GAINING GROUND
The Impact of Medicaid and WIC on Infant Mortality

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This research provides a statistical estimation of the impact of the Medicaid and WIC programs on the infant mortality rate in the United States. These programs are designed to improve the health of poor people by increasing access to traditional medical care and by improving the nutritional values of diets. Using a quasi-experimental, time-series analysis, program impacts are estimated for all infants, white infants, and nonwhite infants. The results suggest that these federal programs are responsible for a 20,000 to 35,000 annual reduction in infant deaths.

The infant-mortality rate, a key indicator of national health, has not been a source of American pride. While U.S. infant mortality is low by worldwide standards, it is only average among industrialized nations. In 1980, Australia, the United Kingdom, Spain, the Netherlands, East Germany, Japan, and Singapore were among the nations with lower rates than the United States. Sweden's infant-mortality rate was less than half that of the United States. The poor showing of the United States, a nation with high *quality* health care, is attributed to variation in the *availability* of health care. Universal access to health care has been limited in this country because population is widely dispersed and wealth is unequally distributed.

Increasing access to health care was a goal of several government policies established during the 1960s. Beginning with the Kerr-Mills Act of 1960 and continuing through Medicare and Medicaid in 1965, legislation targeted economic barriers to

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adequate health care.[1] These programs were part of the wider War on Poverty designed to improve the economic lot of lower income Americans.

This article considers whether or not certain health-care programs have improved the health of Americans. Specifically, using the infant-mortality rate as an indicator of health-care quality, we assess the impact of programs designed to provide greater access to health care among pregnant women. The programs hypothesized to affect infant mortality are the Special Supplemental Food Program for Women, Infants, and Children (commonly called WIC) and the Medicaid program.

HEALTH CARE BEFORE THE GREAT SOCIETY

The improvement in health-care quality in the United States and the Western world is one of the great accomplishments of modern civilization. Life expectancy has doubled since the adoption of the Constitution and has increased by almost 50% since the turn of the century. Infant-mortality rates were nearly 10 times higher in 1900 than they are now. As the quality of health care increased, however, it became evident that the availability of quality care was unevenly distributed.

A nationwide survey on medical care in 1963 found that nonwhites were twice as likely to have never seen a physician as whites were. Systematic differences in medical care were also related to place of residence. Individuals living in farm communities and those living in large urban areas were less likely to receive hospital care than were those living in smaller urban areas and small towns (Andersen and Anderson, 1967: 10-47). This survey suggested that both the quantity and the quality of health care varied considerably from person to person.

A major covariate of access to health care is income. Poorer people have traditionally lacked the same access to health care that wealthier people have had. In 1963 three times as many people with incomes of less than $4,000 had never seen a physician compared to individuals with incomes greater than $7,000. In

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addition, higher-income respondents were nearly twice as likely to have seen a specialist. Among upper-income pregnant women, 88% reported seeing a physician during the first trimester of pregnancy, but only 58% of lower-income women did (Andersen and Anderson, 1967: 10-47). The investigators concluded (p. 150) that despite improvements, lower-income individuals "continue to lag behind higher income groups in use of [some] health services."

Prior to the federal poverty programs, the disadvantages of lower-income individuals were exacerbated by differences in the distribution of third-party payers of medical care. Health-insurance plans were far more common among middle- and upper-income families than among lower-income families. In 1963 only half of low-income Americans had third-party medical coverage while nearly three-fourths of the nonpoor had coverage (Taylor, 1985: 17). The situation was not pleasant: lower-income people were less healthy, less able to pay for their own medical services, and less likely to be covered by third-party payers than were higher-income individuals.

AMERICA'S RESPONSE: THE WAR ON POVERTY

The health-care problems of the poor were addressed as part of a more general government attempt to assist the poor—the War on Poverty. In the area of health care, the battle was fought on two fronts. First, attempts were made to improve the health of lower-income Americans. The thrust of that attack was found in food, nutrition, and educational programs. The second front was to provide greater availability of medical care and was waged through the Medicare and Medicaid programs.

Attempts to aid the needy were focused in two basic classes of programs: general programs designed to provide minimal-subsistence support to the poor and targeted programs aimed at the special needs of those least able to care for themselves. Obviously a number of programs fall into each category; but, in the category of programs providing general support, the one of primary

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relevance here is the Medicaid program.[2] Medicaid was designed to increase the access of poor people to medical care and to provide that care within the mainstream of American medicine (Marmor, 1983: 158). These goals have not been uniformly attained, but poor people are getting more care (e.g., hospital stays or visits to physicians) than they were prior to Medicaid (Marmor, 1983: 158-159; Roemer, 1982: 116; Thompson, 1981: 148-153).

Programs aimed at a general clientele were judged to be insufficient for the special health needs of those least able to control their own well-being: the very young, the elderly, and the disabled. Infants, in particular, were targeted by a 1972 program called the Special Supplemental Food Program for Women, Infants, and Children, more commonly known by the partial acronym, WIC. The WIC program was designed to improve the diets of pregnant women, newborns, and young children.[3] The WIC program provides food assistance and educational programming aimed at needy pregnant women, women in the postpartum period, and infants and children up to age five. The objectives are better fetal development, adequate nutrition during the period of lactation, and adequate nutrition during the crucial early childhood period of development. If successful, infant mortality should decrease while the health and development of infants should improve.

CRITICISMS OF THE WAR ON POVERTY

Recently the idealism of those who developed and promoted programs such as these has been replaced by cynicism regarding their value. While the bases of the criticisms are far from uniform, diatribes against Great Society programs have become a growth industry. Some critics suggest that we are not getting what we pay for while others argue that we simply cannot afford the current level of welfare support. One recent criticism with much currency is that social programs are counterproductive; they hurt the people that they are designed to help. The incentive structure, it is argued, was altered by the Great Society social programs to the

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point that individuals found it more conducive to be poor than to try to overcome poverty. "We tried to provide more for the poor," argues Charles Murray (1984: 9), "and produced more poor instead. We tried to remove the barriers to escape poverty, and inadvertently built a trap."

Criticism of the Great Society is also plentiful at the program level. Virtually every social program has come under scrutiny and received negative comment. These critical evaluations usually take a similar form: The goals of the program were not sufficiently defined, political rhetoric unrealistically raised expectations, program-cost estimates were grossly low, and the bureaucratic framework was unwieldy (see below).

Of the two programs under consideration in this article, the Medicaid program has been more negatively evaluated. Stevens and Stevens (1974) argued that Medicaid was replete with problems that left it, at best, a mixed success. Undoubtedly, medical care was provided in cases where it otherwise would not have been (see also Davis and Schoen, 1978: 65-66), but the provision of care was expensive and uneven. If the goal of Medicaid was to provide "comprehensive health care to the medically indigent, [it was] not realized" (Stevens and Stevens, 1974: 360-361; see also Blendon and Moloney, 1982; Thompson, 1981: 109-153).[4]

We do not mean to imply that Medicaid has had no success, only that the degree of success is debatable. Criticisms generally take one (or both) of two forms: (1) that the provision of services is spotty, and (2) that service tends not to be in the mainstream of American medicine. On the first point, with state-determined criteria, many individuals, particularly in the south, were denied medical benefits. Texas, for example, covered only one-quarter of its people who lived in poverty (compared to over one-half nationally) and offered only 13 of the 32 optional services (Bovbjerg and Holahan, 1982: 17). Davis (1975: 47) found that black recipients received only 75% of the benefits that white recipients did and that the rural poor faced special problems receiving aid (Davis, 1979: 355).

Medicaid recipients also have made, at best, uneven progress toward receiving care in the mainstream of American medicine.

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They are less likely to have personal physicians and more likely to be treated in clinics that are operated by less well-trained physicians (Davis, 1975: 156). Another set of researchers found that Medicaid recipients are more likely than other health-care recipients to be cared for by graduates of foreign medical schools, a medical education considered inferior by many (Studnicki et al., 1979).

To a lesser extent, the WIC program has also been criticized. The chief complaint has been the inability to reach everyone who needs to be served by the program (General Accounting Office, 1984), but others question whether its goals are sufficiently defined and whether we are getting an adequate return for the expenditures. Senator Jesse Helms, in his opening salvo over whether the WIC program should be reauthorized in 1984, made both points:

> Frankly, I would be hopeful that after 10 years, there would be more supportive and conclusive evidence to demonstrate whether or not this program is worth more than $1 billion of the taxpayers' money each year... [and] another concern which I have—and this one deals with the actual program operation—is whether the program is being sufficiently targeted to those women, infants, and children from the poorest families and those in the greatest nutritional need [Hearings before the Committee on Agriculture, 1984: 2].

Helms specifically asked the General Accounting Office to address the question of whether or not there was sufficient evidence to demonstrate that the WIC program was effective. The GAO concluded that existing research did not permit an answer saying that they found "no conclusive evidence of any kind about WIC's success or failure" (General Accounting Office, 1984; but see Forman, 1980).

The impact of the WIC program and of Medicaid remains an empirical question. Both the resources expended and the general debate over the utility of such social programs indicate the need for additional analysis. This research is designed to answer one question about these programs: whether or not they affect the infant-mortality rate.

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A MODEL TO EXAMINE INFANT MORTALITY

Public programs, of course, are not the only factors that affect infant mortality. Infant mortality has a variety of causes including genetic problems of the infant, health problems of the mother, multiple births, poor medical care, inadequate prenatal care and nutrition, and low birth weight. Many infant deaths cannot be prevented by any government or private action, but good medical care can prevent or compensate for a substantial portion of the causes of infant mortality. The best way to overcome many potential health dangers is good and frequent medical attention and good health practices, especially a nutritional diet. In the aggregate, then, the rate of infant mortality is a function of both the quality of medical and health care and the availability or delivery of each of them. Our model, therefore, includes a general factor for the increasing quality of care plus factors to consider the effects of the program to broaden the delivery of medical care (i.e., Medicaid) and the program to improve health and nutrition (WIC).

HEALTH-CARE IMPROVEMENTS

General improvements in the quality of health care should lower the infant-mortality rate. Numerous potential health problems of pregnant women are routinely screened and often treatable. Tests are now used to determine and treat anemia, diabetes, hypoglycemia (low blood sugar), hypotonia (abnormally low muscular tension), and pre-eclampsia (buildup of toxic substances in the blood supply; see Babson, et al., 1975; Lewis et al., 1973; Behrman, 1977; and Institute of Medicine, 1973). New monitoring devices, notably amniocentesis (Naeye, 1985) and ultrasound (Blackman and Hein, 1985), have enabled physicians to follow the development of the fetus better and to identify potential problems that were not identified in the past. Delivery techniques have improved; the increased use of Caesarian sections has enhanced the odds of certain newborns (Williams, 1982). Fetal monitoring devices cue physicians and nurses to problems with a delivery in time to save an endangered fetus. After birth,

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better and more developed intensive care facilities have proved themselves to be valuable in the fight against perinatal death (Babson, et al, 1975; Behrman, 1977; Holmes et al., 1984; and Stahlman, 1984).[5]

If health-care improvements were simply the result of a few specific, sudden improvements, our model could use interruption variables to tap their impact. In health care, however, we have seen many changes and the gradual dissemination of those changes to the point that the pattern resembles a secular trend of improved medical treatments. The general trend of health-care improvements will be operationalized by a trend variable coded 1 for 1951 and increasing sequentially to 32 for 1982. Such a procedure may allocate a portion of the improvement in infant mortality rates to general improvements in health care that otherwise might be attributed to Medicaid or the WIC program. The introduction of a trend variable is consistent with other time-series policy analyses (Lewis-Beck, 1986: 213; Lewis-Beck and Alford, 1980; Meier, 1980).

INCREASING ACCESS TO MEDICAL CARE: MEDICAID

Medicaid has a different impact on infant mortality than the general improvements in the quality of health care. Medicaid essentially increases the access of poor people to medical care.[6] Program growth has been substantial. Program expenditures totaled $22.6 billion in Fiscal Year 1985.

The growth in Medicaid implies that access should have increased substantially. Our model, in turn, suggests that increased access should result in a decrease in infant mortality. To test that hypothesis, we include Medicaid spending in our model. Specifically, we will measure Medicaid expenditures (including Kerr-Mills expenditures) in millions of dollars. The data were taken from the *Historical Tables, Budget of the United States Government Fiscal Year 1986.* Program expenditures were adjusted for inflation by converting them to constant 1967 dollars using the health-care deflator found in the *Statistical Abstract of the United States.*

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INCREASED ACCESS TO HEALTH AND NUTRITION: WIC

Finally, our model suggests that better health and nutrition should influence rates of infant mortality. The WIC program is designed to address nutrition problems by increasing both the understanding of good health practices and the availability of a nutritional diet. By providing adequate nutrition to expectant mothers and to children, WIC strives to reduce premature births and to increase birth weight, both of which are correlated with a reduction in infant mortality. To test that linkage, our model includes program spending for WIC. These data are operationalized in the same manner as the Medicaid data (in millions of 1967 dollars) except that the cost of food deflator was used for WIC expenditures. WIC expenditures in Fiscal Year 1985 were $1.49 billion.

THE ANALYSIS OF THE MODEL

The method of analysis used to determine the impact of the Medicaid and WIC programs on infant mortality is a time-series analysis of data from 1951 to 1982 (the most recent year that infant-mortality figures have been reported by race). The starting point was selected because infant-mortality rates are greatly affected by wars and somewhat affected by birth rates. Starting in 1951 avoids the problem of filtering out the impacts of World War II and the birthrate explosion immediately following the War.

The infant-mortality rate is defined as the number of deaths of infants less than one year old per 1,000 live births. Three infant-mortality rates are used: the rate for all infants, the rate for white infants, and the rate for nonwhite infants.[7] Data are from the U.S. National Center for Health Statistics, *Vital Statistics of the United States*. The overall reduction in the U.S. infant mortality rate is shown in Figure 1.

A regression equation of the following form will be estimated:

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$$Y = a + b_1 (Year) + b_2 (Medicaid) + b_3 (WIC)$$

where Y is the infant mortality rate, Year is the trend variable for health improvements, Medicaid is the Medicaid expenditures in millions, WIC is the WIC expenditures in millions, and b_1, b_2, b_3 are regression coefficients.

This equation cannot be estimated using ordinary least squares because time-series data often have correlated errors, thus violating one assumption of ordinary least-squares regression (see Appendix). Correlated errors make the estimates of the regression coefficients ineffecient so that coefficients appear to be significant when they actually are not (Wonnacott and Wonnacott, 1970: 136-140; Lewis-Beck, 1986: 231). All three equations had significant first-order autocorrelation. To correct the estimation problems, all coefficients were reestimated using pseudo-generalized least squares (Hibbs, 1974).[8]

Table 1 estimates our model for all infants. For this measure of infant mortality, the historical trend representing health-care improvements shows an annual reduction of .239 in the infant-mortality rate. Both program-expenditure variables are statistically significant. For every one million dollars spent on Medicaid, the infant-mortality rate drops by an additional .00147.[9] Similarly, the WIC program has a significant negative impact on infant mortality; each additional million dollars of WIC expenditures reduces the infant mortality rate by .00326. That the WIC coefficient is twice as large as the Medicaid coefficient should not be surprising since the WIC program is specifically targeted at infant-mortality problems whereas the Medicaid program is not. The WIC impact, in fact, is probably even greater than the estimate since only 21% of WIC funds are allocated to the prenatal program; the remainder go to provide food to children up to age 5, a program with a smaller impact on infant mortality (Foreman, 1980: 8).

The impact of federal expenditures differs by race. For whites (shown in Table 2) the health-care trend reduces the infant-mortality rate by .278 a year, a statistically significant reduction. Medicaid and WIC also have significant impacts. For every one million dollars spent on Medicaid, the white infant-mortality rate

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Figure 1: The Infant-Mortality Rate in the United States, 1951-1984

drops by an additional .001048. Although the drop for whites is not as large as the overall drop, this is to be expected since access to health care in the white community was greater before Medicaid. For every one million dollars spent on the WIC program, the white infant-mortality rate drops by .00290. The impact of the WIC program on whites is three times the impact of the Medicaid program per million dollars, consistent with the targeting of WIC to infant-mortality problems. We should also

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TABLE 1
The Impact of Medicaid and WIC on Infant Mortality

Independent Variable	Slope	T-score	p
Year	-.2390	8.25	.0001
Medicaid	-.001476	10.34	.0001
WIC Program	-.003266	2.39	.0241
R^2 = .99	Intercept = 28.32		

TABLE 2
The Impact of Medicaid and WIC on Infant Mortality by Race

WHITE INFANTS			
Independent Variable	Slope	T-score	p
Year	-.2789	10.62	.0001
Medicaid	-.001048	8.06	.0001
WIC Program	-.002905	2.33	.0275
R^2 = .99	Intercept = 25.68		

NONWHITE INFANTS			
Independent Variable	Slope	T-score	p
Year	-.3350	4.40	.0001
Medicaid	-.003231	8.62	.0001
WIC Program	.000277	.08	.9390
R^2 = .98	Intercept = 45.84		

note that the impact of WIC on white infants is about the same as the impact on all infants.

The infant-mortality rate for nonwhites follows a different pattern than that for whites. The impact of the health-care

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improvement trend is much steeper for nonwhites (–.335), an expected result given the larger drop in nonwhite infant-mortality rates during this time period. Medicaid also had a significant negative impact on nonwhite infant-mortality rates. For each additional million dollars in Medicaid expenditures, nonwhite infant mortality drops by .00323. The decline in nonwhite infant mortality associated with Medicaid expenditures is three times the impact for whites, consistent with the lower usage of health care for nonwhites before Medicaid. Finally, the WIC program does not have a statistically significant impact on nonwhite infant mortality; the coefficient is as close to zero as possible.

The absence of a relationship between WIC expenditures and nonwhite infant mortality requires some investigation. The absence of a relationship is a function of program implementation decisions. WIC funds are allocated to the states by a formula that guarantees each state agency the amount they received the previous year plus inflation. If any additional funds are available, they are allocated to states based on the number of eligible individuals (based on poverty figures), infant mortality, and low birth-weight babies. Because this formula rewards states that were aggressive in the early years of the WIC program, WIC funds are inequitably distributed. The proportion of eligible population served in the 50 states ranges from 18% to 78% (*Federal Register,* September, 9, 1986: 32092-5).

We can illustrate the impact that this funding formula has on nonwhite population with a cross-sectional analysis of WIC allocations to the states for fiscal years 1982 through 1984. As

TABLE 3
Regression of State Per Capita WIC Funds

Independent Variables	Slope	T-score	p
Percent of Population in Poverty	.299	5.14	.0001
Percent Nonwhite	-.029	1.71	.0933
R^2 = .36	Intercept = 1.15		
N = 50			

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with most federal programs (Copeland and Meier, 1984), a large portion of WIC funding allocations can be explained by population alone, in this case 89% of the variation. With the effects of population removed, a regression of per capita WIC allocations on poverty and percent nonwhite population are shown in Table 3. According to the regression equation, each state is allocated $1.15 per capita annually plus an additional $.30 for each percent of their population living below poverty. The equation also shows that for each percent of nonwhite population, a state receives three cents *less* per capita.[10]

The formula allocation clearly does not take into account the greater needs of the nonwhite population in combating infant mortality.[11] The black community, for example, has several high-risk characteristics that would suggest a greater allocation to states with large nonwhite population. The birth rate for black women aged 14-19 (a high-risk age) is 2.4 times greater than the rate for white women. The birth rate to black unmarried women is four times that for white unmarried women. A young, unmarried mother is more likely to delay getting health care, especially information concerning nutrition. The result will be more problems with low birth weight infants and greater infant mortality. Although some of our analysis is speculative, clearly WIC funds could be targeted better.[12]

OVERALL IMPACT

The small coefficients reported in Tables 1 and 2 should not obscure the magnitude of impact that the federal programs have had. If one uses Medicaid expenditure figures for 1981 and 1982 (both years are used because Medicaid funds were reduced in 1982)[13] to estimate the reduction in infant mortality and then applies this reduction to the total number of infant deaths, an estimate of the additional infants surviving can be made. We estimate that Medicaid expenditures reduced infant deaths nationwide by 24,533 in 1981 and 22,726 in 1982. Similarly WIC expenditures reduced infant deaths by an estimated 3,211 in 1981 and 3,090 in 1982. Combining these two estimates, the total infant

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deaths reduced by these two federal programs is estimated to be 27,764 in 1981 and 25,816 in 1982.

The estimates of infant deaths averted are subject to fairly large confidence intervals. For 1981 the 95% confidence limit estimates for Medicaid are 29,205 to 19,901; for WIC the estimates are 5,843 to 580. In combination the 1981 confidence limits are 35,048 and 20,481. The figures for 1982 are similar but approximately 2,000 lower. We can be reasonably confident, therefore, that federal Medicaid and WIC programs reduced the number of infant deaths by 20,000 to 35,000 annually, depending on the level of expenditures, not an insignificant amount.

CONCLUSION

This research examined the impact of two federal health-care programs on infant-mortality rates. Infant-mortality rates were hypothesized to decline with general improvements in health care, with increased spending for Medicaid, and with increased spending on the WIC program. Using a time-series analysis, we found that both Medicaid and WIC had a significant negative impact on the infant-mortality rate for all infants. We estimated that these federal programs saved between 20,000 and 35,000 infants per year. The impact of these programs differed by race, however. Although both programs had a negative impact on the white infant-mortality rate, only Medicaid expenditures had a negative impact on the mortality rate for nonwhite infants. In addition, Medicaid expenditures had a stronger impact on the nonwhite infant-mortality rate than they did on the white infant-mortality rate, a finding consistent with the lower level of health care use by nonwhites before the Medicaid program.

Even though these findings support the positive impact of two federal poverty programs, they should not be taken as the total impact of these programs. Medicaid expenditures in particular provide for benefits other than those realized by infants. By increasing access to health care by individuals who could not afford health care before, Medicaid probably has had a positive

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impact on the overall health quality of Americans. Health care obtained early in life is especially beneficial in reducing some major health problems later in life (Davis and Schoen, 1978: 83). In addition, by improving the health of infants, the WIC program probably saves the nation substantial amounts of money that would need to be spent treating the infant illnesses that would have occurred without the nutrition improvements. Our estimate of benefits, therefore, is only a portion of the total benefits provided by the Medicaid and WIC programs.

APPENDIX

Lewis-Beck (1986) notes four problem areas that must be considered in any interrupted time-series design. Each of these is discussed below.

Collinearity. Often trend (e.g., 1,2,3,4,. . .) or interruption (e.g., 0,0,0,1,1,1, . . .) variables that are used simultaneously in a time-series equation create collinearity problems. To avoid collinearity, we used actual expenditures for Medicaid and WIC rather than a countervariable that would begin in the year each program was started. The result was no collinearity of any degree of magnitude in our time-series equations.

Measurement error. One common problem is determining the exact year to start the intervention series (e.g., should Medicaid actually start in 1965 or 1966). By using expenditure figures we assumed a program starts when funds are expended rather than when legislation is passed. In addition, we included as part of Medicaid expenditures those expenditures made under the Kerr-Mills program, a program very similar to Medicaid. In our model we assumed that any impact of expenditures would occur after a lag of at least six months (the time from identifying a pregnancy to delivery of the baby). This lag was incorporated by using fiscal-year funding data in comparison to calendar-year mortality figures. Rather than attempting to readjust for the change in fiscal

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years after the Congressional Budget and Impoundment Control Act, we continued to use fiscal-year expenditures as reported in the Budget. This assumption might result in underestimating the impact of the programs given the year-long definition of infant mortality. Finally, all years before the start of the Medicaid and WIC programs were coded as zero expenditures.

Specification error. Specification error resulting from omission of key variables or entering inappropriate variables in the model was not a major concern. Our examination of the residuals essentially showed a random pattern. To make sure we did not omit any key variables, the following variables were tried as control variables in the model: birth rates for 10- to 14-year-old mothers, birth rates for 15- to 19-year-old-mothers, birth rates for 40+ year-old mothers, birth rates of unmarried mothers, and the number of practicing physicians. None of these variables had any significant impact on the equations. A second concern was whether or not we should add an intervention term to check for the change in intercept that might be associated with the start of a new program. Although we see no reason why the start of Medicaid or WIC would have an impact over and above the expenditure of funds, we attempted to add such a change term to the model. For Medicaid the regression coefficients for this term and their significance were as follows: all infants –.24 ($p = .55$), white infants .15 ($p = .65$) and nonwhite infants –1.41 ($p = .18$). Since none of the coefficients are even remotely significant, we deleted them rather than creating specification error in the equations (see Lewis-Beck, 1986: 223).

Correlated errors. The first-order autocorrelation was .22 for all infants, .40 for white infants, and .21 for nonwhite infants. Although correction for autocorrelation adjusted the ordinary least-squares coefficients in only minor ways, we prefer the confidence we can place in these estimates of significance that we could not have if the equations were estimated by ordinary least squares (see Lewis-Beck, 1986, for an alternative view).

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NOTES

1. The Social Security Amendments of 1950 actually provided for a small federal grant program with state matching funds (Davis and Schoen, 1978: 51), but it was funded at a modest level.

2. We do not mean to dismiss the Maternal and Child Health Care Program, which predates Medicaid. The modest expenditures for this program and the targeting of smaller geographic areas means this program can have only a small impact on nationwide infant mortality rates. The impact on specific local areas, however, has been striking. At times infant mortality has been reduced by 50% in four years (Davis and Schoen, 1978: 150-151; but see Jones, 1974).

3. The Maternal and Child Health Care Program appeared to have no impact on reducing the number of low birth weight babies by the time the WIC program was established (Davis and Schoen, 1978: 152-153).

4. Also, Medicaid eliminates only one of the cost barriers to medical care. Lack of transportation, discrimination by service providers, and limited information concerning the need for and the availability of medical care also limit access (Davis and Schoen, 1978: 71).

5. Many of these medical-care improvements resulted from the use of federal funds to sponsor research or improve services. As we operationalize the trend of improved health care (see below), therefore, we will underestimate the federal government's overall impact on improving infant-mortality rates.

6. Other state and federal programs may also increase access to health care but as Davis and Schoen (1978: 62) note, "The sheer size of the Medicaid program in relation to other health programs for the poor strongly suggests that Medicaid is largely responsible for the increased use of medical services by the poor."

7. Figures for nonwhites were used rather than figures for blacks because historical data did not always provide separate rates for blacks.

8. The specific procedure used was the SAS AUTOREG program.

9. The slope coefficients are estimates of the change in slope from that of the overall-trend line. In this case with the Medicaid program, the decrease in infant mortality is .239 for each year plus .00147 for each million dollars spent on Medicaid. The WIC coefficients can be interpreted in a similar manner (for a discussion of interpretation, see Lewis-Beck, 1986).

10. After controlling for poverty, the correlation between per capita WIC funding and the infant-mortality rate is 0. Poverty and percent nonwhite population are strongly correlated ($r = .52$). When poverty is controlled, however, the negative relationship appears. The WIC formula essentially penalizes states with large nonwhite populations but relative little poverty. Such states as Michigan, California, Illinois, and Maryland are heavily penalized.

11. The formula discriminates an even greater degree against states with large Hispanic populations. This discrimination does not show up in Table 3 because Hispanics, for the most part, are categorized as whites for purposes of infant-mortality calculations.

12. On September 9, 1986 the Food and Nutrition Service of the Department of Agriculture proposed a new WIC allocation formula. The new formula would allocate to each state agency an amount equal to that received last year (with no inflation adjustment). Any additional funds would be allocated according to the number of persons served in the three highest risk categories. This formula is even worse than the previous formula in that

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it sets past inequitable allocations into concrete by rewarding those agencies with larger past budgets. The Food and Nutrition Service denies this contention (*Federal Register*, 1986: 32095), but their logic is unconvincing.

13. The impact of the budget cuts in Medicaid and WIC for 1982 and later years has been recognized by Washington policymakers. The reduction of funds has been used to explain the leveling off of the decline in U.S. infant-mortality rates. Preliminary infant-mortality rates for 1984 and 1985 do not show a decline as sharp as previous years (Kosterlitz, 1986: 2257).

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