Medicaid program characteristics: Effects on health care expenditures and utilization

Relationships between State Medicaid program characteristics and program outputs are analyzed in this statistical report, using 1980 cross-sectional data from a variety of sources. The year 1980 furnishes a baseline against which program changes following the Omnibus Budget Reconciliation Act of 1981 and the 1982 economic recession can be evaluated. Utilization and expenditures are modeled separately for each aid category and each major service category. This use of multiple models allows for measurement of the effect of program controls that might not appear in models of total utilization and expenditures.

Introduction

When Medicaid was enacted in 1965, it built on the historical role State and local governments had played in providing health care to the poor. States were given considerable latitude in structuring individual programs that were jointly funded by Federal and State dollars but administered at the State level. Differing resources, needs, and political cultures fostered differences among the States with respect to eligibility standards, extent of benefits, reimbursement methods, and administrative approaches. New Federal legislation enacted in the 1980's allowed States even more freedom to restrict program eligibility, limit coverage of optional services, limit the scope of required services, experiment with new forms of provider reimbursement, and tighten controls on use of services.

Over the past few years, a small body of research has been developed concerning relationships between Medicaid program characteristics, utilization of program services, and associated expenditures. In a comprehensive analysis of State Medicaid expenditures during the years 1970-76, Davidson (1980) concludes that restrictive eligibility standards for the categorically needy and medically needy reduce State Medicaid expenditures, but the effect of lowering the medically needy eligibility standard is small. Additionally, he holds that State limits on the number of optional services or on the use of the five basic services required to be offered by all State programs have small and inconsistent effects on Medicaid expenditures.

Davidson et al. (1983) analyze the effects of program generosity toward physicians using the ratio of physician reimbursement by the Medicaid and Medicare programs. Their analysis shows little relationship between generosity toward physicians and either physician expenditures or total Medicaid expenditures. They suggest that if private physicians reduce their participation in the Medicaid program because of low Medicaid fees, it may result in an increase in the use of hospital services.

Generally, State budget crises tend to prompt program changes that affect use and expenditures only after some time has elapsed. Cromwell et al. (1984) use time-series models to investigate these lagged effects of changes in program guidelines. They conclude that Medicaid enrollment is influenced by changes in the payment standard for Aid to Families with Dependent Children (AFDC), the need standard of the medically needy program, and the level of Federal cost sharing. Moreover, they demonstrate that changes in program guidelines have more influence on the size of the AFDC population than on the size of the Supplemental Security Income (SSI) population. Overall, Cromwell et al. show that the following program characteristics have positive effects on Medicaid expenditures per poor person: a liberal AFDC payment standard, a liberal medically needy standard, a relatively high number of optional services, and generous standards for physician reimbursement.

Bovbjerg and Holahan's study (1982) of Medicaid changes during the Reagan era concludes that, although States have made important program reductions during this period, wholesale cuts are rare because of Federal cost sharing in the Medicaid program. If extensive State Medicaid program controls are enacted, greater budgetary pressure may be placed on cities and counties to pay for necessary health care for the poor without any subsidy from the Federal Government.

To determine whether program controls alter use of health care by Medicaid beneficiaries or merely transfer the burden of payment to individuals or other payers, analysis of use at the individual level is essential. Dobson and Rodgers (1983) analyze individual-level data to investigate the effects of State program controls on use of services by the AFDC population. They find that health care use by the AFDC population is only weakly associated with limits on services, and no significant relationship is evident between reimbursement method and use of services. These findings support those of previous studies, which found only weak relationships between benefits limits and Medicaid expenditures.

Results of an evaluation of Medicaid expenditures for the years 1981-83 are presented in a recent study by Holahan (1985). Holahan notes that the rate of increase in Medicaid spending fell dramatically from 1981 to 1982. About one-third of the decline is attributed to reductions in eligibility and two-thirds to reductions in spending per enrollee. In a paper by Cohen (1984), a comparison of States having very small spending increases per enrollee with those having larger increases shows that States with smaller increases had more cost-containment measures in their Medicaid programs. Many of these cost-containment measures were permissible prior to Omnibus Budget

Reconciliation Act (OBRA) of 1981 but were used only in response to the fiscal crisis.

The findings presented here should furnish useful baseline information on the relative effectiveness of specific program controls for different Medicaid eligibility groups. In the first article, "Medicaid program characteristics and their consequences for program spending," the State budgetary perspective is taken. The analysis is performed using State-level data for all Medicaid enrollees. In the second article, "State Medicaid program controls and health care services utilization," individual-level data for noninstitutionalized Medicaid enrollees are used to address another issue of critical concern to policymakers, the effects of program guidelines on health care use.

In addition to differences between the two data sources with respect to level of analysis and payment sources included, it is important to recognize that the first article, which is based on State-level data, includes long-term care expenditures. The second article is based on the National Medical Care Utilization and Expenditure Survey and includes responses from the noninstitutionalized population only. Taken together, the two articles furnish a comprehensive overview of total Medicaid expenditures and the use of health care services by the noninstitutionalized population.

The key conclusions from the two articles can be summarized as follows:

Recipients

- A generous AFDC payment standard, the program for AFDC coverage of families with unemployed parents, and the medically needy program significantly increase the number of AFDC Medicaid recipients.
- The presence of medically needy programs significantly increases the number of blind and disabled SSI Medicaid recipients. Conversely, the use of 209(b) eligibility standards significantly reduces their number.
- Eligibility controls do not have a significant impact on the number of aged SSI recipients.

Utilization and expenditures

- Although the presence of diagnosis, screening, and prevention options is shown to significantly increase use of physicians by AFDC children, these options have no significant effect on expenditures for this group.
- Coverage of optional practitioner services raises expenditures for SSI enrollees.
- Less generous reimbursement of physicians decreases total physician expenditures. This variable, as expected, decreases physician visits for the SSI population, but has no significant impact on AFDC adults and increases visits for AFDC children.
- There is little evidence that alternative hospital reimbursement systems significantly affected expenditures during 1980. There is a moderate positive relationship between the use of alternative reimbursement systems and expenditures per AFDC adult recipient, but this could easily reflect a phenomenon by which States with high hospital expenditures were the first to adopt alternative systems. In the utilization estimates based on individual-level data, alternative reimbursement is seen to reduce length of stay for children and the probability of a hospital stay for AFDC adults but to have no effect on the SSI population.
- Limits on the number of physician visits for particular services decrease expenditures for AFDC children and for SSI blind and disabled recipients. A closely related variable, limits on the number of physician visits in particular settings, decreases the number of physician visits for both of these recipient groups.
- For the most part, controls on the utilization of health care services have a greater impact on AFDC children who have chronic conditions than on AFDC children without such conditions. Among AFDC adults, a greater impact of program controls is observed for those without chronic conditions.
- Limits on hospital days have no effect on expenditures but have a significant negative effect on hospital use by AFDC adults.
- The only program dimension affecting long-term care expenditures is the joint effect of the medically needy program and the protected income level in States that have a medically needy program. These program characteristics raise long-term care expenditures by increasing the number of long-term care recipients per 1,000 poor.

The findings of these two studies indicate that the relationships between Medicaid program controls, Medicaid use, and Medicaid expenditures are complex. Although the program control variables attaining statistical significance are not always identical in the two articles, both analyses show that program controls have significant impacts. Some differences between the two sets of findings may be attributed to particular categories of use that represent relatively small components of total expenditures. For example, the finding that coverage of diagnostic, screening, and preventive services affects the number of doctor visits does not necessarily imply that such coverage has significant effects on expenditures. Differences relating to long-term care are also important. Long-term care expenditures represent about 40 percent of the spending modeled in the first article, but long-term care utilization is not modeled in the second article because the utilization data were collected only for noninstitutionalized individuals. Taken together, these two articles furnish a well-rounded picture of the differential effects of variations in State Medicaid programs as they existed in 1980.

Medicaid program characteristics and their consequences for program spending

by Roland McDevitt and William Buczko

Overview

For the past two decades, national health expenditures have grown at a rate exceeding the rate of growth in the gross national product. Much of this growth has been financed through federally sponsored programs such as Medicaid. By the early 1980's, economic and political forces were placing serious fiscal constraints on Medicaid. These forces led to passage of the Omnibus Budget Reconciliation Act (OBRA) of 1981, the purpose of which was to control program expenditures by reducing the levels of Federal financial participation and by offering the States greater discretion in determining eligibility, benefits, and methods of provider reimbursement.

States seeking to control Medicaid spending had two fundamental alternatives: controlling the number of recipients or controlling the level of expenditures per recipient. Bovbjerg and Holahan (1982) indicate that the most popular approach has been to restrict the number of recipients by relying on inflation to effectively cut participation rates over time; that is, States reduce participation in State-administered welfare programs such as Aid to Families with Dependent Children (AFDC) simply by failing to raise income standards to keep pace with inflation. Because participation in these welfare programs automatically qualifies people for Medicaid benefits, participation in the Medicaid program falls simultaneously with the decline in AFDC coverage.

Of course, some eligibility categories are subject to greater State discretion than others, and some categories of recipients use more services than others. For example, States exercise extensive control over the enrollment standards of AFDC program participants. AFDC recipients constituted 64 percent of Medicaid recipients in 1980, but they were responsible for only 28 percent of Medicaid expenditures (Sawyer et al., 1983). These variations in levels and patterns of expenditures among various categories of recipients make it difficult to estimate the effects that changes in program characteristics will have on program expenditures. In this article, we attempt to evaluate the potential effects of changes in program characteristics by examining the relationships between a variety of 1980 Medicaid program characteristics and program expenditures.

Reprint requests: Roland McDevitt, SysteMetrics, Inc., Suite 600, 4733 Bethesda Avenue, Bethesda, MD 20814.

Data and methodology

In the models presented in this article, two kinds of dependent variables are estimated: Medicaid recipients per 1,000 poor people and Medicaid expenditures per recipient. Taken together with the number of poor people in each State, these variables allow estimation of each State program's Medicaid expenditures as follows:

Medicaid expenditures = Recipients per 1,000 poor × expenditures per recipient × thousands of poor persons

This is a desirable approach to estimating Medicaid program expenditures because the programmatic and environmental factors that drive Medicaid expenditures are disaggregated. Eligibility guidelines influence the number of recipients per 1,000 poor; program generosity toward recipients affects expenditures per recipient; and the number of poor persons in the State is an exogenous factor beyond the control of State policymakers.

By focusing on recipients per 1,000 poor and expenditures per recipient, we examine those influences on spending that are most likely to respond to changes in State policy. States with a large number of poor persons and limited financial resources may not be free to choose from the entire array of policy options, but structuring the analysis along these lines helps to distinguish the policy-related components of spending from the demographic components.

In the analysis that follows, this approach is refined by estimating recipients per 1,000 poor and expenditures per recipient for various aid categories, thereby allowing us to consider the differential effects that program guidelines have on different recipient groups. For example, Supplemental Security Income (SSI) recipients tend to consume more services than AFDC recipients do, and they are also likely to consume different kinds of services. Following the analyses for each aid category, similar models are estimated for the major service categories: hospital care, physician utilization, and long-term care.

The use of recipients per 1,000 poor to measure breadth of Medicaid coverage has some limitations. For example, variation across States in the number of recipients per 1,000 poor may indicate differences in enrollment guidelines, but it may also reflect differences in health status and regional practice patterns. The use of enrollees per 1,000 poor would not have this limitation. However, even accurate enrollment information would not reveal the population eligible for Medicaid because many eligible people may not enroll until they need medical services. In any case, enrollment data are not available for all States.

It is not necessary to include poverty level or number of people living in poverty as demographic controls in the models. Using the number of recipients per 1,000 poor automatically adjusts for the size of the poverty population within each State using State-specific poverty levels for 1980. It is necessary to control only for the demographic mix of the poverty population using variables such as the percent of poor families headed by a single female. Using recipients per 1,000 poor as the dependent variable tends to focus the analysis on policy variables that affect enrollment while controlling for the varying size of poverty populations across the States.

The analysis is cross-sectional at the State level, but some aspects of the relationship between Medicaid policy and either program participation or expenditures are dynamic in nature and are best represented by a time-series model. An example of this is the interaction between reimbursement systems and expenditure levels. Because a dynamic model is not possible with these data, the problem of simultaneity and its potential effects on the regression coefficients in a cross-sectional analysis must be acknowledged. Despite this limitation, it is noteworthy that most of the program controls that are statistically significant in the models presented here were also significant in an earlier time-series analysis of program expenditures in the pre-OBRA period (Cromwell et al., 1984).

The primary data source for the analysis that follows is the Medicaid Program Characteristics File, which contains State-level sociodemographic, economic, and Medicaid program data for 49 States and the District of Columbia. The data were collected from a variety of sources to represent programmatic and demographic characteristics during 1980. Recipient and expenditure data were taken from program files maintained by the Health Care Financing Administration based on data derived from Medicaid administrative reporting form 2082. Although the 2082 program files represent the best available source of information on Medicaid utilization and expenditures at the State level, the data are known to have shortcomings attributable to the poor quality of program data maintained by some States. Demographic data were taken from the U.S. Bureau of the Census and other sources. Information concerning the program characteristics of each State was collected through a SysteMetrics survey of State Medicaid programs and through secondary sources as part of a Health Care Financing Administration-funded study of State Medicaid program characteristics for the National Medical Care Utilization and Expenditure Survey.

Although data from all 49 participating States and the District of Columbia are included in the Program Characteristics File (Arizona did not have a Medicaid program in 1980), tests of statistical significance were used as one of the criteria in selecting independent variables for the models. Used in this fashion, the test of statistical significance might be interpreted as an indication that the relationship is strong enough to merit discussion and inclusion in a parsimonious model.

The estimation of recipients per 1,000 poor and expenditures per recipient was performed in two stages. In the first stage, relevant program characteristics and State characteristics were chosen on the basis of their presumed effects on enrollment and their zero-order correlations with the dependent variables. Stepwise regressions were then performed to determine which variables were significant at the .05 level. These variables were used to produce final estimates for each model.

Independent variables that failed to achieve a .05 level of significance were excluded in estimation of these models. All variables included or considered for inclusion in the models are presented in Table 1 along with their means, standard deviations, and a list of the models in which each independent variable was evaluated. The tables for these regressions (Tables 2-5) include both standardized and unstandardized coefficients. Unstandardized coefficients represent the effect on the dependent variable of a one-unit change in the independent variable. Standardized coefficients range from −1 to +1 and represent the relationship between independent and dependent variables that have been transformed to have the same mean (0) and standard deviation (1). Standardized coefficients are particularly useful in evaluating the relative strengths of independent variables in the same model: those close to 0 are weaker than those close to +1 or −1. The standardized coefficients identify which program controls exercise the greatest influence on expenditures and are also useful in evaluating the relative influence of demographic variables.

The percentage of variance explained by the regression (R^2) is useful in assessing the effectiveness of predictors in a model as well as in comparing alternative models for estimating the same dependent variable. However, the R^2 statistic does not furnish a valid comparison of models with different dependent variables because it is influenced by the amount of variation in the dependent variable. In much of the following discussion, models with different dependent variables are compared in an attempt to identify which expenditure categories are more controllable. The coefficient of variation statistic (the standard error of the estimate divided by the mean of the dependent variable) is included in the tables in order to facilitate such comparisons of models. A model with a low coefficient of variation performs well in predicting its dependent variable.

The analysis is structured to emphasize the two policy dimensions of Medicaid spending mentioned earlier. First, we consider those factors that are responsible for the number of Medicaid recipients per 1,000 poor, a measure of breadth of coverage that is independent of the size of a State's poverty population. Second, we consider a series of models for estimating the level of expenditures per recipient, a measure of depth of coverage. Thus, the policies

Table 1
Variables used in the analysis

Variable	Mean	Standard deviation	Equations[1] in which: Initially entered	Equations[1] in which: Obtained significance	Definition	Source
Program characteristic						
AFDC monthly payment standard	346.18	118.144	1, 5-7, 15, 16	5-7, 16	Continuous variable indicating maximum monthly dollar amount that the State will grant to a family of 4 to meet what the State deems basic need.	Chief, 1981
AFDC no-cash coverage	.5	.505	1, 5-7, 15, 16	ns	Dummy variable: 1 = Coverage of AFDC eligibles not receiving cash assistance.	Bartlett and Hanson, 1981; Muse and Sawyer, 1981
AFDC-related group coverage	.58	.499	1, 5-7, 15, 16	1, 16	Dummy variable: 1 = Coverage of optional AFDC-related eligibility categories of children who would be eligible for AFDC but are from intact homes.	Bartlett and Hanson, 1981; Muse and Sawyer, 1981
AFDC transfer-of-assets prohibition	.48	.505	1, 5-7, 15, 16	6	Dummy variable: 1 = State restriction of eligibility for a specified period after individuals exhaust their assets. Precludes eligibility for people who transfer assets to become eligible for assistance.	Chief, 1981
AFDC unemployed parent coverage	.56	.501	1, 5-7, 15, 16	ns	Dummy variable: 1 = Coverage of families with unemployed parents.	Bartlett and Hanson, 1981; Muse and Sawyer, 1981
Inpatient prior authorization	.72	.454	8-14, 18	ns	Dummy variable: 1 = State requirement that recipient obtain approval from Medicaid agency before receiving inpatient services.	Bartlett and Hanson, 1981; Muse et al., 1982
Inpatient hospital reimbursement method	.78	.418	8-14, 18	13	Dummy variable: 1 = State uses Medicare principles (cost-based reimbursement).	Muse and Sawyer, 1981
Limit on inpatient days	.48	.505	8-14, 18	ns	Dummy variable: 1 = State pays for only a specified number of inpatient days.	Bartlett and Hanson, 1981; Muse et al., 1982
Local financing	.26	.446	8-14, 18-20	9, 11, 19	Dummy variable: 1 = Localities required to contribute funds toward Medicaid program.	Muse et al., 1982
Lock-in or lock-out	.245	.434	8-14, 18-20	13	Dummy variable: 1 = State has one or both controls: "Lock-in" refers to restricting high utilizers of services to specified providers; "lock-out" is a procedure whereby the State restricts or precludes the participation of certain providers in the Medicaid program (as of February 1982).	Muse et al., 1982
Limit on number of physician visits	.7	.463	8-14, 19	11, 14	Dummy variable: 1 = State limits number of paid physician visits for particular services.	Bartlett and Hanson, 1981; Muse et al., 1982
Physician visit setting restrictions	.58	.499	8-14, 19	ns	Dummy variable: 1 = Limits on number of visits in certain settings.	Bartlett and Hanson, 1981; Muse et al., 1982

See footnotes at end of table.

Table 1—Continued
Variables used in the analysis

Variable	Mean	Standard deviation	Equations[1] in which: Initially entered	Equations[1] in which: Obtained significance	Definition	Source
Medically needy program-medically needy protected income level interaction	179.4	168.42	1-20	1, 5, 13, 14, 15, 17	Term for combined impact of presence of a medically needy program and level of protected income for medically needy enrollees (product of dummy variable for presence of medically needy program and medically needy protected income level).	Muse and Sawyer, 1981
Number of mandatory services with limits	5.06	2.198	8-14, 18-20	8	Continuous variable indicating number of mandatory services with limits other than prior authorization.	Bartlett and Hanson, 1981; Muse et al., 1982
Optional practitioner services	5.48	2.880	8-14, 18-20	9-12	Dummy variable: 1 = Coverage of services of providers other than physicians but under physician authorization.	Muse and Sawyer, 1981
Diagnostic services	1.12	1.365	8-14, 18-20	ns	Dummy variable: 1 = Coverage of services to ambulatory patients, including screening, preventive, diagnostic, and clinic services.	Muse and Sawyer, 1981
Percent of optional services with limits	.641	.264	8-14, 18-20	13	Continuous variable indicating proportion of total optional services with limits other than prior authorization.	Bartlett and Hanson, 1981; Muse et al., 1982
Personal care services	1.16	1.167	8-14, 18-20	ns	Dummy variable: 1 = Coverage of services prescribed by a physician, supervised or rendered by a registered nurse, and generally rendered in a patient's home. These services differ from mandatory home health services only in the authorizing and initiating agents. Personal care services are not necessarily associated with skilled nursing facility care.	Muse and Sawyer, 1981
Presence of medically needy program	.6	.495	1-20	2, 4, 7	Dummy variable: 1 = Presence of a medically needy program. States may provide Medicaid coverage to households with incomes of up to 133 percent of State's AFDC payment standard or whose out-of-pocket health expenditures deplete their resources to within 133 percent of payment standard.	Muse and Sawyer, 1981
Presence of State-only program	.75	.438	1-20	13	Dummy variable: 1 = Presence of Medicaid-eligible groups totally supported by State funds.	Bartlett and Hanson, 1981; Muse and Sawyer, 1981
Ratio of Medicaid to Medicare reimbursements	.767	.227	8-14, 18-20	19	Medicaid-to-Medicare fee ratio for specialists, fiscal year 1980.	Holahan, 1982
SSI 209B State	.30	.462	1-4, 15-17	4	Dummy variable: 1 = State uses more restrictive 209B principles in SSI eligibility determination.	Muse and Sawyer, 1981

See footnotes at end of table.

Table 1—Continued
Variables used in the analysis

Variable	Mean	Standard deviation	Equations[1] in which: Initially entered	Equations[1] in which: Obtained significance	Definition	Source
SSI essential spouse coverage	.58	.499	1-4, 17	ns	Dummy variable: 1 = State extension of coverage to SSI essential spouses. Essential spouses are not eligible for SSI because of age or disability but are the sole source of care and support for a spouse who is eligible for SSI.	Bartlett and Hanson, 1981; Muse et al., 1982
SSI-State supplement payment coverage	.72	.454	1-4, 17	ns	Dummy variable: 1 = Coverage of persons eligible for and receiving State supplement payments.	Bartlett and Hanson, 1981; Muse and Sawyer, 1981
Unemployment-AFDC unemployed parent coverage interaction	8.70	3.714	1, 5-7, 15, 16	1, 5-7, 15, 16	Term comprised of unemployed parents coverage and State unemployment rate (product of State unemployment rate and dummy variable indicating whether State furnished AFDC benefits to unemployed parents).	Bartlett and Hanson, 1981; Muse and Sawyer, 1981; U.S. Bureau of the Census, 1981
Weekend or preoperative days limits	.84	.370	8-14, 18	ns	Dummy variable: 1 = State will not pay for services rendered on Saturday or Sunday if first and second days of stay and/or State will not pay for inpatient days before date of surgery.	Bartlett and Hanson, 1981; Muse et al., 1982
Other State characteristic						
AFDC recipients per total recipients	.66	.081	8, 12-14, 18-19	ns	Ratio of AFDC recipients to total recipients.	Muse and Sawyer, 1981
Aged poor per total poor	.15	.059	1-4, 17	3	Ratio of aged poor to total poverty population.	U.S. Bureau of the Census, 1981
Hospital beds per 1,000 population, 1980	4.450	1.039	8-14, 17	ns	Hospital beds per 1,000 population.	American Hospital Association, 1981
Hospital per diem charge, 1979	241.16	57.93	8-14, 18	18	Average charge per hospital day in non-Federal, short-term general hospital.	American Hospital Association, 1981
Percent female-headed poverty families	.412	.113	1, 5-7, 15-16	ns	Percent of poverty households headed by females.	U.S. Bureau of the Census, 1982
Percent unemployed	7.42	2.07	1-7, 15-17	ns	Annual unemployment rate for 1980.	U.S. Bureau of the Census, 1981
Average physician visit charge, 1979	16.59	1.739	8-14, 19	9, 10	Mean fee for physician office visit by 9 census divisions.	American Medical Association, 1981

See footnotes at end of table.

Table 1—Continued
Variables used in the analysis

Variable	Mean	Standard deviation	Equations[1] in which: Initially entered	Equations[1] in which: Obtained significance	Definition	Source
Physicians per 1,000 population, 1980	1.73	.763	8-14, 18	12-14	Number of physicians per 1,000 population.	American Medical Association, 1981
Poor children per total poor	.135	.092	1, 5-7, 15-16	ns	Ratio of poverty population under age 18 to total number of poor.	U.S. Bureau of the Census, 1982
Nursing home beds per 1,000 population, 1978	.006	.003	8-14, 20	10	Number of nursing home beds per 1,000 population.	U.S. Bureau of the Census, 1981
Intermediate care facility per diem charge, 1979	26.87	10.20	8-14, 20	9, 10, 20	Mean intermediate care facility charge per day, 1978	Spitz and Atkinson, 1983

Variable	Equation [1]	Mean	Standard deviation
Dependent variable[2]			
Total recipients per 1,000 poor	1	684.91	295.33
Total SSI recipients per 1,000 poor	2	204.25	97.45
Total SSI recipients per 1,000 aged poor	3	1224.62	2282.01
Total SSI blind and disabled recipients per 1,000 nonaged poor	4	106.75	56.56
Total AFDC recipients per 1,000 nonaged poor	5	463.03	220.92
Total AFDC adult recipients per 1,000 poor adults	6	298.63	144.1
Total AFDC child recipients per 1,000 poor children	7	882.31	405.60
Total expenditures per recipient	8	1181.32	326.23
Total expenditures per SSI recipient	9	2806.11	1061.67
Total SSI aged expenditures per aged recipient	10	2675.57	972.94
Total SSI blind and disabled expenditures per blind and disabled SSI recipient	11	3089.14	1320.95
Total AFDC expenditures per AFDC recipient	12	445.03	116.46
Total AFDC adult expenditures per AFDC adult recipient	13	694.76	171.88
Total AFDC child expenditures per AFDC child recipient	14	327.64	101.34
Total hospital recipients per 1,000 poor	15	121.273	46.27
Total physician recipients per 1,000 poor	16	469.67	200.02
Total long-term care recipients per 1,000 poor	17	53.83	27.44
Total hospital expenditures per hospital recipient	18	1612.32	677.06
Total physician expenditures per physician recipient	19	138.53	36.12
Total long-term care expenditures per long-term care recipient	20	5635.62	1622.48

[1] Refer to Tables 2-5 for model specification.
[2] Recipient and expenditure data extracted from Medicaid administrative reporting form 2082. Poverty data used in computation of recipient and expenditure rates are obtained from publications of U.S. Bureau of the Census.

NOTES: AFDC = Aid to Families with Dependent Children.
ns = Variable used in stepwise selection but not significant at .05 level.
SSI = Supplemental Security Income.
SSP = State supplemental payments.
All data used in the development of the models analyzed in this article were extracted from the Program Characteristics File (PCF). The PCF contains information on each State's sociodemographic and economic characteristics, Medicaid program guidelines, Medicaid recipient population, and levels of utilization and expenditures. These data were gathered from a variety of sources, including publications of the U.S. Bureau of the Census, a telephone survey of State Medicaid programs, and program statistics compiled by the Health Care Financing Administration. All dummy variables were coded such that "1" indicates the presence of a characteristic and "0" indicates its absence.

that influence Medicaid expenditures are separated into two categories: those that affect expenditures by extending coverage to a larger population and those that affect expenditures by providing a greater depth of coverage to those receiving benefits. The identity presented at the beginning of this section can then be used to estimate total Medicaid expenditures for any particular State.

Recipients

Two major categories of variables account for the number of Medicaid recipients in any given Medicaid program. First, the eligibility criteria of the program define the classes of people who may qualify. State programs are generally required to furnish Medicaid coverage to those receiving SSI and AFDC assistance.

However, States are afforded considerable latitude in covering additional groups (e.g., medically needy, SSI essential spouses, and families with unemployed parents) and in determining the income levels at which people in these groups may qualify.

The demographic mix of a State's population also influences the number of recipients in a State's program. Considering that families participating in AFDC automatically qualify for Medicaid, one might anticipate that the percentage of poor families headed by a single female would be an important indicator of program participation. Similarly, the percentage of poor persons who are 65 years of age or over would be a predictor of the number of participants because SSI recipients are automatically eligible for Medicaid and the aged poor constitute more than one-half of the SSI population.

In Table 2, the regression models are presented for Medicaid recipients per 1,000 poor persons, with separate models for SSI and AFDC eligibility categories. In comparing the models, it can be seen from the coefficients of variation that the models for estimating AFDC recipients consistently outperform those estimating SSI participation. Moreover, all of the independent variables in the AFDC models are program characteristics under the control of State governments.

States might influence the size of the SSI population in their Medicaid programs by three major methods: deciding whether to provide for the medically needy, choosing whether to raise the SSI income standard through State supplemental payments, and imposing Medicaid eligibility criteria more restrictive than those imposed by the Federal SSI program (Rymer and Adler, 1984).

Although these options seem to allow States great discretion in determining the number of SSI Medicaid recipients, this discretion is limited in at least two ways. First, the Federal SSI program establishes a national minimum payment standard. This sets a floor for Medicaid eligibility of SSI categorically related people, because those who qualify for SSI under the national standard generally qualify for participation in State Medicaid programs. Second, the political appeal of supporting aged, disabled, and blind people, who constitute the SSI population, has been greater than that associated with support of the AFDC population. Thus, State policymakers may be more reluctant to restrict the eligibility of SSI Medicaid recipients.

Among the three SSI models in Table 2, the presence of a medically needy program is significant at the .01 level in the models for total SSI recipients and for blind and disabled SSI recipients. The number of blind and disabled recipients is further influenced by a State's choice to exercise the 209B option, which allows for more restrictive eligibility criteria. The model for aged SSI Medicaid recipients per 1,000 aged poor is dominated by a demographic variable beyond the control of State policymakers: the ratio of aged poor to total poor. Although this model has a high coefficient of variation, it appears that the percentage of aged poor receiving Medicaid benefits is lower in States where the aged poor represent a larger percentage of the poor population.

Analysis of the three AFDC recipient models tells an entirely different story concerning State control over the number of recipients per 1,000 poor. Four eligibility variables are significant in at least one of the three AFDC models (children, adults, and total AFDC), but none of the demographic variables are significant at the .05 level.

Three policy variables appear in the model for estimating total AFDC Medicaid recipients per 1,000 poor. The AFDC monthly payment standard for a family of four is a powerful predictor. Because families earning more than the monthly payment standard do not qualify for AFDC, raising the payment standard expands the number of poor adults eligible for AFDC payments.

The second important policy variable is the product of the medically needy program and the protected income level in those States that have such programs. States with no medically needy program are assigned a value of zero on this variable, and other States are assigned a value corresponding to their protected income level. Thus, this variable represents the joint effects of the presence of a medically needy program and the protected income level for States that have such programs. Of the three independent variables significant at the .05 level, the standardized coefficients indicate that this interaction term is the least powerful predictor.

The strongest predictor of total AFDC recipients per 1,000 poor is an interaction term consisting of the product of the State unemployment rate and a dummy variable indicating whether the State furnishes AFDC benefits to intact families with unemployed parents. This interaction term is used because unemployment rates should have a direct effect on the number of AFDC recipients per 1,000 poor in States that furnish AFDC coverage to families headed by such adults. By providing this benefit, States expand not only the AFDC population but also the corresponding population of AFDC Medicaid recipients.

The model for estimating AFDC adult recipients per 1,000 poor adults is very similar to the model for total AFDC recipients, but the medically needy-protected income term is not significant at the .05 level. However, another variable, transfer-of-assets prohibitions, is significant. The transfer-of-assets prohibition is intended to exclude from AFDC participation persons who impoverish themselves in order to qualify for AFDC. It does not enter the model for AFDC children. Apparently, families affected by this provision tend to have fewer children, and poor families with a large number of children tend to qualify regardless of this provision.

According to the model for AFDC children, States with a medically needy program average 167 more Medicaid child recipients per 1,000 poor children than do States without this program. The medically needy-protected income interaction term does not qualify for the model using a .05 level of significance, indicating that the choice of a protected income level is not a

major factor in determining the number of AFDC child recipients.

The model for total recipients per 1,000 poor explains 58 percent of the variance using a unique combination of three policy variables (AFDC-related group coverage, the medically needy-protected income interaction term, and the interaction of State unemployment rate and AFDC unemployed percent coverage). It is clear from the previous discussion that the presence of a medically needy program affects the number of recipients in both the SSI and AFDC categories. However, Medicaid coverage of AFDC-related groups and the interaction term representing the joint effects of the unemployment rate and AFDC

Table 2

Regression of program characteristics and other State characteristics on Medicaid recipients per 1,000 poor, by enrollment group: 1981

		SSI recipients			AFDC recipients		
Predictor variable	Total recipients per 1,000 poor	Total recipients per 1,000 poor	Aged recipients per 1,000 aged poor	Blind and disabled recipients per 1,000 nonaged poor	Total recipients per 1,000 nonaged poor	Adult recipients per 1,000 nonaged poor	Child recipients per 1,000 poor children
Model number	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Intercept	154.308	154.779	6310.713	92.970	-71.193	-124.752	-145.402
Program characteristic							
AFDC monthly payment standard	ns	x	x	x	0.605 **(0.314)	0.590 ***(0.469)	1.456 **(0.413)
AFDC-related group coverage	129.767 *(0.219)	x	x	x	ns	ns	ns
Presence of medically needy program	ns	82.446 **(0.419)	ns	40.884 **(0.351)	ns	ns	166.537 *(0.202)
Medically needy program-medically needy protected income level interaction	0.574 **(0.327)	ns	ns	x[a]	0.304 *(0.233)	ns	ns
Unemployment-AFDC unemployed parent coverage interaction	40.516 ***(0.510)	x	x	x	30.581 ***(0.526)	21.771 ***(0.574)	47.197 ***(0.438)
SSI 209B State	ns	ns	ns	-38.586 *(-0.321)	x	x	x
AFDC transfer-of-assets prohibitions	ns	x	x	x	ns	-57.727 *(-0.202)	ns
Other State characteristic							
Aged poor per total poor	ns	ns	-37616.363 ***(-0.584)	ns	x	x	x
	R^2 = 0.581 ***F = 21.266 (3, 46) DF CV = .29	R^2 = 0.175 **F = 10.203 (1, 48) DF CV = .44	R^2 = 0.341 ***F = 23.822 (1, 46) DF CV = 1.53	R^2 = 0.196 **F = 5.364 (2, 44) DF CV = .49	R^2 = 0.709 ***F = 34.041 (3, 42) DF CV = .27	R^2 = 0.759 ***F = 44.032 (3, 42) DF CV = .25	R^2 = 0.647 ***F = 26.299 (3, 43) DF CV = .28

NOTES: See Table 1 for definitions of variables and a complete list of variables tested in each model.
AFDC = Aid to Families with Dependent Children.
SSI = Supplemental Security Income.
*** = Significant at .001 level.
** = Significant at .01 level.
* = Significant at .05 level.
ns = Variable used in stepwise selection but not significant at .05 level.
x = Variable not used in this analysis.
x[a] = Variable initially tried in equation but removed because of multicollinearity.
R^2 = Percent of variance explained.
F = Ratio of explained variance to unexplained variance.
DF = Degrees of freedom.
CV = Coefficient of variation.
Standardized coefficients appear in parentheses beneath unstandardized slopes. Degrees of freedom may vary from model to model because observations were dropped when data were missing.

coverage of families with unemployed parents exercise their influence on total recipient counts entirely through the AFDC component of the program.

Based on the policy and demographic variables contained in the Program Characteristics File, it appears that State policymakers have substantial control over the proportion of poor who will receive Medicaid support. For the most part, this control is exercised indirectly through eligibility criteria governing access to AFDC participation. Although States generally have little control over the Medicaid participation of people who qualify through SSI, the decision to cover the medically needy and the selection of a protected income level significantly affect the participation of both SSI and AFDC categorically related groups. The expenditure implications of adding SSI recipients are particularly profound, because Medicaid expenditures average $2,535 per SSI recipient compared with $465 per AFDC recipient (Sawyer et al., 1983).

Expenditures

Bovbjerg and Holahan (1982) contend that State policymakers tend to have more control over the number of recipients in their Medicaid programs than they have over expenditures per recipient. Many basic services funded by Medicaid are mandated, and some other services are so widely accepted that nearly every State offers them.

A more recent study (Feder and Holahan, 1985) attributes two-thirds of the post-OBRA savings in Medicaid expenditures to reductions in expenditures per recipient rather than reductions in the number of recipients. Morever, it suggests that the post-OBRA reductions were accomplished, for the most part, using policy controls available to the States prior to OBRA.

Analysis of the 1980 Program Characteristics File indicates substantial State control over both the number of recipients and expenditures per recipient. Analysis of Table 2 indicated the importance of distinguishing among aid categories in identifying the effects program controls might have on the number of recipients. Examination of Table 3 establishes that this is also necessary in analyzing expenditures per recipient. Although eight program characteristics achieve a .05 level of significance in models estimating expenditures per recipient for the particular aid categories, none of them attain significance in the overall model of expenditures per recipient. The only program characteristic to achieve significance in the overall model is the number of mandatory services with limits, a program control with a substantial negative effect on expenditures.

The lack of commonality between the overall expenditure model and those for particular aid categories reflects the complexity of Medicaid program characteristics and their differential effects on per-recipient expenditures within various aid categories. Just as the coefficients of variation in Table 2 indicated that the number of AFDC recipients was generally more controllable than the number of SSI recipients, the coefficients of variation in Table 3 indicate that the AFDC models are generally better predictors of expenditures per recipient than are the corresponding SSI models.

The comparisons of AFDC and SSI expenditures models are complicated by the presence of several predictor variables exogenous to the Medicaid program. Thus, models which furnish good estimates of expenditures per recipient may be driven primarily by factors beyond the control of State Medicaid policymakers.

This is the case with the expenditures model for the SSI aged, for which the three strongest predictors—nursing home beds per 1,000 population, average physician visit charge, and per diem charge for intermediate care facilities (ICF's)—are not Medicaid program characteristics. Two of these variables, nursing home beds per 1,000 population and ICF per diem charge, reflect the major role Medicaid plays in funding long-term care for the aged.

Average physician visit charge, the third variable, is negatively related to expenditures per aged SSI recipient. One possible explanation of this rather perplexing finding is the hypothesis that physicians practicing in States with above average physician charges may rely more heavily on Medicare for payment of services they furnish to the aged. In seeking an explanation for this relationship, we examined the Pearson correlation between Holahan's Medicaid-to-Medicare fee ratio (Bovbjerg and Holahan, 1982) and the average physician visit charge. The two variables are negatively associated ($r = -.36$), indicating that in States with higher physician fees, the Medicaid program generally pays a lower percentage of the average fee.

Under these circumstances, aged SSI recipients in States with high physician charges may receive much of their care from physicians who do not participate in the Medicaid program, thereby reducing Medicaid expenditures. Although receiving physician services entirely through the Medicare program, the aged might still appear as Medicaid recipients by virtue of the program's coverage of pharmaceuticals and other medical services.

The model for estimating expenditures for the blind and disabled does not predict expenditures quite as well as the SSI aged model does. However, all three of the predictor variables for the blind and disabled are State Medicaid program characteristics. Two of these variables (optional practitioner services and limitations on the number of physician visits in particular settings) exercise their influence by controlling utilization of Medicaid services.

The presence of local financing (a program requirement that localities contribute funds to the Medicaid program), is the third independent variable in the expenditure model for the blind and disabled. Local financing exercises a strong positive influence on expenditures. It appears that State policymakers gain additional financial leverage by requiring a local

Table 3

Regression of program characteristics and other State characteristics on expenditures per recipient, by enrollment group: 1981

Predictor variable	Total expenditures per recipient	SSI recipients			AFDC recipients		
		Total expenditures per recipient	Expenditures per aged recipient	Expenditures per blind or disabled recipient	Total expenditures per recipient	Expenditures per adult recipient	Expenditures per child recipient
Model number	(8)	(9)	(10)	(11)	(12)	(13)	(14)
Intercept	1217.552	3138.184	2386.552	1075.989	243.225	976.538	146.100
Program characteristic							
Optional practitioner services	ns	123.134 **(0.345)	78.968 *(0.242)	183.838 **(0.399)	10.943 *(0.271)	ns	ns
Limits on number of physician visits	ns	ns	ns	-848.236 *(-0.291)	ns	ns	-71.126 **(-0.317)
Number of mandatory services with limits	-64.813 ***(-0.384)	ns	ns	ns	ns	ns	ns
Percent of optional services with limits	ns	ns	ns	ns	ns	-272.143 **(-0.480)	ns
Local financing	ns	653.416 *(0.276)	ns	1187.310 **(0.407)	ns	ns	ns
Lock-in or lock-out	ns	ns	ns	ns	ns	141.157 *(0.376)	ns
Medically needy program-medically needy protected income level interaction	ns	ns	ns	ns	ns	0.299 *(0.320)	0.275 ***(0.460)
Inpatient hospital reimbursement method	ns	ns	ns	ns	ns	-140.818 *(-0.387)	ns
Presence of State-only program	ns	ns	ns	ns	ns	-131.295 *(-0.361)	ns
Other State characteristic							
Physicians per 1,000 population, 1980	ns	ns	ns	ns	81.421 ***(0.550)	ns	45.010 **(0.347)
Nursing home beds per 1,000 population 1978	48.127 **(0.385)	ns	98.056 *(0.275)	ns	x	x	x
Average physician visit charge, 1979	ns	-249.316 *(0.420)	-255.677 **(0.469)	ns	ns	ns	ns
Intermediate care facility per diem charge, 1979	ns	111.558 ***(0.563)	132.336 ***(0.771)	ns	x	x	x
	R^2 = 0.336 ***F = 11.915 (2, 47) DF CV = .23	R^2 = 0.543 ***F = 11.308 (4,38) DF CV = .27	R^2 = 0.562 ***F = 12.827 (4, 40) DF CV = .25	R^2 = 0.431 ***F = 10.613 (3, 42) DF CV = .34	R^2 = 0.406 ***F = 14.365 (2, 42) DF CV = .21	R^2 = 0.363 **F = 4.100 (5, 36) DF CV = .20	R^2 = 0.557 F = 18.026 (3, 43) DF CV = .21

NOTES: See Table 1 for definitions of variables and a complete list of variables tested in each model.
AFDC = Aid to Families with Dependent Children.
SSI = Supplemental Security Income.
*** = Significant at .001 level.
** = Significant at .01 level.
* = Significant at .05 level.
ns = Variable used in stepwise selection but not significant at .05 level.
x = Variable not used in this analysis.
R^2 = Percent of variance explained.
F = Ratio of explained variance to unexplained variance.
DF = Degrees of freedom.
CV = Coefficient of variation.
Standardized coefficients appear in parentheses beneath unstandardized slopes. Degrees of freedom may vary from model to model because observations were dropped when data were missing.

contribution. Any such gain would be magnified by the availability of Federal matching funds.

Expenditures per blind or disabled recipient are quite sensitive to utilization controls, particularly limitations on the number and kind of services. This finding suggests that such controls are most likely to affect the chronically ill, who are high users. It is consistent with the findings of the individual-level survey analysis presented by Mauskopf, Rodgers, and Dobson in the article that follows.

The models for estimating expenditures per AFDC recipient generally outperform those for estimating expenditures per SSI recipient, with program characteristics dominating the models. Nevertheless, the general model for expenditures per AFDC recipient is dominated by physicians per 1,000 population, a supply variable exogenous to the Medicaid program.

The responsiveness of AFDC Medicaid expenditures to the supply of physicians can be interpreted in at least two ways. The first interpretation is that low levels of provider reimbursement may create incentives for physicians to treat other patients in preference to Medicaid recipients. Bovbjerg and Holahan (1982) have demonstrated that most State Medicaid programs pay physicians far less than the "usual, customary, and reasonable" fees paid by the Medicare program. Physicians treating Medicaid patients are required to accept the Medicaid payment as full payment. Therefore, one might expect Medicaid recipients to encounter problems in obtaining access to physicians in areas with a low concentration of physicians. On the whole, AFDC recipients are probably not as seriously ill as SSI recipients are, so they might be less persistent in their efforts to achieve access to physicians.

Another interpretation of the relationship between physician supply and AFDC utilization is that States with high concentrations of physicians also tend to have a high percentage of specialists and a greater concentration of sophisticated medical services. Consequently, AFDC patients who might otherwise be treated by general practitioners using less sophisticated procedures become consumers of a more expensive mix of services.

Although the physician supply variable dominates the general AFDC expenditure model and enters the model for AFDC children, seven program variables enter at least one of the three AFDC models. The most interesting of these is the presence of a medically needy program. (Actually, the variable is an interaction term composed of medically needy program and medically needy protected income level.) It appears that recipients who qualify through the provisions of the medically needy program utilize services at a higher rate. Many people qualify for medically needy programs by spending their incomes on medical care until their remaining income falls below the medically needy income standard. Unless the incomes are already very close to the standard, spending down to this level implies that the people are indeed very ill. Consequently, the presence of a medically needy program appears to modify a Medicaid program's case mix by creating special opportunities for seriously ill people to qualify for the program.

The presence of a State-only program (i.e., Medicaid-eligible groups that are supported totally by State funds) seems to change the AFDC adult case mix in a different way. It apparently brings relatively healthy people into the program, thereby lowering expenditures per recipient.

Four variables directly related to utilization appear in at least one of the three AFDC models: coverage of optional practitioner services, limitations on the number of physician visits for particular services, the percentage of optional services with limits, and the presence of lock-in or lock-out restrictions. (Lock-in restricts choice of providers, and lock-out allows States to exclude particular providers from Medicaid participation.) In each case, the effects are as anticipated, with limits on services reducing expenditures and provision of optional services increasing them.

Finally, method of inpatient reimbursement is a significant predictor of expenditures per AFDC adult recipient, indicating a negative relationship between hospital reimbursement based on Medicare principles (cost-based reimbursement) and total expenditures per AFDC adult recipient during 1980. It is probably wrong to suggest that alternative methods of hospital reimbursement, such as prospective payment, are responsible for higher levels of expenditures. Rather, it is likely that States experiencing the highest health care costs in the late 1970's had the greatest incentives to adopt alternatives to the cost-reimbursement methodologies that were long the standard for Medicaid programs. Today, 33 State Medicaid programs use prospective payment. It is noteworthy that the negative association between Medicare reimbursement principles and expenditures per recipient appears only in the model for AFDC adults. It does not appear in a subsequent model for estimating expenditures per Medicaid hospital recipient.

Hospital, physician, and long-term care services

The previous discussion has been based on models structured around the recipient's enrollment category. This orientation tends to emphasize the importance of eligibility criteria rather than service-related program characteristics because eligibility criteria play a key part in defining the case mix of the Medicaid population within each aid category. Models structured around service category, on the other hand, should be more sensitive to the effects of policies intended to control expenditures within particular service categories.

In Table 4, models for estimating total recipients per 1,000 poor people for hospital, physician, and long-term care services are displayed. From these models, it appears that State Medicaid program

Table 4

Regression of program characteristics and other State characteristics on Medicaid recipients per 1,000 poor, by hospital, physician, and long-term care services: 1981

Predictor variable	Total recipients per 1,000 poor: Hospital services	Physician services	Long-term care services
Model number	(15)	(16)	(17)
Intercept	59.263	10.633	0.041
Program characteristic			
Unemployment-AFDC unemployed parent coverage interaction	4.779 **(0.379)	22.389 ***(0.416)	x
Medically needy program-medically needy protected income interaction	0.114 **(0.410)	ns	0.0001 **(0.439)
AFDC monthly payment standard	ns	0.550 **(0.325)	x
AFDC-related group coverage	ns	127.637 ***(0.318)	
	R^2 = 0.381 ***F = 14.436 (2, 47) DF CV = .31	R^2 = 0.594 ***F = 22.443 (3, 46) DF CV = .28	R^2 = 0.193 ***F = 11.237 (1, 47) DF CV = .46

NOTE: See Table 1 for definitions of variables and a complete list of variables tested in each model.
AFDC = Aid to Families with Dependent Children.
*** = Significant at .001 level.
** = Significant at .01 level.
* = Significant at .05 level.
ns = Variable used in stepwise selection but not significant at .05 level.
x = Variable initially tried in equation but removed because of multicollinearity.
R^2 = Percent of variance explained.
F = Ratio of explained variance to unexplained variance.
DF = Degrees of freedom.
CV = Coefficient of variation.
Standardized coefficients appear in parentheses beneath unstandardized slopes. Degrees of freedom may vary from model to model because observations were dropped when data were missing.

characteristics have substantial effects on the number of recipients of these services. Moreover, all of the independent variables in these models estimating the number of recipients for hospital, physician, and long-term care services are eligibility guidelines governing access to the program.

The interaction of the 1979 unemployment rate and coverage of AFDC unemployed parents affects recipient rates for both hospital and physician recipients. It is the most powerful predictor of physician recipients and the second most powerful predictor of hospital recipients. It does not have a significant effect on the number of long-term care recipients, reflecting the low level of long-term care utilization in the AFDC population.

The interaction between the presence of a medically needy program and the medically needy protected income level is the most important predictor of hospital recipients per 1,000 poor. Moreover, it is the only predictor in the model for long-term care recipients. The presence of a medically needy program, particularly one with a high protected income level, changes the case mix of the Medicaid population to such a degree that the proportion of the poor population receiving hospital and long-term care services rises markedly. This is a particularly important finding from a budgetary perspective because hospital and long-term care services dominate Medicaid expenditures. The AFDC monthly payment standard and AFDC-related group coverage both increase the number of recipients of physician services per 1,000 poor.

These findings suggest that program controls, particularly enrollment guidelines, can be effective in limiting Medicaid hospital and physician utilization. In contrast, only a small amount of the variance is explained by the model for long-term care recipients, and the coefficient of variation is high. This indicates that the number of long-term care recipients per 1,000 poor is less controllable and less predictable than are the other recipient categories. Nevertheless, the inclusion of the medically needy program variable represents an important finding because long-term care represents about 40 percent of total Medicaid expenditures.

In Table 5, models for estimating expenditures per hospital, physician, and long-term care recipient are displayed. These service-specific models demonstrate that expenditures for all three services are influenced by price.

The hospital per diem charge is the most important predictor of hospital expenditures. Each additional dollar in hospital per diem charges accounts for an additional $6.73 in hospital expenditures per Medicaid hospital recipient. The presence of a medically needy program is also an important predictor of hospital expenditures. Enrollees entering Medicaid through the medically needy option are high users of hospital services. In Table 4, it was shown that medically needy recipients are more likely to be admitted to hospitals; in Table 5, it is shown that they tend to consume more services once admitted.

Physician charge per visit is not included in the physician expenditure model because it is not significant at the .05 level. However, another price-related variable, the Medicaid-to-Medicare fee ratio for specialists (Bovbjerg and Holahan, 1982), is the most important predictor of physician expenditures. A 1-percent increase in this measure of Medicaid generosity toward physicians results in an increase of $86 per physician recipient. This clearly indicates that Medicaid generosity toward physicians increases physician expenditures, but generosity toward physicians may also help to avoid unnecessarily high use of hospital emergency room and outpatient services. Physician expenditures are related to two other program characteristics: A high number of mandatory services with limits and the presence of local financing appear to decrease total Medicaid

Table 5

Regression of program characteristics and other State characteristics on expenditures per recipient for hospital, physician, and long-term care services: 1981

Predictor variable	Total hospital expenditures per hospital recipient	Total physician expenditures per physician recipient	Total long-term care expenditures per long-term care recipient
Model number	(18)	(19)	(20)
Intercept	-268.327	96.701	3099.987
Program characteristic			
Number of mandatory services with limits	ns	-4.104 *(-0.255)	ns
Local financing	ns	-18.888 *(-0.236)	ns
Presence of medically needy program	428.063 **(0.313)	ns	ns
Ratio of Medicaid to Medicare reimbursements	ns	86.341 ***(0.551)	ns
Other State characteristic			
Hospital per diem charge, 1979	6.733 ***(0.576)	x	x
Intermediate care facility per diem charge, 1979	x	x	92.519 ***(0.585)
	$R^2 = 0.425$ ***$F = 17.353$ (2, 47) DF CV = .33	$R^2 = 0.439$ ***$F = 11.723$ (3, 45) DF CV = .20	$R^2 = 0.343$ ***$F = 22.940$ (1, 44) DF CV = .24

NOTE: See Table 1 for definitions of variables and a complete list of variables tested in each model.
AFDC = Aid to Families with Dependent Children.
*** = Significant at .001 level.
** = Significant at .01 level.
* = Significant at .05 level.
ns = Variable used in stepwise selection but not significant at .05 level.
x = Variable not used in this analysis.
R^2 = Percent of variance explained.
F = Ratio of explained variance to unexplained variance.
DF = Degrees of freedom.
CV = Coefficient of variation.
Standardized coefficients appear in parentheses beneath unstandardized slopes. Degrees of freedom may vary from model to model because observations were dropped when data were missing.

physician expenditures per recipient. Many limits on mandatory services relate to physician services, but the apparent negative influence of local financing on physician expenditures is difficult to understand.

The only significant predictor in the model for long-term care expenditures per recipient is the ICF per diem charge. A $1 increase in ICF per diem charges increased 1980 Medicaid long-term care expenditures by $92.52 per long-term care recipient.

Unlike the models for estimating the number of recipients of long-term care and hospital services, the corresponding expenditure models are dominated by the effects of an exogenous factor, price. In contrast, the physician expenditure model suggests that this service category can be controlled by changing the level of physician reimbursement and limiting the provision of mandatory services. Nevertheless, any attempt to further restrict expenditures for physician services must be tempered by an awareness that such an attempt may encourage greater use of hospital emergency room and outpatient services.

Conclusion

In this article, a variety of methods were identified by which State policymakers were able to control Medicaid expenditures during 1980. States exercised considerable control over their population of Medicaid recipients through the eligibility guidelines of the AFDC program and through decisions to provide for the medically needy, but they exercised relatively little control over the number of SSI Medicaid recipients. The number of aged SSI recipients was particularly unresponsive to variation in eligibility standards.

With respect to Medicaid expenditures per recipient, both child and adult AFDC categories and the SSI blind and disabled category were responsive to program controls. Expenditures for SSI aged recipients, on the other hand, were primarily a function of supply and price variables beyond the control of State Medicaid policymakers.

The analysis of particular service categories allowed us to compare the relative control States exercised over hospital, physician, and long-term care expenditures. States exercised the greatest control over physician expenditures and the least control over long-term care expenditures. Use of the model for long-term care recipients per 1,000 poor demonstrated that State decisions concerning the provision of a medically needy program and the selection of protected income levels for such programs exercised a significant influence on the number of long-term care recipients. However, the medically needy program variable was the only program characteristic that demonstrated a significant effect on the number of long-term care recipients or the level of long-term care spending.

Although this article suggests a variety of methods to control Medicaid spending, it is not designed to yield information about the tradeoffs in health services that might accompany each method. Critical issues that must be considered are the extent to which Medicaid recipients are dependent on the Medicaid program for their health care needs and the extent to which Medicaid program characteristics determine access to care and levels of utilization. The next article sheds light on these issues.

State Medicaid program controls and health care services utilization

by Josephine Mauskopf, Jack Rodgers, and Allen Dobson

Overview

In this article, we explore the effects of specific State Medicaid program controls on the health care utilization patterns of individual Medicaid recipients using 1980 household-level data from the National Medical Care Utilization and Expenditure Survey (NMCUES). The analysis provides baseline information useful for evaluations of Federal and State Medicaid cost-containment efforts.

The principal hypothesis tested in this article is that less generous Medicaid programs decrease the utilization of health care services for members of the poor and near-poor population who are enrolled in the Medicaid program for at least part of the year. Less generous State programs are those that offer fewer services to their enrollees and impose more limits on the services provided.

Our results support those of previous empirical studies: in many cases, benefit limits and payment controls seem to have statistically insignificant effects on the use of health care services by Medicaid enrollees. However, by separately analyzing the effects of specific program controls on different categories of Medicaid enrollees, we have been able to gain clearer insight into the disaggregated effects of such controls. In some cases, the program control variables have significant effects in the expected direction. In other cases, the effect is the opposite of that expected. The direction and magnitude of the impact is also seen to vary according to the state of health of the Medicaid enrollee.

Estimation model

The dependent variables for the regression equations estimated in this analysis are of two basic types:

- Probability of use of a specific health care service.
- Levels of use during 1980 for users of a specific service.

In previous empirical studies, significant relationships have been found between individual socioeconomic characteristics and individual use of health care services (Grossman, 1972; Newhouse and Phelps, 1976; Colle and Grossman, 1978; Goldman and Grossman, 1978; Wilensky, Rossiter, and Taylor, 1981; and Manning et al., 1981), as well as between State socioeconomic characteristics and program controls (McDevitt et al., 1984). Therefore, the following independent variables are included in each estimation equation so that our estimates of the effects of program controls are adjusted for variation in nonprogrammatic factors:

- Price variables, including prevailing price of services, time price for travel and waiting, full- or part-year Medicaid, employment status, and other insurance coverage.
- Income variables, including annual family income and family size.
- Health status variables, including self-assessed health status, presence of chronic conditions, and age.
- Sociodemographic variables, including education, sex, race, marital status, and rural or urban residence.
- Supply variables, including physicians per 1,000 persons and hospital beds per 1,000 persons.

Davidson et al. (1983) have shown that there are regional variations in attitude toward welfare programs, including the Medicaid program, and accompanying differences in program characteristics. For this reason, the four major geographic regions are always included as background variables in the regression models so that regional effects on health care use can be separated from the effects of program controls.

The characteristics of State Medicaid programs that are thought to be related to health care use are also included as independent variables in the analysis. They can be categorized as follows:

- Outpatient utilization controls, including the requirement of preauthorization for certain services, exclusion of optional services, and limits on the number of office visits to a physician in a specified setting and for a specific diagnosis.
- Inpatient utilization controls, including the requirement of preauthorization for certain admissions, exclusion of optional services, limits on the number of days in the hospital according to diagnosis or time period, and limits on weekend admissions and preoperative testing.
- Dental services controls, including prior authorization requirements, limits on visits, and copayments. Dental coverage is optional and may not be part of a State program.
- Reimbursement controls, including alternative inpatient reimbursement methods and relative physician reimbursement rates for the Medicare and Medicaid programs.

For a complete description of the variables included in the analyses, see Table 1. Values of utilization control variables for each State represented in NMCUES data are shown in Table 2.

In the analysis, three groups of Medicaid enrollees are studied: Supplemental Security Income (SSI); Aid to Families with Dependent Children (AFDC) under 17 years, or AFDC children; and AFDC 17 years or over, or AFDC adults. In this way, we can determine whether program controls affect these population groups in the same way. The effects of program controls designed to limit service use are estimated for each health care service studied.

Reprint requests: Josephine Mauskopf, Research Triangle Institute, Room 112, Ragland Building, 3040 Cornwallis Road, Research Triangle Park, NC 27709.

Table 1

Definitions of variables used in the analysis

Type of variable	Definition
Independent	
Individual background:	
Age	Age in years—continuous variable.
Sex	1 = Male; 2 = Female.[1]
Family income	Annualized family income for 1980.
Family size	Average number of family members over the year.
Education	Years of education of individuals 17 years of age or over. If under 17, education variable used is that for mother of individual or "mother equivalent" if there is no mother.
Marital status	1 = Married; 2 = Widowed, separated, or divorced; 3 = Never married[1] for individuals 17 years of age or over. If under 17, marital status used is that for mother, as for education variable.
Residence	1 = SMSA; 2 = Outside SMSA, urban; 3 = Outside SMSA, rural.[1]
Region	1 = Northeast; 2 = South; 3 = West; 4 = North Central.[1]
Race	1 = Other than white; 2 = White.[1]
Self-perceived health status	1 = Fair or poor; 2 = Excellent or good.[1]
Chronic conditions	1 = If chronic condition reported; 0 = Otherwise.
Medicare prevailing price	Price for an initial intermediate-level physician visit to a general practitioner by county (from Health Care Financing Administration, 1983).
Other insurance	1 = If other insurance (apart from Medicaid) anytime during year; 0 = Otherwise.
Employment status	Measured as work weeks (40 hours) worked during the year for persons 17 years of age or over. If under 17, employment status of mother is used, as for education variable.
Travel time	Reported value for travel time if individual had a usual source of care. If individual did not have a usual source of care, using data for people with a usual source of care, estimated mean value from estimation equation: Travel time = f (hospital beds/square miles, standard metropolitan statistical area, census region, annualized income, employment status, health insurance type).
Waiting time	Similar to travel time. Estimated values from: *Waiting time = f (race, census region, annualized income, employment status,* sex, health insurance type).
Physicians	Physicians per 1,000 people by county; data from Area Resource File.
Hospital beds	Hospital beds per 1,000 people by county; data from Area Resource File.
Inpatient use	1 = If used the hospital; 0 = Otherwise.
Medicaid part-year	1 = If not on Medicaid all year; 0 = Otherwise.
State program characteristics:	
Prior authorization, inpatient	1 = If prior authorization required either for all elective procedures or for certain specific procedures; 0 = Otherwise.
Limits on procedures, inpatient	1 = If specific inpatient procedures (e.g., cosmetic procedures, transplants, elective surgery) are not covered; 0 = Otherwise.
Limits on days, inpatient	1 = If limit length of stay by year, admission, or diagnosis; 0 = Otherwise.
Limits on weekend admissions, inpatient	1 = If limit weekend admissions or preoperative days for elective surgery; 0 = Otherwise.
Prior authorization, physician	1 = If prior authorization required for specific procedures, specific settings, or elective procedures; 0 = Otherwise.
Limits on procedures, physician	1 = If specific outpatient services not covered; 0 = Otherwise.
Limits on number of visits for specific services, outpatient	1 = If limits on number of physician visits for specific services (e.g., psychiatric, comprehensive examination); 0 = Otherwise.
Limits on number of visits in specific setting	1 = If limits on number of physician visits in specific settings (e.g., hospital, office, home); 0 = Otherwise.
Presence of diagnosis, screening, and prevention options	0, 1, 2, or 3 depending on the number of these optional services offered by the State.
Medicare-Medicaid specialist payment	Ratio of Medicare and Medicaid reimbursement rates for a specialist (Holahan, 1982).
Alternative hospital reimbursement	1 = Rate or fee schedule, prospective reimbursement, or other; 0 = Reimbursement based on Medicare principles.
Dental coverage	1 = If dental coverage is included; 0 = Otherwise.
Prior authorization, dental services	1 = If prior authorization required for dental services; 0 = Otherwise.

See footnote at end of table.

Table 1—Continued
Definitions of variables used in the analysis

Type of variable	Definition
Copayment for dental services	1 = If copayment required for dental services; 0 = Otherwise.
Limits on dental services	1 = If dental services limited in any way; 0 = Otherwise.
Dependent	
Physician use	1 = If physician visit during 1980; 0 = Otherwise.
Physician visits	Number of physician visits during 1980.
Hospital use	1 = If had hospital stay during 1980; 0 = Otherwise.
Hospital days	Number of days in the hospital in 1980.
Dental use	1 = If had dental visit during 1980; 0 = Otherwise.
Dental visits	Number of dental visits in 1980.

[1] This variable was used as the reference level and omitted from the regression analysis.

We also recognize that program controls may not affect use of health services equally for all members of a Medicaid subgroup. Specifically, sicker individuals may be more or less affected by a program restriction than their healthier counterparts are. This effect is tested in the analysis of hospital and physician use by including in the regression equations program control variables interacted with a dummy variable. The dummy variable is equal to one if the person reports a chronic or recurrent condition; otherwise, it is equal to zero.

All regression equations are estimated using SURREGR, a software package designed to appropriately estimate coefficients and their standard errors using data from a cluster sample such as that for NMCUES (Holt, 1977).[1]

The probability-of-use and level-of-use estimates can be combined to give estimates of expected per capita use. For an individual, expected number of physician visits, for example, is given by:

$$E(\text{visits}) = \text{Probability of visit} \times E(\text{number of visits if visits} > 0),$$

where probability of visit and E (number of visits if visits > 0) are calculated from the estimated equations. E (visits) is thus a function of both background and program control variables. The expected number of physician visits per person will be reduced by a program control if either the probability of a visit is reduced or the number of visits for those with at least one visit is reduced. In some cases, we may observe that a reduction in the probability of use of a service is accompanied by an increase in the level of use of that service for positive users. This will occur if the reduction in probability of use affects only low-level users of the service. Remaining users will be expected to use more services on average. The net effect, probability of use $\times$ E (level of use), should still be negative.

Description of the data

The health services utilization data analyzed in this study are from the National Medical Care Utilization and Expenditure Survey. This major survey, carried out in 1980, was financed by the Health Care Financing Administration and the National Center for Health Statistics. It consists of three major components: a national household survey, an administrative records survey, and a State Medicaid household survey.

The results reported in this article are obtained using data from the national household survey, a national probability sample of the civilian noninstitutionalized population with a sample size of 17,900 persons from 6,000 households representing the general population. Five rounds of interviews regarding events related to medical care received in 1980 were conducted with the respondents. The first, second, and fifth interviews were conducted in person, and the third and fourth interviews were conducted primarily by telephone. A core questionnaire was employed in each interview. This document contained batteries of questions concerning medical care utilization, expenditures, sources of payment, health insurance coverage, and employment. In addition, questionnaire supplements were used in the first, third, and fifth rounds of interviews. The supplement for the first round contained questions concerning demographic and social characteristics, self-perceived health status, limitations in activity, and family income. The third-round supplement contained questions about access to care. The fifth-round supplement included detailed questions concerning employment during 1980, individual income by source, and functional limitations.

The second major source of data for this study is the Medicaid Program Characteristics File, which contains State-level Medicaid program data for 49 States and the District of Columbia.

A final source of data is the Area Resource File (ARF). ARF contains approximately 5,000 items of

[1] Standard logit and probit algorithms produce biased estimates of standard errors when using data from a complex sample design. The probability-of-use models are estimated in linear probability form because logit and probit options are not yet available in SURREGR. This estimation method is appropriate because the Taylor linearization method utilized by SURREGR does not depend on homoscedasticity, a property violated by linear probability models. However, estimated probabilities are not restricted to lie between zero and one and should be interpreted with caution. The level of utilization by nonzero users of a service is estimated in linear form, even though the distribution of the errors terms is assumed not to be normal. The SURREGR estimation method does not assume normally distributed errors.

Table 2

Variable values of controls for each State represented in data from the National Medical Care Utilization and Expenditure Survey (NMCUES): 1980

State	Inpatient care				Outpatient care			
		Limits on				Limits on		
	Prior authorization	Procedures	Hospital days	Weekend admissions	Prior authorization	Procedures	Visits by service	Visits by setting
Alabama	1	1	1	1	1	0	1	1
Alaska	1	0	1	0	1	0	0	0
Arkansas	0	0	1	0	1	0	0	1
California	1	0	0	0	0	1	1	0
Colorado	0	0	0	0	0	0	0	0
Connecticut	0	0	0	0	1	0	0	0
District of Columbia	0	1	0	0	1	1	0	0
Florida	0	1	1	0	0	0	1	1
Georgia	1	1	1	1	1	1	1	1
Hawaii	1	1	1	0	0	0	0	1
Illinois	0	0	0	1	0	0	0	0
Indiana	0	0	1	0	0	0	0	0
Iowa	0	1	0	0	1	1	0	0
Kansas	0	0	0	0	1	1	1	1
Kentucky	0	1	1	0	0	1	1	0
Louisiana	1	0	1	0	0	0	0	1
Maine	0	0	1	0	0	0	0	0
Maryland	1	1	0	1	1	0	0	0
Massachusetts	0	0	1	0	1	0	0	0
Michigan	1	1	1	0	0	1	0	1
Minnesota	0	0	0	0	0	0	0	0
Missouri	0	0	0	0	0	0	1	1
Montana	0	0	0	0	0	1	1	0
New Jersey	0	1	0	0	0	0	0	0
New York	0	1	1	1	0	0	0	0
North Carolina	1	0	0	0	1	1	1	1
Ohio	0	0	1	0	1	1	0	1
Oklahoma	0	0	1	0	0	0	0	1
Oregon	0	0	1	0	1	1	0	0
Pennsylvania	0	1	0	0	0	0	1	1
South Carolina	1	1	1	0	0	1	1	0
South Dakota	0	0	1	0	0	1	0	0
Tennessee	0	0	1	0	1	0	0	0
Texas	0	1	1	0	1	0	0	0
Virginia	0	0	1	0	1	0	1	0
Washington	0	0	1	0	1	1	0	1
West Virginia	0	0	1	0	0	0	0	0
Wisconsin	1	0	0	0	1	1	0	0
				Mean variable value				
AFDC under 17 years	.442	.333	.476	.124	.338	.499	.460	.305
AFDC 17 years or over	.452	.351	.460	.107	.361	.503	.432	.319
SSI	.435	.419	.577	.132	.392	.509	.539	.338

See footnotes at end of table.

Table 2—Continued

Variable values of controls for each State represented in data from the National Medical Care Utilization and Expenditure Survey (NMCUES): 1980

State	Diagnosis, screening, and prevention options	Alternative hospital reimbursement	Medicare/ Medicaid specialist payment	Dental care			
				Dental coverage	Limits on dental care	Prior authorization	Copayment
Alabama	0	0	1.67	0	0	0	0
Alaska	0	0	1.00	0	0	0	0
Arkansas	0	0	1.09	1	1	0	0
California	3	1	1.85	1	0	1	0
Colorado	0	1	1.96	0	0	0	0
Connecticut	3	0	2.08	1	1	1	0
District of Columbia	3	0	1.69	0	0	0	0
Florida	0	0	2.27	1	0	0	0
Georgia	0	0	1.30	0	0	0	0
Hawaii	3	0	1.11	1	1	1	0
Illinois	2	1	1.64	1	1	1	0
Indiana	2	0	1.00	1	0	1	0
Iowa	0	0	1.00	1	1	1	0
Kansas	0	0	1.32	1	0	1	0
Kentucky	0	0	1.01	0	0	0	0
Louisiana	0	0	1.02	0	0	0	0
Maine	3	0	1.64	0	0	0	0
Maryland	0	1	2.33	0	0	0	0
Massachusetts	3	1	1.79	1	1	1	0
Michigan	1	1	1.27	1	1	0	1
Minnesota	3	0	.98	1	0	1	0
Missouri	0	0	1.75	1	1	0	0
Montana	3	0	1.39	1	1	1	0
New Jersey	3	1	2.33	1	1	1	0
New York	3	1	4.17	1	0	1	0
North Carolina	3	0	1.00	1	1	1	0
Ohio	1	0	1.64	1	1	0	0
Oklahoma	0	0	1.00	0	0	0	0
Oregon	2	0	1.20	1	0	1	0
Pennsylvania	0	1	3.45	1	1	0	0
South Carolina	0	0	0.98	1	1	0	1
South Dakota	0	0	1.14	1	0	0	0
Tennessee	0	0	1.11	0	0	0	0
Texas	0	0	1.00	0	0	0	0
Virginia	0	0	1.54	0	0	0	0
Washington	2	0	1.37	1	1	0	0
West Virginia	0	0	1.54	0	0	0	0
Wisconsin	0	0	1.00	1	0	0	0
			Mean variable value				
AFDC under 17 years	1.71	.550	1.78	.967	.612	.687	.188
AFDC 17 years or over	1.74	.549	1.80	.982	.632	.679	.189
SSI	1.34	.455	1.82	.933	.593	.599	.215

NOTES: A "1" in the table means that the control was present in the State in 1980. A "0" in the table means the control was not present in the State in 1980. See Table 1 for definitions of controls.
AFDC = Aid to Families with Dependent Children.
SSI = Supplemental Security Income.

SOURCE: SysteMetrics, Inc.: Medicaid programmatic characteristics file. Dec. 1982.

information for each of the 3,000 U.S. counties. Very detailed information on the characteristics of health care providers is available in ARF. In addition, ARF contains detailed demographic and county-level epidemiological information. Specifically, the county-level information used in this study is on the supply of health resources: hospital beds, physicians, and dentists.

Results

A full set of background variables was initially included in each model. Background variables with insignificant coefficients ($p < .30$) were omitted from the final estimations. The estimated coefficients for the background variables are not reported in this article, but their effects are briefly summarized.[2] The estimated coefficients for the program control variables are reported later. The estimated percentage changes attributable to program control variables presented are conditional on all the other included variables having their mean value.

Utilization of physician services

The analysis of physician utilization is in two parts. The dependent variables are:

- Probability of a physician visit.
- Number of physician visits for users of physician visits.

The estimated effects of the background variables are generally in accord with those found in previous studies: higher price and larger family size have a negative effect; higher income, poor health, and greater supply have a positive effect. Poor health as measured by chronic conditions and an inpatient stay is a powerful predictor of both the probability of a physician visit and the number of physician visits, but self-assessed health status has a significant positive effect only on the number of physician visits. Prevailing price was obtained from the *Medicare Directory of Prevailing Charges, 1980*. Higher prevailing price has a significant negative effect for Medicaid recipients. This may be attributable to crowding out of Medicaid patients by more lucrative private or Medicare patients when the prevailing price is higher. Where significant, higher income has a positive effect on use, and larger family size has a negative effect. Higher education of the mother has a significant positive effect on the number of physician visits for children. Education is otherwise insignificant. Persons who are male or of races other than white have lower use rates than other enrollees have.

Estimates of the effects of physician controls on the probability and level of use of physician services are presented in Tables 3 and 4. Physician-use results for the AFDC populations are shown in Table 3. The estimated coefficients for probability of physician use by AFDC children are insignificant for all program controls except the presence of diagnosis, screening, and prevention optional services. In a State with all three optional services, the probability of a child's seeing a physician is estimated to be increased by 0.081 (3 x .027 or 11.4 percent), compared with a State offering none of these service options. A similar but insignificant effect is observed for the AFDC adult population. The number of physician visits by AFDC children is also significantly increased in the presence of diagnosis, screening, and prevention services, there being an estimated increase of .987 visits (24.6 percent) if all three options are offered rather than none. The effect on the adult AFDC population is insignificant.

Prior authorization for some physician services is estimated to have significant impact on the probability and number of physician visits for AFDC adults. In the presence of prior authorization, the probability of a physician visit for this group is decreased by -.074 (-8.6 percent), but the number of visits is increased by 1.10 visits (19.4 percent). The net effect on expected visits is positive, an unexpected result. Prior authorization for some physician services, such as sterilizations, transplants, and cosmetic procedures, is intended to reduce the number of unnecessary procedures. An increased number of physician visits may be compatible with this goal if the visits are associated with fewer procedures.

Limits on physician procedures have a significant positive impact on physician use for AFDC children in terms of number of visits (.651, an increase of 15.3 percent). Limits on physician procedures refer, for the most part, to noncoverage of cosmetic or other elective surgery. This positive estimated effect may be the result of substitution of less expensive outpatient care for more costly inpatient procedures in the presence of the program control.

The number of physician visits by AFDC children is significantly decreased by limits on physician visits by time period and setting (a decrease of .530 visits, or 11.2 percent), as expected. However, for AFDC adults, this control variable has the opposite impact on number of visits, increasing them by .965 visits, or 16.8 percent.

The ratio of Medicare to Medicaid specialist reimbursement rates is used as an indicator of Medicaid reimbursement generosity. The number of physician visits by AFDC children is significantly higher in the presence of less generous Medicaid reimbursement (an estimated increase of .860 visits, or 19.9 percent, with an increase in the payment ratio between Medicare and Medicaid from 1.0 to 2.0). The increase may result from physicians' attempts to maintain their Medicaid income when reimbursement is less generous by increasing the volume of visits, perhaps by scheduling more followup visits for this age group.

In Table 4, the presentation of physician-use results for the SSI population is subdivided into two groups, those eligible for only Medicaid and those eligible for both Medicaid and Medicare (dual eligibles). No consistent difference in the effectiveness of program

[2] A complete set of the estimated coefficients is available from the authors on request.

controls is shown for these two groups. The probability of a physician visit is not significantly affected by any program control except limits on procedures, which increase the probability for dual eligibles (.126, or 15.9 percent).

Several significant effects are estimated for the number of visits. For those not dually eligible for Medicaid and Medicare, mostly the blind and disabled, limits on physician visits by service have a positive effect (4.973 visits, or 72 percent); limits on visits by setting, a negative effect (-3.908 visits, or -35.8 percent); and less generous Medicaid reimbursement, a negative effect (-2.252 visits, or -16.5 percent). The latter two effects are in the expected direction. The effect of physician visit limits by service is contrary to expectation. Limits on

Table 3

Effects of outpatient controls on use of physician services, by AFDC child and adult recipients: 1980

Type of control	AFDC children		AFDC adults	
	Probability of visit	Number of visits	Probability of visit	Number of visits
Prior authorization, physician [−]	—	−.409 (1.24)	*−.074 (1.81)	*1.100 (2.05)
Limits on procedures, physician [−]	−.029 (.62)	*.651 (1.80)	.060 (1.45)	—
Limits on physician visits by service [−]	−.051 (1.13)	—	.057 (1.11)	−1.054 (1.39)
Limits on physician visits by time period and setting [−]	—	*−.530 (1.70)	−.029 (.78)	*.965 (2.04)
Medicare/Medicaid specialist payment [−]	.029 (.78)	*.860 (2.98)	.022 (.71)	—
Diagnosis, screening, and prevention options [+]	*.027 (2.08)	*.329 (1.76)	.025 (1.49)	—
Sample size	861	650	423	351
Mean of dependent variable	.757	4.578	.835	6.031
R^2 (for both background and control variables)	.228	.328	.256	.345
Significance level for joint *F*-test (for program control variables)	.090	.002	.050	.090

*$p < .10$.
NOTES: Variables not significant ($p > .3$) and omitted from final model shown by "—." The Student *t*-statistic is shown in parentheses. The [ ] indicate expected direction of effect. See Table 1 for definitions of controls.
AFDC = Aid to Families with Dependent Children.

Table 4

Effects of outpatient controls on use of physician services by Supplemental Security Income recipients, by eligibility status: 1980

Type of control	Probability of visit		Number of visits	
	Medicaid only	Medicaid and Medicare	Medicaid only	Medicaid and Medicare
Prior authorization, physician [−]	−.006 (.07)	.034 (.93)	−.047 (.02)	*−2.401 (2.00)
Limits on procedures, physician [−]	.169 (1.62)	*.126 (2.74)	1.817 (.65)	−.599 (.31)
Limits on physician visits by service [−]	−.064 (1.01)	−.013 (.26)	*4.973 (1.95)	*3.648 (1.88)
Limits on physician visits by setting [−]	.034 (.48)	.037 (1.06)	*−3.908 (1.81)	0.218 (.20)
Medicare/Medicaid specialist payment [−]	.015 (.28)	.022 (.78)	*−2.252 (1.67)	−.637 (.59)
Diagnosis, screening, and prevention options [+]	−.0004 (.01)	.001 (.07)	−1.014 (.94)	.003 (.00)

*$p < .10$.
NOTES: The regression estimates used to generate this table can be obtained from the authors on request. The sample sizes for the probability of visit and number of visits regressions were 421 and 362, respectively. The means of these dependent variables were .855 and 9.591. The Student *t*-statistic is shown in parentheses. The [ ] indicate expected direction of effect. See Table 1 for definitions of controls.

physician visits by service for dual eligibles also have a positive effect. Limits on visits by setting and less generous Medicaid reimbursement have insignificant impacts on physician use for this group. However, prior authorization has a significant negative impact on number of physician visits for dual eligibles (-2.401, or -22.8 percent).

The results of the analysis to determine whether the effects of physician program controls on use of physician services vary according to the recipients' state of health are presented in Tables 5 and 6. Individuals in the AFDC populations were studied. A strong relationship between the presence of chronic conditions and the effectiveness of program controls is shown for AFDC children. The probability of physician visits is increased by the presence of diagnosis, screening, and prevention programs for children with and without chronic conditions. However, only children with a chronic condition are less likely to see a physician when there are limits on physician procedures (Table 5).

As shown in Table 6, limits on physician visits by time period and setting have no impact on number of physician visits for children without chronic conditions but a significant negative impact for those reporting such conditions (-1.492 visits, or -30.6 percent) (Table 6). This finding supports the hypothesis that program controls that set upper limits on use have more impact on those in poorer health. On the other hand, less generous reimbursement for

Table 5

Differential effects of outpatient controls on probability of a physician visit for AFDC child and adult recipients, by presence of chronic conditions: 1980

Type of control	AFDC children		AFDC adults	
	No chronic condition	Chronic condition	No chronic condition	Chronic condition
Prior authorization, physician [-]	—	-.016	*-.126	-.038
		(.41)	(1.77)	(.79)
Limits on procedures, physician [-]	0.12	*-.101	*.126	.021
	(.22)	(1.82)	(1.98)	(.44)
Limits on physician visits by service [-]	-.051	-.051	.054	.054
	(1.15)	(1.15)	(1.07)	(1.07)
Limits on physician visits by time period and setting [-]	—	—	-.027	-.027
			(.70)	(.70)
Medicare/Medicaid specialist payment [-]	.024	.024	.024	.024
	(.69)	(.69)	(.74)	(.74)
Diagnosis, screening, and prevention options [+]	*.024	*.024	.025	.025
	(1.84)	(1.84)	(1.44)	(1.44)

*$p < .10$.

NOTES: The regression estimates used to generate this table can be obtained from the authors on request. The sample sizes for children and adults were 861 and 463, respectively. The means of the dependent variables were .757 and .835. Variables not significant ($p > .3$) and omitted from final model shown by "—." The Student *t*-statistic is shown in parentheses. The [ ] indicate expected direction of effect. See Table 1 for definitions of controls.

AFDC = Aid to Families with Dependent Children.

Table 6

Differential effects of outpatient controls on number of physician visits for AFDC child and adult recipients, by presence of chronic conditions: 1980

Type of control	AFDC children		AFDC adults	
	No chronic condition	Chronic condition	No chronic condition	Chronic condition
Prior authorization, physician [-]	—	—	*1.206	*1.206
			(2.06)	(2.06)
Limits on procedures, physician [-]	-.102	*1.214	—	—
	(.19)	(1.87)		
Limits on physician visits by service [-]	.410	-.493	*-1.559	-1.151
	(.76)	(.71)	(2.11)	(1.09)
Limits on physician visits by time period and setting [-]	.379	*-1.492	*1.345	.511
	(.98)	(3.24)	(2.10)	(.74)
Medicare/Medicaid specialist payment [-]	.367	*1.494	.820	.820
	(1.38)	(3.62)	(.74)	(.74)
Diagnosis, screening, and prevention options [+]	*.525	.104	-.008	-.008
	(2.85)	(.44)	(.03)	(.03)

*$p < .10$.

NOTES: The regression estimates used to generate this table can be obtained from the authors upon request. The sample sizes for the children and adults were 650 and 351, respectively. The means of the dependent variables were 4.578 and 6.031. Variables not significant ($p > .3$) and omitted from final model shown by "—." The Student *t*-statistic is shown in parentheses. The [ ] indicate expected direction of effect. See Table 1 for definitions of controls.

AFDC = Aid to Families with Dependent Children.

Medicaid relative to Medicare increases the number of physician visits more for children with a chronic condition. This finding is consistent with the suggestion that more followup visits are scheduled when reimbursement is less. The presence of diagnosis, screening, and prevention options has a greater impact on number of visits for children without a chronic condition, as would be expected. For AFDC adults, program controls appear to have a greater impact on those without chronic conditions.

Utilization of hospital services

The analysis of hospital utilization is in two parts. The dependent variables are:

- Probability of a hospital stay.
- Number of days in the hospital for those with a hospital stay.

The estimated effects of the background variables are generally in accord with those found in previous studies. Poor health as determined by the presence of chronic conditions is a powerful predictor of hospital use. However, self-assessed poor health status is less highly correlated with increased use. Higher prevailing price has a significant negative effect on use only for persons not enrolled for the full year. The effect of higher income is negative for AFDC adults. Level of education has no significant effect on hospital use. Males have a lower use rate only among AFDC adults. Racial differences vary according to region: Black people have a lower rate of use in the North Central region and higher use in the South.

Estimates of the effects of inpatient utilization and payment controls on the utilization of hospital services are presented in Tables 7 and 8. It should be noted that the sample sizes for regressions of the number of inpatient days are very small. In Table 7, the hospital utilization results for the AFDC populations are presented. All the estimated coefficients for AFDC children are insignificant, although there is some indication that prior authorization and less generous reimbursement of specialists reduce the probability of a hospital stay. For AFDC adults, both limits on hospital days (-.062, or -24.6 percent) and an alternative hospital payment system (-.144, or -47.5 percent) have a negative impact on the probability of a hospital stay. All other estimated coefficients for this population are insignificant. Thus, limits on hospital days seem to act by discouraging use of the hospital rather than shortening the stay of those admitted.

In Table 8, hospital utilization results for the SSI population are presented for two groups, those eligible only for Medicaid and those eligible for both Medicaid and Medicare. Limits on hospital days have a significant positive effect on the probability of a hospital stay for those not also eligible for Medicare

Table 7

Effects of inpatient controls on use of hospital services by AFDC child and adult recipients: 1980

Type of control	AFDC children		AFDC adults	
	Probability of hospital stay	Number of inpatient days	Probability of hospital stay	Number of inpatient days
Prior authorization, inpatient [−]	−.050 (1.60)	.181 (.13)	.099 (1.22)	−1.360 (.36)
Limits on procedures, inpatient [−]	−.029 (1.00)	—	—	3.429 (.89)
Limits on hospital days [−]	−.026 (.95)	—	*−.062 (1.75)	−5.349 (1.19)
Limits on preoperative and weekend admissions [−]	.050 (1.25)	—	.062 (.79)	—
Medicare/Medicaid specialist payment [−]	−.038 (1.38)	—	−.045 (1.11)	.943 (.55)
Alternative hospital reimbursement [−]	.045 (1.36)	−.564 (.26)	*−.144 (2.52)	—
Sample size	861	124	423	92
Mean of dependent variable	.131	4.895	.224	7.326
R^2 (for both background and control variables)	.147	.020	.133	.062
Significance level for joint *F*-test (for program control variables)	.215	.970	.074	.612

*$p < .10$.
NOTES: Variables not significant ($p > .3$) and omitted from final model shown by "—." The Student *t*-statistic is shown in parentheses. The [ ] indicate expected direction of effect. See Table 1 for definitions of controls.
AFDC = Aid to Families with Dependent Children.

(.194, or more than 100 percent). This is contrary to expectation. The effect on dual eligibles is insignificant. Limits on inpatient procedures significantly reduce the number of hospital days for the Medicaid-only group (-8.934, or -39.6 percent) but not for dual eligibles. Limits on hospital days increase the number of hospital days for dual eligibles (12.789, or more than 100 percent). Possibly, both effects are attributable to substitution of Medicare days for Medicaid days.

An analysis was conducted to determine whether the effects of inpatient program controls on hospital utilization vary according to the health status of the individual for the AFDC populations. The results are shown in Tables 9 and 10. Among AFDC children, prior authorization is shown to have a negative impact on the probability of an inpatient stay only for those with a chronic condition (-.094, or -57.4 percent). However, among AFDC adults, limits on hospital days have a negative impact on the probability of hospital stay for those without chronic conditions (-.147, or -58.6 percent) but no impact for those with such conditions. This finding may reflect a difference between the type of chronic conditions encountered in children and adults and the elective nature of treatment for many childhood conditions. More restrictive hospital reimbursement reduces the probability of a hospital stay for adults with and without chronic conditions but has no effect for children. Once in the hospital, restrictive hospital

Table 8

Effects of inpatient controls on use of hospital services by Supplemental Security Income recipients, by eligibility status: 1980

Type of control	Probability of hospital stay		Number of hospital days	
	Medicaid only	Medicaid and Medicare	Medicaid only	Medicaid and Medicare
Prior authorization, inpatient [-]	-.108 (1.06)	-.096 (1.11)	4.549 (.62)	6.708 (.91)
Limits on inpatient procedures [-]	-.043 (.40)	-.040 (.39)	*-8.934 (1.67)	-1.721 (.23)
Limits on hospital days [-]	*.194 (2.23)	-.004 (.05)	.926 (.17)	*12.789 (1.99)
Medicare/Medicaid specialist payment [-]	.046 (.49)	.039 (.67)	-3.256 (1.40)	-7.563 (1.14)
Alternative hospital reimbursement [-]	.160 (1.28)	.127 (1.35)	6.431 (.71)	8.610 (.63)

*$p < .10$.
NOTES: The regression estimates used to generate this table can be obtained from the authors on request. The sample sizes for probability of a hospital stay and number of hospital days were 422 and 115, respectively. The means of these dependent variables were .268 and 18.814. The Student *t*-statistic is shown in parentheses. The [ ] indicate expected direction of effect. See Table 1 for definitions of controls.
AFDC = Aid to Families with Dependent Children.

Table 9

Differential effects of inpatient controls on probability of a hospital stay for AFDC child and adult recipients, by presence of chronic conditions: 1980

Type of control	AFDC children		AFDC adults	
	No chronic condition	Chronic condition	No chronic condition	Chronic condition
Prior authorization, inpatient [-]	-.018 (.49)	*-.094 (2.17)	.093 (1.14)	.093 (1.14)
Limits on procedures, inpatient [-]	-.029 (.97)	-.029 (.97)	—	—
Limits on hospital days [-]	-.024 (.89)	-.024 (.89)	*-.147 (2.31)	-.010 (.24)
Limits on preoperative and weekend admissions [-]	.047 (1.14)	.047 (1.14)	.057 (.71)	.057 (.71)
Medicare/Medicaid specialist payment [-]	-.035 (1.21)	-.042 (1.21)	.041 (1.02)	-.041 (1.02)
Alternative hospital reimbursement [-]	.046 (1.41)	.046 (1.41)	*-.118 (1.74)	*-.167 (2.43)

*$p < 1.0$.
NOTES: The regression estimates used to generate this table can be obtained from the authors on request. The sample sizes for children and adults were 861 and 423, respectively. The means of the dependent variables were .131 and .224. Variables not significant ($p > .3$) and omitted from final model shown by "—." The Student *t*-statistic is shown in parentheses. The [ ] indicate expected direction of effect. See Table 1 for definitions of controls.
AFDC = Aid to Families with Dependent Children.

payment reduces length of stay for children without chronic conditions (-3.885 days, or -73.1 percent) but has no significant effect for those with chronic conditions.

Utilization of dental services

The analysis of dental care is in two parts. The dependent variables are:

- Probability of a dental visit.
- Number of dental visits for users of dental services.

Both AFDC and SSI Medicaid populations are analyzed. Medicare does not cover dental services. Therefore, dual eligibility will not confound our results in this case.

In many cases, the relationship of the background variables to the probability of use of dental services is different from the relationship to the number of dental visits. For example, higher income and education have a positive effect on use but a negative

Table 10

Differential effects of inpatient controls on number of hospital days for AFDC child and adult recipients, by presence of chronic conditions: 1980

Type of control	AFDC children		AFDC adults	
	No chronic condition	Chronic condition	No chronic condition	Chronic condition
Prior authorization, inpatient [-]	.259 (.19)	.259 (.19)	-1.504 (.40)	-1.504 (.40)
Limits on procedures, inpatient [-]	—	—	3.556 (.92)	3.556 (.92)
Limits on hospital days [-]	—	—	-2.982 (.87)	-6.188 (1.23)
Limits on preoperative and weekend admissions [-]	—	—	—	—
Medicare/Medicaid specialist payment [-]	—	—	-1.122 (.65)	-1.122 (.65)
Alternative hospital reimbursement [-]	*-3.885 (1.76)	1.098 (.52)	—	—

*$p < .10$

NOTES: The regression estimates used to generate this table can be obtained from the authors on request. The sample sizes for children and adults were 124 and 92, respectively. The means of the dependent variables were 4.895 and 7.326. Variables not significant ($p > .3$) and omitted from final model shown by "—." The Student t-statistic is shown in parentheses. The [ ] indicate expected direction of effect. See Table 1 for definitions of controls.
AFDC = Aid to Families with Dependent Children.

Table 11

Effects of dental program controls on use of dental services, by type of recipient: 1980

Type of control	AFDC children		AFDC adults		SSI	
	Probability of visit	Number of visits	Probability of visit	Number of visits	Probability of visit	Number of visits
Dental coverage [+]	-.078 (.61)	*1.714 (2.02)	.067 (.35)	*1.892 (2.17)	*.237 (2.32)	-2.019 (1.03)
Prior authorization if covered [-]	.059 (1.00)	*-.528 (2.06)	-.054 (.84)	.079 (.23)	-.022 (.44)	.103 (.21)
Copayment if covered [-]	*-.131 (2.05)	*.907 (2.83)	*-.176 (2.10)	-.653 (1.20)	.039 (.80)	.037 (.06)
Other limits if covered [-]	*.134 (2.00)	*-.631 (1.74)	.044 (.63)	.197 (.57)	*-.158 (2.16)	.678 (1.04)
Sample size	861	293	423	161	422	96
Mean of dependent variable	.337	2.244	.388	2.520	.234	2.724
R^2 (for both background and control variables)	.248	.268	.127	.225	.113	.207
Significance level for joint F-test (for program control variables)	.060	.004	.228	.131	.058	.469

*$p < .10$.

NOTES: The Student t-statistic is shown in parentheses. The [ ] indicate expected direction of effect. See Table 1 for definitions of controls.
AFDC = Aid to Families with Dependent Children.
SSI = Supplemental Security Income.

effect on number of visits in the AFDC populations, but the reverse is true for higher prevailing price of medical care. Both measures of use are lower for members of larger families and people of races other than white but higher for people who have a chronic condition. White children are more likely to see the dentist than other children are, but this is not the case for adults. Higher education reduces the number of dental visits for children but increases the number for the SSI population.

Estimates of the effects of dental program controls on the utilization of dental services are presented in Table 11. For the AFDC populations, the presence of dental coverage has no impact on the probability of use but has a large positive impact on the number of visits for those who use dental services (1.714 visits, or 100 percent, for AFDC children and 1.892 visits, or 100 percent, for AFDC adults). In the case of the SSI population, the effect is reversed, being positive and significant for probability of use (.237, or 100 percent) but insignificant for number of visits. For people living in States with dental coverage, dental program controls significantly affect use of services. Prior authorization reduces the number of dental visits for AFDC children only (-.528, or -20.3 percent). Required copayment reduces the probability of a dental visit for both AFDC children and adults (-.131, or -37.3 percent, for children and -.176, or -43.5 percent, for adults), but increases the number of dental visits for AFDC children who have at least one visit (.907 visits, or 42.1 percent). The net effect of copayment on expected visits is very small but positive, contrary to expectations. Copayment has no effect on utilization of dental services by the SSI population. Other limits, which are mostly confined to limits on use for adults, have no effect on AFDC adults, reduce the probability of a dental visit for the SSI population, and increase it for AFDC children. The number of dental visits for AFDC children is lower in the presence of other limits. However, the combined effect on expected visits is positive.

Conclusions

Most of our results demonstrate that there are important differences in the effects of program controls on different Medicaid eligibility groups. In our analyses of utilization of physician, hospital, and dental services, differing effects of program controls on AFDC children and adults have been demonstrated. These differences are mostly with respect to whether or not the estimated coefficient is significant. However, in some cases, the direction of the estimated effect differs between the two age groups. For example, limits on physician visits by setting have a negative effect on physician visits for AFDC children but a positive effect for AFDC adults. The positive effect for adults might be correlated with increased use of the outpatient department or emergency room when office visits are limited. Adult physician visits for high users are less likely to be elective than those of children, as discussed later.

Overall, our results indicate that utilization of health care services is responsive to some program controls for all eligibility groups, but in some cases the direction of the change may be opposite to that anticipated by the policymaker.

Medicaid program controls, if effective, may either reduce unnecessary care or deny necessary care to the sickest individuals. Prior authorization for care would be expected to screen out only unnecessary users of health care services. Controls on volume of services, especially those in the form of limits on the number of hospital days or physician visits in a given time period, might reduce unnecessary services but also deny needed care to the sickest individuals in the Medicaid program. The analysis of hospital and physician service utilization for the AFDC populations includes program control variables interacted with the presence of chronic conditions, a dummy health variable known to be correlated with high service use.

In the case of physician visits, program controls appear to affect adults with and without chronic conditions in the same way. This is not true for AFDC children; in this group, visit limits have a disproportionately large negative impact on those with chronic conditions and restrictive physician reimbursement increases visits more for children with chronic conditions. The positive effect of diagnosis, screening, and prevention options on physician visits is felt more by children without chronic conditions. For hospital use, utilization controls reduce the probability of hospitalization more for AFDC children with chronic conditions than for those without, but they have the opposite effect on AFDC adults.

These dissimilar program effects for adults and children might be related to differences in the types of chronic conditions common in the two age groups and corresponding differences in the elective nature of the treatment. For example, chronic ear, nose, and throat infections, for which large variations in treatment are possible, are common in children. Such chronic conditions as diabetes and high blood pressure are frequently observed in adults. The treatment for these conditions may be subject to less variation.

Several statistical issues should be considered when interpreting the results presented in this article. First, program control variables are crudely measured. For example, limits on hospital days, a dummy variable, is equal to one whether those limits are defined by time period, admission, or diagnosis and whatever their magnitude. Generally, such measurement error will bias coefficients toward zero and produce statistically insignificant results.

A second reason to expect statistically weak results is that for some program controls, the difference between States with and without the controls is small. For example, in one State a Medicare-style reimbursement system may have upper limits on reimbursements, and in another State an alternative prospective reimbursement system may contain numerous exceptions. The reimbursement patterns may be quite similar in the two States. Generally, the

effects of small variations are difficult to measure and may be poor indicators of the effects of major changes in Medicaid regulations. A final reason to expect statistically weak results is that subdividing the Medicaid population results in small sample sizes for an individual-level analysis, especially for members of the subgroup that had an inpatient stay during 1980.

Despite these statistical problems, the results of this study are consistent with those from previous aggregate and individual-level studies. Although program controls are shown to have some significant effects on utilization of health services by eligibility category and state of health within that category, offsetting effects between categories are common. In several cases, the results are contrary to expectation.

The estimates of the effects of State Medicaid program controls on use of health care services presented in this article highlight the complexity of the issue. Policymakers must fully understand all the differential, and possibly offsetting, effects of proposed program changes on children, young adults, and aged persons with varying health conditions. Although a reimbursement or utilization control might have the desired effect for one eligibility category, the effect might be offset by the opposite impact on a different Medicaid group. The net effect on the State Medicaid program may be the opposite of that intended.

Acknowledgments

The authors wish to thank Rick Williams and Sara Wheeless of Research Triangle Institute for their contribution to the statistical analyses presented in this article. Tim Gabel of Research Triangle Institute performed the computer runs.

References

American Hospital Association: *Hospital Statistics.* Chicago. American Hospital Association, 1981.

American Medical Association: *Physician Characteristics and Distribution in the United States, 1980.* Chicago. American Medical Association, 1981.

Bartlett, L., and Hanson, C.: *A Catalogue of State Medicaid Program Changes.* HCFA Grant No. 18-P-97923. Prepared for Health Care Financing Adminstration. Washington. National Governors' Association, 1981.

Bovbjerg, R., and Holahan, J.: *Medicaid in the Reagan Era—Federal Policy and State Choices.* Washington. Urban Institute Press, 1982.

Chief, E. H.: *Characteristics of State Plans for Aid to Families with Dependent Children Under the Social Security Act Title IV-A: Need, Eligibility, Administration,* 1981 ed. SSA Pub. No. 80-21235. Office of Family Assistance, Social Security Administration. Washington. U.S. Government Printing Office, 1981.

Cohen, J.: Success and Failure in Containing Medicaid Costs: Twelve States' Experience Between 1981 and 1982. Working Paper No. 3339-01. Washington, D.C. The Urban Institute, Oct. 1984.

Colle, A. D., and Grossman, M.: Determinants of pediatric care utilization. *J Hum Resour* 13 Supp.:115-153, 1978.

Conklin, J. E., and Lieberman, J. V.: Modeling Covariation in Program Characteristics. Preliminary draft. Santa Barbara, Calif. SysteMetrics, Inc., July 1984.

Cromwell, J., Schurman, R., Nurdle, S., et al.: *The Evolution of State Medicaid Programs.* DHHS Grant Number 066A-83. Prepared for Department of Health and Human Services. Chestnut Hill, Mass. Center for Health Economics Research, June 1984.

Davidson, S.: *Medicaid Decisions: A Systematic Analysis of the Cost Problem.* Cambridge, Mass. Ballinger Press, 1980.

Davidson, S., Perloff, J., Kletke, P. R., and Schiff, D. W.: Regional Differences in Medicaid: Their Origins and Effects. Unpublished paper. Northwestern University, Sept. 1983.

Dobson, A., and Rodgers, J.: The Effects of State Programmatic Characteristics on Medicaid Utilization. Paper presented at the Annual Meeting of the Allied Social Sciences Association. San Francisco, 1983.

Goldman, F., and Grossman, M.: The demand for pediatric care: An hedonic approach. *Journal of Political Economy* 86(2):259-280, 1978.

Grossman, M.: *The Demand for Health: A Theoretical and Empirical Investigation.* New York. Columbia University Press, 1972.

Health Care Financing Administration: *Medicare Directory of Prevailing Charges, 1981.* Baltimore, 1983.

Holahan, J.: A Comparison of Medicaid and Medicare Physician Reimbursement Rates. Working Paper No. 1306-02-04. Washington, D.C. The Urban Institute, March 1982.

Holahan, J.: The Effects of the 1981 Omnibus Reconciliation Act on Medicaid Spending. Working Paper No. 3339-03. Washington, D.C. The Urban Institute, Oct. 1985.

Holt, M. M.: *SURREGR: Standard Errors of Regression Coefficients From Sample Survey Data.* Research Triangle Park, N.C. Research Triangle Institute, 1977.

Manning, W. G., et al.: A two-part model of the demand for medical care: Preliminary results from the Health Insurance Study, in Van der Gaag, J., and Perlman, M., eds., *Health, Economics, and Health Economics.* Amsterdam. North Holland Publishing Company, 1981.

McDevitt, R., Conklin, J., Buczko, W., et al.: Medicaid Program Characteristics and Their Relationships to Program Outputs. Draft report. Bethesda, Md. SysteMetrics, Inc., December 1985.

Muse, D. N., Clinkscale, R. M., McCue, S., et al.: Medicaid Program Characteristics Summary Tables, Draft. HCFA Contract No. 500-81-0040. Prepared for Health Care Financing Administration. Rockville, Md. LaJolla Management Corporation, 1982.

Muse, D. N., and Sawyer, D.: *The Medicare and Medicaid Data Book, 1981.* HCFA Pub. No. 03128. Office of Research and Demonstrations, Health Care Financing Administration. Washington. U.S. Government Printing Office, 1981.

Phelps, C. E., and Newhouse, J. P.: New estimates of price and income elasticities of medical care services, in Rosett, R.N., ed., *The Role of Health Insurance in the Health Service*, New York. National Bureau of Economic Research, 1976.

Rymer, M., and Adler, G.: *Short-Term Evaluation of Medicaid: Selected Issues.* HHS Contract No. 100-82-0038. Grants and Contracts Report, HCFA Pub. No. 03186. Office of Research and Demonstrations, Health Care Financing Administration. Washington. U.S. Government Printing Office. Oct. 1984.

Sawyer, D., Ruther, M., Pagan-Berlucchi, A., and Muse, D. N.: *The Medicare and Medicaid Data Book, 1983.* HCFA Pub. No. 03156. Office of Research and Demonstrations, Health Care Financing Administration. Washington. U.S. Government Printing Office, Dec. 1983.

Spitz, B., Atkinson, G.: *Nursing Homes, Hospitals and Medicaid: Reimbursement Policy Adjustments, 1981-82.* Washington. National Governor's Association, March 1983.

U.S. Bureau of the Census: *Statistical Abstract of the United States*, 102d ed. Washington. U.S. Government Printing Office, 1981.

U.S. Bureau of the Census: *Provisional Estimates of Social, Economic and Housing Characteristics, 1980 Census of Population and Housing.* Pub. No. (PHC) 80-S1-1. Washington. U.S. Government Printing Office, 1982.

Wilensky, G., Rossiter, L., and Taylor, A.: The Role of Money and Time in the Demand for Medical Care. Paper Delivered at the American Economic Association Annual Meeting, Washington, D.C., 1981.