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Policy Studies Journal; Summer 1996; 24, 2; ProQuest
pg. 215

Policy Studies Journal, Vol. 24, No. 2, 1996 (215–229)

The Spending-Service Connection: The Case of Health Care

David R. Morgan and James T. LaPlant

This research tests the relationship between state and local spending for health and hospitals, a set of health service measures, and three final policy outcomes—low birthweight infants, infant mortality, and child deaths. The analysis includes several proxies for service demand—state resources, percentage of single-teen births, and percentage of the population without health insurance. The multiple regression equations also incorporate a measure of federal spending on health and an indicator of state spending for Medicaid. This first stage of the analysis can account for only a limited amount of variation in per capita state and local health and hospital spending. Health expenditures, however, are prominently related to health workers per 10,000 population, while hospital spending buys hospital beds. The final step in the analysis uses path models. The results show that neither spending nor the intermediate-level health outputs (including a measure of prenatal care) are significantly related to the final three outcome variables. Single-teen births is the dominant influence in the final equations.

Following the Great Society programs of the 1960s, some critics claimed that "throwing money" at social problem would do little good. In fact, political conservatives supported by some academics even argued that increased spending for public programs might raise expectations unduly. Thus, spending more for social services might have an overall detrimental effect; matters actually might get worse rather than better. Except for educational research, the social science literature has not much addressed the question of how spending affects service levels. In education, the conventional wisdom is that differences in funding levels have little or no effect on student performance as measured by standardized tests (Hanushek, 1981). But, apart from education, much less is known. To what extent does money affect public services? Do states that spend more for certain functions receive better services?

Sharkansky (1967) was one of the first to address this question systematically for a series of state and local government services. He correlated per capita spending and various measures of service quantity and quality in six basic public service areas—education, highways, welfare, health, environment, and public safety. He concluded that the expenditure-service linkage was weak to nonexistent. Several years later, Dean and Peroff (1977), using other measures and techniques, arrived at a different conclusion. Concentrating only on a few services, they found spending had considerable effect on welfare, only some impact on a highway index, but virtually no influence on a composite health measure. Dean and Peroff found this lack of connection between health spending and service levels unsurprising. Actions taken in the private sector are much more likely to affect the quantity and quality of health care in a state than is true for many other service areas. Yet one might still hope, if not expect, that state and local health spending will affect health care, especially for disadvantaged populations.

This research will address spending and service levels only for public health care. Our approach will distinguish between two categories of services—outputs, or service levels, and outcomes, or benefit levels. Simply put, we expect that health

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expenditures will influence state and local outputs, but will have much less effect on various measures of outcome. Because we found so few measures of the final consequences of public health policy available for all states, our research concentrates on programs aimed at improving the quality of health care for infants, children, and pregnant women. In particular, we test several causal models in which the final dependent variables are rates of low-birthweight infants, infant mortality rates, and child death rates.

Expenditures, Outputs, and Outcomes in State Policy Research

The limited research on the connection between expenditures and services represents a variation on the decades-long effort to specify a fully complete model of the policy process. Most policy researchers have viewed policymaking as a series of sequential actions (for example, see Anderson, 1975, pages 26–27). Yet the literature reflects disagreement over where the process ends and what empirical referents should be included under the general heading of "policies" or "outputs." For example, Easton's (1965, pages 351–352) early theoretical work on political systems discussed separating outputs, the more immediate product of the system, from outcomes, the longer-range consequences for society. Yet, Ringquist's (1993b, page 75) recent assessment of the state policy literature found that policy research by political scientists often pays scant attention to outcomes or impacts.

Early research often lumps various outputs together. For example, Dawson and Robinson's (1963) pathbreaking state policy research used such diverse measures as per pupil expenditures, unemployment insurance, and old-age assistance to represent welfare policies. Even Sharkansky's imaginative effort to isolate spending from service levels included both short-run effects (hospital beds) and long-range consequences (infant mortality rates) as part of a single group of public service indicators. Dean and Peroff (1977) did the same. Their single category of health policy included such diverse measures as number of hospital beds per 10,000 population, doctors per 10,000 population, and infant mortality rates. But combining expenditures, service levels, and outcomes may obscure more than it illuminates. As Hanson (1983) notes regarding state welfare policies, a given level of effort might sustain a wide range of services and benefits. However, before examining how the various end-products of the policy system relate to each other, we need to discuss an overall model of the state policymaking process.

Despite differences in approach, methodology, and variables, comparative state scholars have reached agreement on one point—any model of policymaking must include both economic and political variables. Most comparative state policy research, for example, includes some measure of state wealth. Wealthy states, of course, can afford to be more generous; they have sufficient economic surplus to support more bountiful public programs. Plotnick and Winters (1985, page 462) offer an additional rationale: "Greater affluence allows larger numbers of persons to indulge at higher levels their impulse to aid the needy." Thus, we expect more affluent states to have higher per capita health and hospital spending. They also should manifest more generous policies in behalf of a disadvantaged population that depends heavily on public health services. Because income substantially affects access to health care, more affluent states also should have fewer low-birthweight babies, a lesser rate of infant mortality, and fewer child deaths.

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The need for public health services also should help shape the demand for such programs. Need is usually expressed by various socioeconomic measures such as percentage in poverty or even percentage minority population. If public services fail to reach a sizable segment of a state's population, the demand for remedial action is likely to emerge. Barrilleaux and Miller (1988) used urbanization and unemployment to represent service demand, because both may increase the number of needy service recipients. Whether one calls it need or demand, an analysis of health care policies should incorporate proxies for certain policy recipients or target populations as predictor variables.

Finally, the public's preference or willingness to support public spending or programs for improved health care should affect demand. Erikson, Wright, and McIver (1989) found a measure of state opinion liberalism to be a significant predictor of liberal policies. Although the findings are not consistent, several other studies have confirmed a positive relationship between a liberal political climate and support for redistributive policies (Barrilleaux & Miller, 1988; Morgan, 1994).

The Connection Between Policy Outputs and Impacts

Previous policy research has not ignored the linkage between policy actions and policy consequences (Dye, 1980; Ringquist, 1993a; Thompson, 1981). In fact, an abundance of policy implementation literature deals with the failure of policy outputs to produce the expected outcomes (Ingram & Mann, 1980). In education, most studies confirm the Coleman Report's (Coleman, 1966) conclusion that external conditions (parents' socioeconomic status, peer influence) overwhelm any effects of school characteristics. In effect, conditions exogenous to the policy are usually so powerful as to swamp policy impacts. Researchers who focus on fairly specific programs often point to implementation difficulties as well. These may arise from overlapping responsibilities of multiple actors, cluttered lines of authority, and the resistance, ineffectualness, or inefficiency of low-level implementers (Berman, 1980, page 209). In short, the results are strikingly similar. To paraphrase Hanushek (1981, page 20), in spite of heroic efforts by researchers, our understanding of why some policies yield such uncertain outcomes is surprisingly primitive.

How does this apply to health policy? Because of the pervasive impact of private health care decisions, one might expect public expenditures to have little effect on most health outcomes. Yet, spending could have certain intermediate consequences; it might buy selected health and hospital services, for example. Because state and local governments are especially labor intensive, health dollars above all should buy health workers. That relationship should be strong and direct. Clearly, more hospital spending should yield more hospital beds. Whether either type of spending can reduce high-risk pregnancies is more problematic. Considerable research, however, does confirm that inadequate or no prenatal care puts mothers and infants at much higher risk of adverse pregnancies (Institute of Medicine, 1985, page 11).

The Health Policy System and Health Outcomes

At this point, we might examine briefly the various components of the health policy system in the United States. Because our interest is in the effects of public spending, we will examine only public health activities. A little more than

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3% of the nation's total health spending goes for government public health services (National Center for Health Statistics, 1992, page 162). Still, expenditures for health and hospitals consume some 14% of all state and local spending (National Center for Health Statistics, 1992, page 160). According to a recent survey, the most common services offered by local public health agencies are immunizations, 92%; communicable disease control, 91%; collection and analysis of data, 87%; and "child health," 84%. About 69% of local agencies provide WIC, a special supplemental food program for women, infants, and children, but only 59% offer prenatal care to pregnant women (Centers for Disease Control, 1991, pages 7–8).

Over the years, scholars from various disciplines have analyzed the causes of infant mortality. From this research come several well-established relationships. The most immediate determinant of infant death is low birthweight (Hadley, 1982, page 34; Institute of Medicine, 1985, page 1), and lack of or insufficient prenatal care contributes to low-weight births. We do think both measures—infant mortality and low birthweight—can serve as useful health outcome measures. Low-weight births require very expensive care and impose enormous costs on state hospitals, whether the mother has insurance or not. In addition, low-weight survivors often suffer lifelong neurological disabilities.

Several sociodemographic characteristics, especially race, affect both low-weight births and infant deaths. Percentage black is a powerful predictor of both. According to the Institute of Medicine (1985, pages 52–55), even after most other demographic characteristics are taken into account (e.g., education and social status), African Americans still have higher rates of low-weight births than do whites. We know much less about the causes of death among older children. More than 40% of child fatalities result from accidents, almost one-half of which are motor vehicle crashes (Center for the Study of Social Policy, 1993, page 10). We include child deaths in the analysis primarily because it is one of the very few long-range indicators of health status readily available that arguably might be connected to public spending.[1]

Any effort to account for interstate variations in health policy cannot ignore the influence of the federal government. Research shows that certain federal enactments do affect health outcomes. Copeland and Meier's longitudinal analysis (Copeland & Meier, 1987; also see Meier & Holbrook, 1991) found that federal spending for Medicaid and WIC reduces infant mortality rates. Because our primary purpose is to identify state effects on policy, we include only state Medicaid spending.[2] Thus, our only federal variable will consist of expenditures for WIC, along with funding for other health and nutrition programs that might improve the chance for a favorable pregnancy outcome.

The first task in the analysis is to account for the variations in state and local spending for health and hospitals.[3] Two additional steps will follow. First, we want to determine how much these expenditures affect a set of health policies or services. The final step will rely on path analysis to show how these policies influence three health outcomes—low-weight births, infant mortality rates, and child death rates.

Data and Measures

The final outcome measures include: (1) infants born with low birthweight as a percentage of all births, 1990 (Van Son, 1993); (2) infant deaths per 1,000 live births, 1990 (United States Bureau of the Census, 1993); and (3) child death rate,

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ages 1–14, per 100,000 children, 1990 (Center for the Study of Social Policy, 1993). In addition to per capita health and hospital spending (both for 1990), the analysis contains three output measures: (1) state and local public hospital beds per 10,000 population, 1990 (Morgan, Morgan, & Quitno, 1993); (2) state/local full-time-equivalent health workers per 10,000 population, 1990 (United States Bureau of the Census 1991); and (3) percentage of mothers receiving adequate prenatal care, 1988 (Van Son, 1993).[4]

The initial analysis includes five exogenous or contextual measures. The three demand variables are: (1) state resources, or affluence (we transformed into z-scores and then added together two closely related measures—per capita income for 1991 and tax capacity, 1991),[5] (2) percentage of births to single teens, 1989 (Van Son, 1993), and (3) percentage of population without health insurance (either private or public), 1990 (Morgan, Morgan, & Quitno, 1993). Because of the very great differences in health status between blacks and whites in the United States, especially for low-weight births and infant mortality, we planned initially to use percentage African American as a primary indicator of need. Such a strategy created several problems. First, the percentage black variable is highly collinear with other measures of need and resources. Second, we realized that another need indicator—births to single teens—was related quite closely to percentage African American.[6] In fact, it is a more direct measure of need, as it relates to maternal and child health care. Aday (1993, page 53), among others, has observed that teen mothers are especially likely to give birth to low-weight babies. Probably no other group of would-be mothers is in greater need of prenatal health care.

The measure of federal health-related spending for the disadvantaged is a composite of federal dollars (in thousands) for WIC, food stamps, child nutrition, child and family services, and the Maternal and Child Health Block Grant (MCHBG) (all 1990 or 1991 data are from Van Son, 1993, except for MCHBG, which is from unpublished agency data). This additive aid measure is divided by the state's total number of poor (1990). This measure clearly better represents the national government's commitment to programs that might benefit pregnant women, infants, and children than would the more commonly used total per capita federal aid variable.

As indicated above, because we emphasize state health efforts, our Medicaid variable includes only state dollars. This measure also omits funds expended for the population over age 65. The final state Medicaid expenditure figure is for 1991 (in thousands), and is divided by the total number of children in poverty (for 1991, this variable was constructed from *Health Care Financing Review* [Health Care Financing Administration, 1993], and Congressional Research Service, 1993).

The preliminary analysis also included a measure of public opinion liberalism, along with several other measures of a state's political system.[7] However, none of these variables was a significant predictor of the intervening policy outputs, and none survived controls for other measures in the final path analysis. Thus, no political variables appear in the equations to follow.

Findings

Table 1 contains the complete equations for the three final dependent variables—the health outcome measures. Consider first low-weight births. Even though the nine variables in the first equation can account for 69% of the variation (adjusted R^2), only one significant explanatory measure appears. Single teen

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mothers is by far the best predictor. A one-percentage-point increase in the incidence of single teen mothers leads to about a 0.43% greater incidence of low-weight births (as a percentage of all births), other variables held constant. To investigate whether multicollinearity might be depressing the effects of other predictors, we removed various highly-correlated measures one at a time, and found that all three equations were reasonably stable.[8] The subsequent path analysis also helps to sort out these key relationships. It reveals, for example, that some variables with weak effects in Table 1 actually are useful predictors of spending or intermediate-level health policies.

Turning again to Table 1, we can identify those measures that best account for variation in state infant mortality rates. Again, teen births is by far the most

Table 1
Regression Equations for Low-Weight Births, Infant Mortality Rates, and Child Death Rates

Independent Variables	Low-Weight Births[a]	Infant Mortality Rate[b]	Child Death Rate[c]
Resources	.15 (1.63)	-.05 (-.32)	.41 (.82)
% Single Teen Mothers	.43 (7.15)**	.51 (5.28)**	.93 (2.79)**
% Population without Health Insurance	-.01 (-.20)	-.04 (-.67)	.33 (1.75)*
Federal Health Expenditures, per Poor Child	-.71 (-1.03)	-1.51 (-1.36)	1.98 (.51)
State Medicaid per Poor Child	-.01 (-.12)	-.08 (-.43)	-1.67 (-2.74)**
State/Local Health Expenditures per Capita	-.01 (-1.55)	.00 (.40)	.02 (1.10)
State/Local Hospital Expenditures per Capita	.00 (1.42)	-.00 (-.15)	.00 (.40)
Health Workers per 10,000 Population	.04 (1.53)	.08 (1.76)*	.04 (.25)
% Prenatal Care	-.00 (-.70)	.00 (.68)	-.01 (-.79)
Adj. R^2	.69	.52	.53
F	12.74**	6.80**	6.94**

Notes

Coefficients are unstandardized slopes, with t values in parentheses. N = 49 (Arizona has missing data for Medicaid).

[a] as a percent of all births. [b] per 1,000 live births. [c] per 100,000 children.

* $p < .05$, one-tailed test. ** $p < .01$, one-tailed test.

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powerful effect ($p < .01$). For every 1% rise in single-teen motherhood, a state might expect about 0.51 more infant deaths per 1,000 live births, other things equal. One other variable just reaches the .05 level of significance—health workers. Unexpectedly, in this case, the sign is in the wrong direction—positive. It makes no sense, of course, that adding more health workers would increase infant mortality rates. What we likely have here is a reverse relationship. Presumably, states with higher than average infant deaths may have other serious public health problems and have opted to hire more health workers as a result. The adjusted R^2 value for this equation is .52.

Finally, Table 1 shows the results for child death rates. The adjusted R^2 value is .53, with three significant independent variables—teen mothers, population without health insurance, and Medicaid spending. In this case, the single-teen variable probably is best seen as a proxy for a set of adverse environmental conditions that may pose an unusual threat to child safety. Single-teen births are especially common among members of minority groups and among those with low levels of educational attainment who inhabit inner-city ghettos. Daily television and newspaper accounts often dramatically feature the high-risk living conditions in such settings, especially for young males. State Medicaid spending, though, has beneficial effects. For every $1,000 increase in such expenditures (per poor child), states should experience almost two (1.67) fewer child deaths for every 100,000 children. The measure of health insurance coverage is significant at the .05 level. Apparently, as expected, in those states with lower levels of coverage, children are at greater health risk.

A final observation is in order about Table 1. Note the absence of a previously-discussed independent variable—hospital beds. It was correlated at $r = .79$ with hospital spending, and the inclusion of both measures created instability for these three equations. We kept the spending measure because its potential effects are of greater theoretical interest. The hospital beds measure materializes later in the path models.

Before proceeding to the causal analysis, we might offer several observations about the relationships among the various measures of state health policy. The first directly contradicts previous findings about the effects of state spending on health policy. As obvious as it seems, health and hospital expenditures do make a difference. As noted, hospital outlays buys hospital beds. In addition, more state and local spending (per capita) for health programs leads to an increase in health workers per 10,000 population ($r = .52$).

Second, when we hold other influences constant, neither federal health spending nor state Medicaid funding are significant predictors of variation in low-weight births or in infant mortality rates among the states. These seemingly weak effects require elaboration. The signs for federal expenditures and state Medicaid are in the right direction (negative) for both equations. Even though these federal and state spending variables lack statistical significance, from a substantive perspective these programs do matter. More federal outlays for health programs aimed at the disadvantaged, and increased state Medicaid spending for the nonelderly, both should help reduce infant deaths and lessen problem pregnancies. We might also note here that federal Medicaid expenditures for the nonaged have a similar positive effect on low-weight births and on infant death rates. Because separate state and federal Medicaid variables correlate so highly ($r = .87$), they cannot be included in the same equation. When the two Medicaid indicators are combined (as in actual practice), that variable also behaves very similarly to the state variable by itself. Thus, we are

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confident that Medicaid spending for the nonelderly at all levels does have a beneficial effect on maternal and child health.

The path model shown in Figure 1 can provide a further perspective on the relationships among the variables (Table 2 reports the results of the standardized regression equations for the model). We have dropped all arrows for relationships not meeting the .05 level of significance (for a one-tailed test). Some authorities favor keeping all theoretically important paths regardless of their statistical significance. In this case, as we observed above, theory and previous findings reflect considerable uncertainty about the final effects of public health expenditures. Thus, we think the relevant theory is not sufficiently well-established at this point to include all path arrows. Fewer variables and causal lines make for a less cluttered model as well. In fact, Figure 1 shows that only a few measures can account for a substantial amount of the variance in the three outcome measures.

We might discuss briefly the initial stages of the model. Only two variables predict state and local health expenditures—a state's resources (beta = .55) and federal health spending (beta = .26). The adjusted R^2 value is .38. Other measures of need or demand have no significant effect on health care spending. Apparently, neither a larger percentage of single-teen births nor a larger uninsured population prompt state lawmakers to spend more for public health programs. Only one significant predictor appears in the equation predicting hospital expenditures—teen births (beta = 0.40; adjusted R^2 = .15). In all, this is not a very satisfactory result. The simple correlation between a state's resources and public hospital spending actually is negative (-.16). In short, the initial stages of the path analysis are only nominally successful in accounting for the forces that determine state and local spending for either health or hospitals.

Does spending in these two areas affect any health policies? The answer is a qualified "yes." Under controlled conditions, hospital dollars still buy hospital beds (beta = 0.72). Also, states with higher levels of spending for nonaged Medicaid tend to have fewer state and local public hospital beds (beta = -.39). Upon reflection, this negative relationship makes sense. Those states that target more Medicaid money to the nonaged should have less money left for programs aimed at the medically needy elderly (nursing home care and hospital beds). Beyond its effect on beds, hospital spending goes nowhere. We find a similar relationship between health spending and other endogenous variables. Not surprisingly, the more that the states and localities spend on health care, the more health workers they employ (beta = 0.44). Holding other effects constant, every \$100 per capita increase in health spending buys about six more health workers for every 10,000 people in the state. The value of R^2 for this equation is .28.

Only one variable is a significant predictor of the percentage of women receiving adequate prenatal care (R^2 = .33). Above all, mothers get prenatal care where a state's population is covered by health insurance (beta = -0.59). As expected, health insurance plays a pivotal part in making this valuable service available to pregnant women.

Finally, we reach the three health outcomes. Even though the level of explained variance is generally high for these three equations, only one intermediate health policy variable remains in the path analysis at this point. First, observe the low-birthweight equation. The value of adjusted R^2 is .65, almost identical to the comparable coefficient in Table 1 (but with an F value here of 90.21). Yet the only significant effect is for births to single teens (beta = 0.81). The unstandardized slope (b) of 0.45 is virtually the same as in Table 1 (0.43). So, the causal analysis confirms the extraordinarily adverse impact of single-teen motherhood on low-

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Figure 1
Path Model Explaining Low Birthweight, Infant Mortality Rates, and Child Death Rates Among American States (n = 49)

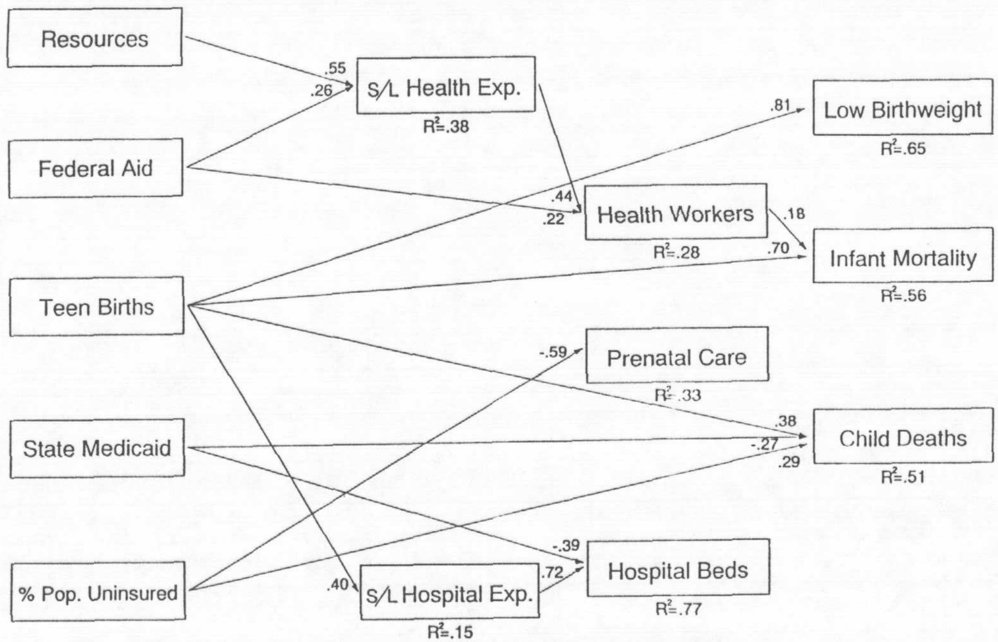

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Table 2
Standardized Regression Coefficients for Path Analysis of Health Measures

Independent Variables	Dependent Variables							
	State and Local Hospital Expenditures	State and Local Health Expenditures	Health Workers	Prenatal Care	Hospital Beds	Low Birth Weight	Infant Mortality	Child Deaths
Teen Births	.40 (5.58)**					.81 (.05)**	.70 (.07)**	.38 (.29)**
Resources		.55 (2.32)**						
Federal Aid		.26 (26.23)*	.22 (3.91)*					
% Uninsured				-.59 (1.94)**				.29 (.17)**
State Medicaid					-.39 (.34)**			-.27 (.46)**
Health Workers							.18 (.03)*	
State and Local Health Expenditures			.44 (.02)**					
State and Local Hospital Expenditures					.72	(.01)**		
Adj. R^2	.15	.38	.28	.33	.77	.65	.56	.51

Notes

Arizona is excluded. Standard errors are in parentheses. * $p < .05$, one-tailed test. ** $p < .01$, one-tailed test.

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weight births. No matter what other conditions are found within a state, the fundamental determinant of low-birthweight babies is the presence of an unusually large group of teen mothers.

Two variables appear in the final path equation for infant mortality—single-teen births, with a standardized coefficient (beta) of 0.70, and health workers, with a 0.18 beta value. The teen-birth measure's unstandardized slope of 0.50 is almost identical with the comparable figure of 0.51 shown in Table 1. Again, as in Table 1, the health workers indicator shows up with the wrong sign. Even though the unstandardized coefficient is virtually the same as in the earlier equation (0.06 for the path model; 0.08 originally), the variable manifests a weak but statistically significant effect. The adjusted coefficient of determination of .56 (F = 32.29) exceeds that value (.52) for the initial complete equation displayed in Table 1.

Three exogenous variables remain for the final equation explaining child deaths per 100,000 children (Figure 1). The most powerful predictor is single-teen births (beta = 0.38), followed by the uninsured population measure (0.29) and state Medicaid spending (-0.27). The adjusted R^2 value is .51 (F = 17.60), and is quite comparable to the value of .53 shown in Table 1. The slope for teen births here is 0.96, compared to 0.93 in the original equation. The unstandardized coefficient for percent uninsured is 0.41 for the causal model, as compared with 0.33 originally. The power of Medicaid persists, with a slope of -1.07, compared to -1.67 in Table 1. Medicaid spending remains robust in explaining child fatalities even in the presence of a large proportion of teen births.

Before concluding, we might comment on the absence of a variable that presumably might have had a sizable effect on the two birth-related outcome measures—percentage of women receiving adequate prenatal care. In the full equations shown in Table 1, prenatal care does not surface as a significant predictor. Likewise, it cannot be found in Figure 1. Some interesting correlations for this health policy indicator do appear, however. As observed previously, the largest value of r for prenatal care is -.59, with percentage of the populace without health insurance. Yet, neither health nor hospital spending significantly influences the prenatal measure. This otherwise important health policy variable also has no strong effect on any of the three outcome measures. We might comment, however, that the prenatal indicator has the expected zero-order relationship with the final dependent variables. Prenatal care correlates at a value of -.31, for example, with low-weight births. But the overwhelming effect of the single-teen birth measure apparently depresses its explanatory power.

Conclusion

States and localities spend big bucks to provide public hospitals and health care. Yet variations in such spending across the states have little overall effect on three important health outcomes—the birth of low-weight babies, infant mortality rates, and the incidence of child deaths. Is there, then, no connection between health spending and health services? Not necessarily. Obviously, health and hospital dollars buy a range of important, if not indispensable, services. But such expenditures apparently matter little in accounting for differences in certain measures of health outcomes, especially those related to the well-being of newborns. We did discover, as obvious as it seems, that states spending more on public hospitals had more hospital beds, and that the number of health workers varied with state/local health expenditures. But, hospital beds and health workers had virtually no effect on

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low-weight births, infant mortality, or child deaths. This lack of correspondence between health spending and services deserves elaboration.

Previously, we discussed why the best-intended policies often fail to yield the desired effects. Even where the objectives are fairly clear, policy implementation often is plagued by poorly understood causal connections, bureaucratic goal displacement, faulty communication, and imperfect monitoring. For broader policy ends, such as reducing violent crime, drug dependency, drunk driving, or infant mortality, the situation is even more enigmatic. As political conservatives argue, social problems cannot be solved with money alone. More than this, the absence of good theory, the shortage of solid information, and the lack of political will often make even limited progress difficult. The socioeconomic and demographic characteristics of the target population also represent barriers to effective change. The most needy groups are often the ones least informed of the need for health service; they often lack supportive family relationships; and their lack of income compels them to accept a level of institutionalized care that the more affluent would never tolerate. The deterioration of family structure that is so pervasive among certain low-income groups also intensifies their predicament.

The nature of the public health system requires comment as well. Previously, we noted the wide range of activities performed by local health agencies. Few of these most common services, e.g., immunizations, communicable disease control, and data collection, appear to be aimed primarily at improving birthweight, reducing infant mortality, or avoiding child fatalities. These are important, if not essential, services, to be sure, but for other clients and groups, the impact of which we cannot measure. In short, we should not overgeneralize the findings here. Were it possible to measure other important health outcomes, perhaps spending and certain intermediate-range policies then would be useful predictors.

We also must recognize that most of those health programs that might reasonably be expected to reduce adverse pregnancies are not universally available. Previous research shows that Medicaid coverage does improve health care for poor children. Yet, in 1991, just under half (48%) of households below the poverty level received Medicaid (United States Bureau of the Census 1993, page 365). Services provided by WIC fall far short of meeting the need (Kimmich, 1985, page 100). Furthermore, one study estimated that in 1987 only 42% of American preschool children received the recommended preventive health care (Short & Lefkowitz, 1992). So, a number of factors impinge on the availability and effectiveness of public health programs and services. We did show that increased Medicaid spending helped reduce child deaths. Also, we found that more federal health spending did increase the amount that state and local governments spent on health care and produced a larger number of health workers. That federal indicator, however, did not influence the final three health outcome measures. Beyond that, we must emphasize again the pervasive effect of private health spending on various indicators of the nation's health. Although not included in this analysis, we discovered that a state's total private spending on health care (per family) had an especially strong impact on child death rates, with a correlation of $r = -.50$. The covariation between per-family private health expenditures and the other two health outcomes was less dramatic: $r = -.22$ with low birthweight, and $r = -.28$ with infant mortality rate.[9]

This research confirms that certain sociodemographic forces are powerful predictors of three critical health outcomes. Above all, the measure of single-teen births was dominant in accounting for differences in low-weight babies and infant fatalities. This finding is not new or startling, of course; it only reinforces what medical researchers long have known. Yet, this fundamental relationship has

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notable policy implications. Analysts and policymakers alike long have bemoaned the high rates of pregnancy among unmarried mothers in the United States. Recent reports, though, reflect encouraging news on this front, at least among African Americans. The birth rates among unmarried black women—including teenagers—declined in 1993 for the fourth year in a row. Unfortunately, no such drop occurred among white women (Koretz, 1996). The reasons for such changes are unclear. Other recent research suggests, however, that part of the answer may lie with improving the effectiveness of school-based sex education. A study done by the Centers for Disease Control for the Office of Technology Assessment shows that properly designed sex education programs can reduce teen pregnancy (Mauldon & Luker, 1996). This brings us to a final point not considered heretofore—the effect of abortion. Some research indicates that an increase in legal abortions significantly reduces white, and even more so nonwhite, neonatal deaths (Corman & Grossman, 1985). At the state level, we could not verify this connection. Neither differences in state abortion rates nor abortion policy had significant effects on low-weight births or infant mortality rates.[10] No doubt, though, a range of outreach and educational efforts to reduce teen pregnancies would clearly yield a huge payoff in decreasing and avoiding high-risk pregnancies.

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Notes

The data used in this study have been forwarded to the Inter-university Consortium for Political and Social Research at the University of Michigan.

An earlier version of this article was presented at the 1994 Meeting of the Southwestern Political Science Association.

[1] Recent publications providing state health indicators often include an overall measure of a state's "healthiness." Two problems arise in using such composite scores as health outcomes in the type of analysis we undertake. First, such scores invariably include our three dependent variables—infant mortality rates, low-weight births, and child death rates. Second, they include a number of indicators rather far removed from public health spending or programs, such as lifestyle choices, disabilities, disease rates, and overall mortality rates (see Morgan, Morgan, & Quitno, 1993; Van Son, 1993, page 172).

[2] Medicaid is the largest federal program in support of children's health. Children in Aid to Families with Dependent Children families comprise about 46% of recipients, but receive only 15% of Medicaid funds. Most Medicaid money goes to the aged, blind, and disabled (26% of recipients, but 70% of spending; National Center for Health Statistics, 1992, page 7).

[3] The commitment of public health spending varies significantly among the states. The average per capita outlay for public hospitals in 1990 is almost twice the amount for "public health:" $180, compared to $94. The range for per capita hospital spending is especially wide, from $40 (VT) to $400 (WY). Per capita health spending ranges from $38 (NE) to $264 (AK). There is no association between the two types of spending among the states. Per capita expenditures for hospitals and health correlate at a level of only $r = -.08$ (in 1990).

[4] Although more state-level measures of health care exist than for perhaps any other policy area (Morgan, Morgan, & Quitno, 1993, list 456 separate indicators), we found few public policy output

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variables. Most indicators relate to the private side of health care, or best represent inputs. We found one other possible health output measure—rate of immunization for two-year-olds. Unfortunately, this variable had no effect on any of the three outcome measures.

[5] The correlation between per capita income and tax capacity is r = .70. Tax capacity measures a state's revenue-raising ability by estimating the tax yield resulting from applying a standard, representative set of taxes to 27 taxable resources (income, property, sales, etc.) (Advisory Commission on Intergovernmental Relations, 1993, page 3).

[6] The correlation between percentage black and births to single teens is r = .79.

[7] We tried several measures of political ideology. The one with the most promise was Holbrook-Provow and Poe's (1987) "conservative coalition" roll-call measure. Even though this variable had fairly high correlations with the three final dependent variables, it could not survive the controls for other predictors. We also included, unsuccessfully, several more measures of a state's political system—interparty competition, voter turnout, and percentage Democratic control (governor and legislature).

[8] Other simple correlations above r = .5 are as follows: resources with state Medicaid spending, r = .70; resources with state health spending, r = .59; resources with federal aid, r = .51; prenatal care with population without health care, r = -.59; and state health spending with health workers, r = .52. As noted in the text, removal of these variables one at a time made little difference in the results shown in Table 1.

A reviewer raised the question about whether our equations might suffer from heteroscedasticity. To test for this possibility, we applied a diagnostic test recommended by Cook and Weisberg (1983). The score for the test was not significant at $p < .05$ for any of the three equations shown in Table 1. The test confirmed the null hypothesis of constant error variation. We also examined plots of the studentized residuals against the fitted values. There was no discernible tendency of the residual spread to increase with the predicted value of Y.

[9] We could not include private health expenditures in the regression equations, even as a control measure, because it was too highly correlated with the measure of state resources, r = .75.

[10] The rate of legal abortion correlates with low birthweight at r = .05, and with infant mortality rate at r = -.18.

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