of the restriction decreased over time after restrictions were enforced. • The author concluded that women's reproductive decisions are not significantly influenced by abortion funding restrictions and that the decreasing impact of restrictions over time was due to Medicaid-eligible women being prepared and able to find alternate sources of funding.	• An important limitation of the study is the lack of variation in the Medicaid funding of abortions with which to identify effects of the funding restriction. This may explain the lack of any decline in the abortion rate associated with the Medicaid policy.
Hansen, 1980[13]	All states with data; 1976	Number of abortions; CDC	• Medicaid funding for abortion was strongly positively associated with abortion rates.	• A positive aspect of the study was the author's attempt to apply path analysis (described in the text) to capture the complicated interplay between factors related to state abortion rates. • However, the study was still cross-sectional, and the author was unable to control for many variables associated with differences in state-level abortion rates. • The dependent variable—Medicaid expenditures for abortion per 1,000 women of reproductive age—is an imperfect measure of abortion policy at a time when all states theoretically paid for Medicaid abortions.

Author/ year	Area/study period	Outcome variables and data sources	Key findings	Summary assessment
Henshaw and Wallisch, 1984[41]	One clinic in St. Louis, Missouri; 1977 and 1982	Abortions by Medicaid status and gestational age, from computerized clinic records; reasons for delay from patient interviews	• Although most Medicaid-eligible women did not report a delay when funding was restricted, the average delay due to financial hardship was 2–3 weeks. • Approximately 22% of Medicaid-eligible women who had second-trimester abortions were delayed into that period by lack of Medicaid funding. • Some 42% of Medicaid-eligible women, compared with only 10% of Medicaid-ineligible women, said they delayed their pregnancy test or their abortion for financial reasons.	• Although this study was based on data from only one clinic, its finding of a three-day average delay supports the similar finding of Trussell et al.[34]
Kane and Staiger, 1996[29]	All available counties; 1973–1988, excluding 1983 and 1986	Birthrate of women aged 15–19; NCHS	• Although some specifications showed a decrease in teenage birthrates due to Medicaid restrictions, the restrictions had no clear effect on this measure because their impact was hard to distinguish from a general downward trend.	• Using counties as the unit of analysis is a potentially valuable approach. However, other studies have found that results were strongly affected by allowing for unit-specific linear trends, in this case county-specific trends. • Trends in rural counties, which make up most of the counties in the restrictive states, could differ from those in the more urban counties in the Medicaid-funding states.

Author/ year	Area/study period	Outcome variables and data sources	Key findings	Summary assessment
Klick, 2005[49]	All states with data; 1981–1998	Rates of suicide among women aged 25–64; NCHS Compressed Mortality File	• Medicaid restrictions were associated with an increase in suicides among women of about 7%. • Mandatory counseling and waiting periods were associated with a 10% reduction in this outcome.	• The findings that mandatory counseling and waiting periods protect against suicide, but that Medicaid financing restrictions increase suicide are contradictory and go unexplained. • The author unnecessarily excluded teenagers and young women and unnecessarily included women aged 45–64, who are unlikely to be affected by Medicaid policies. • It seems etiologically doubtful that Medicaid restrictions could have a measurable impact on suicide rates.
Korenbrot et al., 1990[35]	Colorado, North Carolina and Pennsylvania; 1982–1987	Number of abortions and live births among state residents; state health departments	• The proportion of reported pregnancies resulting in births rather than abortions increased from two to six percentage points in the study states after Medicaid restrictions took effect. • Among teenagers, the increase ranged from one to eight percentage points.	• A strength of the study is that it reported trends over the three years immediately spanning the policy change rather than over a longer period during which other factors could have affected trends in births and abortions. • However, the study was largely without estimates of what the trend would have been in the absence of the Medicaid cutoff. • The authors relied on abortion reporting by state health departments, which is often incomplete.

Author/ year	Area/study period	Outcome variables and data sources	Key findings	Summary assessment
Levine et al., 1996[18]	All states with data; 1977–1990	Abortion rates from Guttmacher Institute; birthrates from NCHS; individual-level data from NLSY	• The abortion rate fell by about 6% in states where Medicaid restrictions were enacted during 1977–1988; when state-specific trend variables were included, the decline was 3%. • The effect of the restrictions on the birthrate varied across models; the authors concluded that birthrates will either remain unchanged or fall slightly in response to funding restrictions on abortions.	• The study is widely cited. A strength is that the authors present basic time-series plots. • However, coding of the Medicaid variable is questionable, and the nonrestrictive states were not really comparable to the restrictive states. • The authors also used individual-level data from the NLSY to confirm the results obtained with aggregate data. Although the NLSY underreports abortion, it contains a rich set of controls including household income. • The impossibility of using state-fixed effects in the NLSY model is a considerable limitation since identification of the restriction includes comparison across states; cross-state comparisons are vulnerable to confounding. • The finding that birthrates fell as much as abortion rates in response to Medicaid restrictions is implausible.
Lundberg and Plotnick, 1990[27]	National; 1979–1986	Abortion and pregnancy rates of teenagers aged 14–16; NLSY	• Restrictive Medicaid policies reduced the likelihood of pregnant teenagers having an abortion.	• The study is innovative for its use of a nested logit model to allow for correlation among the three equations pertaining to pregnancy, birth and marriage. • However, the sample was small and the study may therefore not have had sufficient statistical power to detect the effect of states' policies on so few outcomes. • The authors relied on cross-state variation in state policies, but it is not clear if the association represents the effect of the policy or differences in attitudes toward abortion among teenagers in culturally different states. • Despite these limitations, the study is important as an application of a potentially promising statistical methodology.

Author/ year	Area/study period	Outcome variables and data sources	Key findings	Summary assessment
Matthews et al., 1997[22]	National; 1978–1988	Abortion rates and birthrates of women aged 15–44; Guttmacher Institute and national vital statistics	• The effect of Medicaid restrictions was sensitive to the inclusion of state-specific trends. • Without state trends, the restrictions were associated with a 6% decline in state abortion rates ($p<.05$), but with the trends, there was a statistically nonsignificant 3% decline. • Without state trends, the restrictions were associated with a 2% decline in state birthrates, but with these trends, there was no significant effect.	• The study is appealing for its straightforward approach. • The authors used abortion by state of residence instead of by state of occurrence, and they controlled for a large set of state characteristics. • They also analyzed birthrates. • Results are shown with and without state-specific trends. • The authors did not try to oversell marginally significant estimates. • However, there was limited variation in the Medicaid funding measure over the study period.
Medoff, 1999[30]	All states with data; 1980 and 1992	Abortions among teenagers from Guttmacher Institute; births to teenagers, source not given	• Teenage women had 46–54 more abortions per 1,000 pregnancies in states that funded Medicaid abortions.	• Despite the inclusion of a number of variables associated with abortion, cross-sectional studies cannot adequately control for factors associated with both abortion rates and policies to restrict abortion. • The analysis was based on estimated abortion data for some states.
Medoff, 2007[25]	All states with data; 1982, 1992 and 2000	Abortion ratio; Guttmacher Institute	• Medicaid restrictions were associated with a reduction in the proportion of pregnancies ending in abortion from 26% to 23%. • With the restrictions, there were 33–38 fewer abortions per 1,000 pregnancies, depending on the model, among women of all ages and 61–69 fewer per 1,000 pregnancies among minors.	• There was relatively little change in Medicaid funding over the study period. • Identification of the effect of Medicaid funding restrictions came from differences between states, a strategy that is vulnerable to confounding. This suggests that the author was really confounding hard-to-measure differences between states with effects of the law.

Author/ year	Area/study period	Outcome variables and data sources	Key findings	Summary assessment
Medoff, 2008[26]	All states with data; 1980, 1990 and 2000	Number of abortions from the Guttmacher Institute; number of births from the Census Bureau	• Restriction of Medicaid funding did not appear to have an impact on the pregnancy rate of all women or of teenagers.	• Similar to an earlier study by Medoff,[25] this study has problems in the identification of the effect of Medicaid funding restrictions.
Meier and McFarlane, 1994[8]	All states; 1982–1988	Abortion rate from Guttmacher Institute and CDC; teenage birthrate, low birth weight, premature births, late prenatal care, infant mortality and neonatal mortality from NCHS	• Medicaid restrictions were associated with a 42% decrease in the rate of abortions that would have been funded through the program. • The restrictions were associated with an increase in the teenage birthrate. • There was a 0.024–percentage point reduction in the percentage of low-birth-weight babies, a 0.027–percentage point reduction in the percentage of premature births and a 0.263–percentage point reduction in the percentage of births with late or no prenatal care for each additional funded abortion per 1,000 women aged 15–44. • There was no effect on neonatal or infant mortality.	• The possibility that state-level factors other than Medicaid restrictions affected abortion rates cannot be ruled out. • The use of the Medicaid funding rate may introduce a spurious correlation in that states with a high abortion rate are likely to have a high rate of Medicaid-funded abortions. • The authors controlled for fixed effects in some but not all states, and there were no controls for state-specific trends in the abortion rate.
Meier et al., 1996[9]	All states; 1982–1992	Abortion rate of women aged 15–44; Guttmacher Institute and CDC	• The rate of Medicaid-funded abortions, included as a control variable in the regression analyses, was positively associated with the abortion rate.	• The use of the Medicaid funding rate may introduce a spurious correlation in that states with a high abortion rate are likely to have a high rate of Medicaid-funded abortions. • The attempt to control for fixed effects by including the lagged abortion rate in the regression analyses was inappropriate because it should be associated with changes in other variables rather than their absolute values.

Author/ year	Area/study period	Outcome variables and data sources	Key findings	Summary assessment
Morgan and Parnell, 2002[39]	North Carolina; 1988–1995	Individual records of abortions and births; state office of vital statistics	• The proportion of women eligible for funded abortions who carried their pregnancies to term when funding was unavailable ranged from 29% to 68% among white women, depending on age, and from 17% to 29% among black women.	• The study used excellent data and analytical methods. • The authors note that women may have been influenced by the social service network that referred poor women to abortion services as well as by the financial assistance.
New, 2007[31]	All states with data; 1985–1999	Abortion rate of minors; CDC	• Medicaid restrictions were associated with a 23% reduction in the abortion rate of minors.	• The results were based on policy changes in only six states, two of which were misclassified as providing abortion funding.
Rubin et al., 1979[40]	One metropolitan areas of Texas; Aug. - Dec., 1976 and Aug.- Dec. 1977	Abortion data; interviews with abortion providers	• The number of abortions performed in the facilities rose 9% after funding was cut off; meanwhile, the total number of subsidized abortions fell 31%. • Some 36% of "expected" abortions were not performed. • No change in birth patterns or the number of reported complications from illegal abortions was found.	• It is not clear that "subsidized abortions" were a good measure of the number of women having abortions after the Medicaid cutoff. • The details of the analysis of trends in births were not shown, so there is no way to estimate the power of the calculation. • A 31% drop in the number of subsidized abortions would have a relatively small impact on the number of births even if all the pregnancies had been carried to term, so it is not surprising that no effect was found.
Sen, 2003[46]	National except for North Carolina; 1975–1995	Gonorrhea rates; CDC	• There was no evidence that Medicaid restrictions significantly reduced gonorrhea rates. • The author interpreted this to mean that Medicaid restrictions had little effect on sexual activity rates.	• Gonorrhea rates are incompletely reported, and reporting fluctuates from year to year. • These rates are an imperfect measure of pregnancy prevention behavior, which may involve nonbarrier contraceptive methods, such as hormonal methods, as well as condoms and abstinence.

Author/ year	Area/study period	Outcome variables and data sources	Key findings	Summary assessment
Sen, 2003[45]	All states with data; 1975–1995	Gonorrhea rates; CDC	• There was no evidence that Medicaid restrictions significantly reduced gonorrhea rates; hence, they do not promote pregnancy avoidance behaviors.	• Gonorrhea rates are incompletely reported, and reporting fluctuates from year to year. • These rates are an imperfect measure of pregnancy prevention behavior, which may involve nonbarrier contraceptive methods, such as hormonal methods, as well as condoms and abstinence.
Sen, 2006[47]	National sample; 1997	Sexual activity rate of women aged 15–17; NLSY	• Restrictions on Medicaid funding were not associated with sexual activity.	• The model controlled for many state as well as individual characteristics. • However, the results could be distorted by uncontrolled differences between states that fund and restrict Medicaid coverage of abortion.
Sen, 2007[44]	All states; 1981–2002	Child abuse rates; WISQARS	• In the most complete model, restrictions did not have a statistically significant impact among white children. • By contrast, among black children, the lack of Medicaid funding was associated with an increase of 15% in unintentional fatal injuries of any type and an increase of 17% in unintentional fatal injuries excluding motor vehicle accidents. • The result for homicide was not statistically significant.	• An effect among black but not white children is plausible since black women tend to have lower incomes and are more affected by Medicaid policies. • Nevertheless, the association between state policies and rare outcomes is vulnerable to spurious associations since only a few additional deaths in a state around the time of the policy can generate an association. • In addition, it is not clear that the author has estimated the standard errors correctly, which can also lead to type I errors (an unwarranted rejection of the null hypothesis).

Author/ year	Area/study period	Outcome variables and data sources	Key findings	Summary assessment
Sheier and Tell, 1980[37]	Illinois; 1976–1978	Medicaid-funded abortions and births; public state fiscal data	• Approximately 8,435 Medicaid-eligible women in Illinois paid for abortions themselves when funding was unavailable. • The birthrate among Medicaid-eligible women rose by 12%. • Viewed another way, of the 11,142 women who could not get Medicaid-funded abortions, 24% continued their pregnancies.	• A strength of this study is the clear increase in the Medicaid birthrate. • Among the important assumptions is that the Medicaid pregnancy rate increased at the same rate as the state's, and that women did not make greater efforts to prevent pregnancy in response to the Medicaid cutoff.
Torres et al., 1986[50]	All states; 1985	Number of abortion patients and level of expenditures for abortion services, Medicaid maternity care services and infant care costs, from the Guttmacher Institute; data to estimate the amount of medical care provided to the average child from the NAMCS, the NHDS and the NNS; data to determine amount of fiscal benefits to a family from AFDC and WIC	• Permitting the use of state and federal funds to pay for abortions would result in federal and state medical and social welfare savings of $435–540 million over two years. • This is 4.3–4.6 times more than the funding needed to cover abortions for Medicaid-eligible women during the same time period.	• This study assumed that 20% of the abortions that would have been funded by Medicaid are instead carried to term when funding is unavailable.

Author/ year	Area/study period	Outcome variables and data sources	Key findings	Summary assessment
Trussell et al., 1980[34]	Georgia, Ohio and Michigan; Feb.–Jul. 1977 and Feb.–Jul. 1978	Medicaid abortions and births, from state vital statistics offices; abortions to Medicaid-eligible women from surveys of patients and providers	• Some 23% of Medicaid-eligible women in Ohio and 18% of those in Georgia who would have had an abortion if there were Medicaid funding did not do so. • Women in Ohio who were eligible for Medicaid received abortions three days later, on average, than those who were not eligible. • There was some evidence of financial hardships among women seeking abortions.	• The authors faced challenges in identifying and categorizing Medicaid-eligible women who had abortions after the funding cutoff. • Although similar findings for the two states lend credibility, the study depended on the accuracy of data collected from abortion providers, the assumption that the funding cutoff did not cause women to make greater efforts to prevent pregnancy, and the assumption that decreases in births to Medicaid-eligible women would have been substantially greater than the observed decline in the absence of the funding cutoff.
Wetstein, 1995[15]	National; 1966–1992	Ratio of abortions to births; CDC and Guttmacher Institute	• Medicaid restrictions did not have any statistically significant impact on the national abortion rate.	• The study is essentially a pre-post analysis at the national level with no comparison group. • The proportion of women nationally affected by the funding cutoff was relatively small considering that California, New York and other states with high abortion rates continued to fund Medicaid abortions. • The author correctly concluded that the effect of policy changes is best studied at the state level.

*Enjoined restrictions are legally prohibited from taking effect (i.e., are not enforced). *Notes:* Superscripted numbers refer to the reference list (see page 29). NSFG=National Survey of Family Growth. CDC=Centers for Disease Control and Prevention. AHA=American Humane Association. NCPCA=National Committee to Prevent Child Abuse. NLSY=National Longitudinal Survey of Youth. NCHS=National Center for Health Statistics. WISQARS=Web-based Injury Statistics Query and Reporting Systems. NAMCS=National Ambulatory Medical Care Survey. NHDS=National Hospital Discharge Survey. NNS=National Natality Survey. AFDC=Aid to Families with Dependent Children. WIC=Women, Infants and Children. DHEW=Department of Health, Education and Welfare.

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