Physician utilization and expenditures in a Medicaid population

by William Buczko

The determinants of physician visit utilization and expenditures for the full-year Medicaid enrollees in the State Medicaid household survey portion of the National Medical Care Utilization and Expenditure Survey are analyzed in this article. The regression analyses for the probability of a physician visit, for number of physician visits, and for physician visit expenditures underscore the importance of perceived health status as a determinant of both physician utilization and expenditures. Other important determinants of physician utilization and expenditures were regular source of care, State, enrollment group, sex, and family size.

Introduction

Although there have been several studies of the determinants of physician utilization in the general population based on the pioneering work of Andersen and Newman (1973), their approach has rarely been applied to physician utilization in the Medicaid population. Moreover, there have been few opportunities to determine the variables affecting physician visit expenditures for either the general population or for Medicaid populations because of the absence of expenditure data in most survey data bases.

Regression analysis is used here to examine the determinants of the probability of a physician visit, the number of physician visits, and the total physician visit expenditures for full-year Medicaid enrollees in California, Michigan, New York, and Texas during 1980. The data source for this study, the State Medicaid household survey (SMHS) portion of the National Medical Care Utilization and Expenditure Survey (NMCUES), represents one of the few attempts to draw representative samples of Medicaid enrollees in different States and to validate self-reports of utilization and expenditures with Medicaid claims data.

The wealth of demographic, health status, income, source of payment, and employment information accompanying the data on medical care expenditures and utilization presents a rare opportunity for a detailed evaluation of the determinants of expenditures and utilization for Medicaid enrollees and for the comparison of the results with those obtained for the general population. NMCUES also presents the opportunity for the comparison of utilization and expenditure trends for enrollees across State Medicaid programs.

Ambulatory care utilization and expenditure studies

Ambulatory care utilization research has sought to determine the factors responsible for differences in access to and utilization of ambulatory care across sociodemographic groups. Previous descriptive research (Wilensky and Bernstein, 1983; Aday and Andersen, 1984) found that the following groups were disproportionately higher users of physician services:

- Women.
- People 65 years of age or older.
- Children 6 years of age or under.
- Urban residents.
- High income families.
- White people.
- People with insurance or other third-party coverage.
- People with a regular source of care.

However, multivariate analyses are required to estimate the relative importance and combined explanatory power of these determinants of physician utilization. A model of health care utilization developed by Andersen and Newman (1973) has been used in many ambulatory care studies to define the relevant variables and concepts for the analysis of survey data concerning ambulatory care utilization.

The Andersen-Newman model defines the following three specific aspects of utilization:

- Contact (seeing a physician).
- Volume (number of physician visits).
- Episodes (multiple visits for the same condition).

In most Andersen-Newman model studies, either contact or volume was used as a dependent variable. Rarely have episodes been used as a dependent variable.

In the Andersen-Newman model, ambulatory care utilization is a function of predisposing, enabling, and health status variables. Predisposing variables are sociodemographic and attitudinal factors that encourage use of ambulatory services. Enabling variables are indicators of an individual's ability to secure ambulatory services. Some important enabling variables are income, health insurance, regular source of care, and supply of physician services. Health status variables measure the existence or severity of perceived or diagnosed conditions. Because health status variables prompt individuals to seek care, they are often the most important predictors of ambulatory care utilization (Hulka and Wheat, 1985). The focus in the remainder of this section is on the findings of

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several multivariate studies of ambulatory care utilization based on the Andersen-Newman model.

Andersen (1975) used his model to examine the utilization of physician services in a sample of the U.S. population. He found that health status variables (number of disability days, self-reported symptoms, and worrying about one's health) were the most important determinants of the probability of physician contact. The following enabling variables were also significant determinants of physician contact: regular source of care, family income, physician-to-population ratio and insurance coverage for physician visits. Age, family size, education of head of household, and ethnicity were identified as significant predisposing variables.

The following health status variables were the most important determinants of volume of physician services: disability days, self-evaluated symptoms, diagnosed conditions, perceived health, worry about health, and frequency of pain. Regular source of care, income and residence were enabling variables that were significant determinants of volume. Age, family size, and ethnicity were the only significant predisposing variables. Much of the variation in both contact and volume was explained by health status variables. Regular source of care was the only other variable explaining a substantial amount of variance in physician utilization.

Phelps (1975) found number of disability days to be the most important predictor of number of physician visits. Frequency of experiencing pain and perceived health status were other significant health status variables. Insurance coverage and appointment delay (enabling) and age (predisposing) were the only other statistically significant variables.

Davis and Reynolds (1975) similarly discovered that the best predictors of number of physician visits were presence of a chronic condition, limitation of activities, and number of restricted activity days. Public assistance, income, and the number of physicians per capita were significant enabling variables. Age, race-by-region interaction, sex, and employment were predisposing variables that attained significance in their analysis.

Evashwick, et al. (1984) noted that health status variables (perceived health status, limitations in activities of daily living) were the most important determinants of number of physician visits. Medicaid eligibility, regular source of care, and not having transportation problems (enabling), and sex, education, and use of preventive visits (predisposing) were also significant predictors.

Analyses of Health Interview Survey data for 1970 by Berki and Kobashigawa (1976) and for 1971, 1972, and 1973 by Wolinsky (1978) using the Andersen-Newman Model found health status variables to be the best predictors of volume of physician visits for these national samples. In several other studies (Hershey, Luft, and Gianaris, 1975; Berki and Ashcraft, 1979; Kronenfeld, 1978, 1980; Branch, et al. 1981; Tanner, et al. 1983; and Wan, 1982), it was found that regular source of care also increased physician visits. Two other enabling variables, insurance coverage and family income, significantly increased the number of physician visits (Wan and Soifer, 1974; Kronenfeld, 1980).

In summary, in most studies of physician visit utilization, illness level and enabling variables were found to be the most important predictors of contact and volume of physician visits. Predisposing variables have been of secondary importance.

Although there have been many studies of ambulatory care utilization, there have been few multivariate analyses of ambulatory care expenditures. This is attributable to the scarcity of survey data bases with detailed information on expenditures for ambulatory care. Physician expenditures have increased 12.4 percent annually from 1969 to 1979. Only 2.4 percent of this increase was attributable to increased visits per person and population growth (Freeland and Schendler, 1983). The remainder was attributable to either inflation, increased physician's fees, or changes in service intensity. In 1977, the National Medical Care Expenditure Survey found higher ambulatory care expenses for older people, women, hispanic people, people earning less than $12,000, people who were not employed, people living in standard metropolitan statistical areas (SMSA's) and residents of the West or Northeast U.S. Census regions (Wilensky and Bernstein, 1983).

Phelps (1975) used the independent variables in the Andersen-Newman model as predictors of physician expenditures and found insurance for physician services to be his best predictor. Number of disability days, age, education, perceived health status, presence of pain, income, travel time by income interaction, and appointment delay were also significant predictors of physician expenditures.

When ambulatory care utilization in a Medicaid population using NMCUES data from four States was studied, it was found that physician and other medical care provider expenditures per visit varied across States, Medicaid enrollment groups, and age groups (Fullenbaum and Sarich, 1985). Because of this, physician expenditures cannot be considered simple linear functions of the number of physician visits.

Research methods

Survey description

The data presented in this article are drawn from the National Medical Care Utilization and Expenditure Survey (NMCUES), which was cosponsored and financed by the Health Care Financing Administration and the National Center for Health Statistics. The health care utilization and expenditure patterns of the civilian noninstitutionalized population of the United States during 1980 were documented by NMCUES data.

NMCUES contains the following three components:

- A randomly selected national household survey sample panel of the civilian noninstitutionalized population.
- A randomly selected four-State Medicaid household survey sample panel of the civilian noninstitutionalized population.
- A Medicare and Medicaid administrative records survey sample.

The data analyzed in this article were drawn from the sample of noninstitutionalized enrollees in the SMHS component of NMCUES who were eligible for the full year from January 1, 1980, to December 31, 1980 (N=7,643). SMHS was, in effect, four separate surveys conducted in New York, California, Texas, and Michigan because a sample of noninstitutionalized enrollees, stratified by enrollment group, was drawn from the Medicaid eligibility file of each State.

Five interviews were conducted with respondents regarding events related to medical care received in 1980. 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 that contained questions concerning utilization, expenditures, sources of payment, health insurance coverage, and employment. Questionnaire supplements were used in the first, third, and fifth rounds of interviews that contained questions about demographic and social characteristics, limitations in activity, family income, employment status, and access to care. SMHS response rates were 82 percent for California, 80 percent for Michigan, 77 percent for New York, and 92 percent for Texas. Self-reported SMHS data on Medicaid enrollment status, utilization, and expenditures were verified with ARS data for all Medicaid enrollees (Whitmore, 1983).

State Medicaid household survey

The four SMHS States comprised 36 percent of the total Medicaid population and 40 percent of total Medicaid expenditures nationwide in 1980. The SMHS States were highly urbanized and had above average per capita incomes. Texas and Michigan had slightly younger populations than the national average, and the population of New York was slightly older than the national average. Both New York and Texas had a higher than average percent of their populations in poverty. The 1980 unemployment rate in Michigan (12.3 percent) was much higher than the national average in a year that was marked by unusually high levels of unemployment nationwide. In contrast, Texas had an unemployment rate of only 5 percent in 1980 (Fullenbaum and Sarich, 1985).

The State Medicaid programs in California, Michigan, and New York each covered the medically needy, State-only enrollee groups, most Aid to Families with Dependent Children (AFDC) related optional groups eligible for Federal Medicaid assistance, and most of the optional services available under Medicaid in 1980 (Muse and Sawyer, 1982). Each of these State programs had above average AFDC payment standards and large number of AFDC recipients as a result of less restrictive AFDC eligibility standards (Rymer, Burwell, and Madigan, 1984). Because of the number of people eligible for Medicaid in these States as well as the liberal coverage of optional services, State Medicaid programs in California, Michigan, and New York also had high expenditure levels in 1980.

In contrast, the Texas Medicaid program in 1980 was one of the most restrictive programs in the South, where eligibility has been highly restrictive and benefit levels have been low. The Texas Medicaid program had the lowest ratio of Medicaid enrollees to persons in poverty in the Nation (.35) because of restrictive State AFDC eligibility standards. Texas did not cover the medically needy or other State-only groups, and it only covered one optional AFDC related group. The AFDC payment standard in Texas was very low when compared with the national average. Consequently, the Texas Medicaid program was far more limited in scope than the Medicaid programs in New York, Michigan, and California.

Statistical methods

The focus in this section will be on the following dependent variables: probability of a physician visit during 1980, number of physician visits during 1980, and total physician visit expenditures during 1980. These variables will first be presented by age, health status, Medicaid coverage, presence of a regular source of care, death during 1980, enrollment group, and State. Then, the effects of several predisposing, enabling, and health status variables will be assessed using multiple regression for each dependent variable. Separate multiple regression analyses are performed for both total enrollees and physician visit users for the number of physician visits and total physician visit expenditures. The probability of a physician visit is examined for total enrollees only. The natural logarithms of total physician visits and total physician expenditures were taken prior to estimation to compensate for skewness and outliers.

The regression equations presented are the result of a two-step process. Initially, all independent variables included in a model were run against the dependent variable. Only those variables attaining statistical significance at the .05 level were retained and then regressed against the dependent variable to obtain final estimates of these coefficients.

Ordinary statistical procedures should not be used when analyzing data from surveys using a cluster sampling design. Because NMCUES was a cluster sample, regression equations for this analysis were estimated using SURREGR, a software package designed by Research Triangle Institute to appropriately estimate the standard errors of linear

models from complex survey designs (Holt, 1982).

Normally, estimates of linear models for dichotomous dependent variables employ either a logit or probit algorithm because of the heteroscedasticity implicit in dichotomous dependent variables. Because state of the art software for probit or logit models do not incorporate design effects for complex samples when calculating standard errors, the regression analysis for a dichotomous dependent variable such as the probability of a physician visit was estimated in linear probability form using SURREGR. This method of estimation was appropriate, because the Taylor linearization method used by SURREGR does not require normally distributed data or a constant variance across all error terms (homoscedasticity).

Only unstandardized regression coefficients are used in this article because SURREGR does not provide standardized regression estimates. Because standardized coefficients were not available, the relative importance of coefficients in the regression models presented here cannot be assessed through path analytic methods commonly used in the social sciences (Duncan, 1975). These methods would allow one to make explicit statements about the relative importance of independent variables in a regression models. It is incorrect to compare unstandardized coefficients of predictors within the same equation to determine their relative importance, because the magnitude of each coefficient is affected by differences in the magnitude and variability of each independent variable (Lewis-Beck, 1980). Consequently, the relative importance of independent variables in the equations presented can be best, albeit imperfectly, evaluated through comparison of significance levels of the F test for their regression coefficients. The F test for the overall model uses the number of strata rather than the number of cases minus number of regressors as its denominator.

The expenditure data in these analyses represent total reimbursements actually paid to providers for physician visits. Total expenditures include not only Medicaid expenditures but also expenditures covered by Medicare, private insurance, out-of-pocket payment, and other payers. Similarly, utilization totals represent all reported physician visits regardless of source of payment, including visits not covered by Medicaid. The data are weighted using the person identifier weights developed by Research Triangle Institute.

Data analysis

During 1980, 77.9 percent of the full-year Medicaid enrollees in the SMHS sample saw a physician. This group averaged 5.6 visits per enrollee, with an average total expenditure for physician services of $213. In comparison, 72.8 percent of the general population saw a physician during 1977, resulting in 4.0 physician visits per person (Wilensky and Bernstein, 1983). As shown in Table 1, 62 percent of the sample were female, 13 percent were married, 12 percent were in the labor force during 1980, 19 percent had at least a high school education, and 87 percent resided in standard metropolitan statistical areas. Nearly 39 percent of the population was not white. Respondents dually enrolled in Medicare and Medicaid comprised 22 percent of the sample, and 88 percent of the sample had a regular source of care.

Table 1

Means and standard deviations of selected variables used in the analysis

Variable	Mean	Standard deviation
Total physician visit expenditures	$213.31	434.70
Any physician visit during 1980	.78	.42
Number of physician visits	5.58	8.60
Health status	2.18	1.00
Presence of limiting condition	.24	.43
Died during 1980	.01	.08
Regular source of care	.88	.32
Bed disability days	12.03	30.81
Annual family income	$9,335.77	$8,867.53
Medicare coverage	.22	.42
Age	30.22	25.82
Sex	.62	.49
Married	.13	.34
High school education or greater	.19	.38
Black and other minorities	.39	.49
Family size	3.88	2.31
In labor force, 1980	.12	.33
SMSA resident	.87	.33
SSI aged enrollment dummy	.15	.35
SSI blind and disabled enrollment dummy	.17	.37
AFDC adult enrollment dummy	.22	.42
AFDC child enrollment dummy	.39	.49
State-only enrollment dummy	.07	.26
California State dummy	.42	.49
Michigan State dummy	.16	.37
New York State dummy	.31	.46
Texas State dummy	.11	.31

NOTES: SMSA is standard metropolitan statistical area. SSI is Supplemental Security Income. AFDC is Aid to Families with Dependent Children.

SOURCE: Health Care Financing Administration and National Center for Health Statistics: Data from the State Medicaid household survey, National Medical Care Utilization and Expenditure Survey, 1980.

The respondents in the SMHS sample perceived their health to be good; only 24 percent reported a limiting condition. However, they were less healthy than the general population, as noted in previous research by Kasper and Howell (1985). They also averaged 12 bed days, and 0.6 percent died during 1980.

The percent of full-year Medicaid enrollees with a physician visit, the mean number of physician visits, and the mean physician visit expenditures by health status, age, Medicare coverage, death during 1980, having a regular source of care, enrollment group, and State are shown in Table 2. As health status declined, the percent of physician visits, mean physician visits, and mean physician visit expenditures increased. Similarly, respondents who died during 1980 used more physician services and had higher total expenditures than the other enrollees.

Physician utilization and expenditures increased with age. Respondents under 17 years of age had

Table 2

Percent with a physician visit, mean physician visits, and mean physician visit expenditures, by selected characteristics for full-year Medicaid enrollees

Characteristic	Number of enrollees	Mean physician visit expenditures	Percent with a physician visit	Mean physician visits
Health status				
Excellent	2,236	$119.60	72.6	3.3
Good	2,808	156.76	75.9	4.6
Fair	1,594	276.28	83.8	7.3
Poor	1,005	479.87	86.1	10.8
Died during 1980				
Yes	43	341.60	83.2	6.8
No	7,600	212.59	77.9	5.6
Respondent has a regular source of care				
Yes	6,733	221.16	80.2	5.8
No	910	155.14	62.2	3.6
Age				
Under 17	3,293	96.02	74.3	3.3
17-34	1,720	226.35	76.1	5.5
35-49	614	301.96	84.0	8.3
50-64	748	390.52	81.7	9.1
65 or over	1,268	352.88	84.6	8.1
Medicare coverage				
Yes	1,689	359.60	86.3	8.1
No	5,954	171.82	76.1	4.9
Enrollment group				
SSI aged	1,117	333.07	83.7	7.7
SSI blind and disabled	1,285	365.73	79.3	8.6
AFDC adult	1,697	223.02	79.7	5.6
AFDC child	2,993	94.28	74.4	3.3
State only	552	231.85	75.6	6.5
State				
California	3,188	316.40	81.8	6.7
Michigan	1,261	165.94	73.3	4.5
New York	2,380	124.08	76.3	5.0
Texas	814	143.88	74.4	4.8

SOURCE: Health Care Financing Administration and National Center for Health Statistics: Data from the State Medicaid household survey, National Medical Care Utilization and Expenditure Survey, 1980.

markedly lower levels of utilization and expenditure. Although those 65 years of age or over were the most likely to see a physician, they had less physician visits and lower physician visit expenditures than those enrollees 50 to 64 years of age.

Respondents with Medicare coverage had higher levels of both physician utilization and expenditures than the other full-year enrollees. Previous research on the dually enrolled population by McMillan et. al. (1983) and McMillan and Gornick (1984) found dual enrollees to be in poorer health than other Medicare beneficiaries. As a result, they were a high utilization and high expenditure group.

Respondents who did not have a regular source of care (M.D., osteopath, clinic, etc.) had decidedly lower levels of physician visit utilization and expenditures. Although most respondents without a regular source of care reported their health as either excellent or good, nearly 10 percent of the sample were in poor health and had probably put off seeking physician care.

Although the Supplemental Security Income (SSI) aged were the most likely group to visit a physician, the SSI blind and disabled had the most physician visits and highest expenditures. AFDC children had the least physician utilization and expenditures of any Medicaid enrollment group. California enrollees had decidedly higher levels of physician utilization and expenditures than full-year enrollees in the other three SMHS States.

Physician visit utilization models

Regression models for the probability of a physician visit and the number of physician visits are displayed in Figure 1. In the Andersen-Newman framework,

Figure 1

Analytical model for multivariate analyses

Dependent variable	Health status	Enabling	Predisposing
1. Probability of physician visit 1 = Yes; 0 = No	1. Health status 1 = Excellent 2 = Good; 3 = Fair; 4 = Poor	1. Income	1. Age
2. Number of physician visits	2. Limiting conditions 1 = Yes; 0 = No	2. Medicare coverage 1 = Yes; 0 = No	2. Sex 1 = Female; 0 = Male
3. Total physician visit expenditures	3. Died during 1980 1 = Yes; 0 = No	3. Regular source of care 1 = Yes; 0 = No	3. Marital status 1 = Married; 0 = Not married
	4. Bed days		4. Education 1 = 12 or more years of school 0 = Less than 12 years of school
			5. Race 1 = Black and other minorities; 0 = White
			6. Number of persons in family
			7. Employment status 1 = Worked full or part time during 1980; 0 = Not in labor force during 1980
			8. SMSA resident 1 = Yes; 0 = No
			9. Enrollment group a. SSI aged b. SSI blind and disabled c. AFDC adults d. AFDC children (State only enrollees excluded as reference group) 1 = Yes; 0 = No
			10. State: a. California b. New York c. Texas (Michigan excluded as reference group) 1 = Yes; 0 = No

NOTES: SMSA is standard metropolitan statistical area. SSI is Supplemental Security Income. AFDC is Aid to Families with Dependent Children.

these two models analyze the probability of physician contact and volume of physician services utilization, respectively.

A model for the probability of a physician visit is estimated for all full-year Medicaid enrollees. The dependent variable is dichotomous, indicating whether the respondent had at least one physician visit during 1980. The independent variables used in this study are similar to those used by Andersen (1975). Models for number of physician visits are estimated for all full-year enrollees as well as for those full-year enrollees with one or more physician visits. The natural logarithm of the number of physician visits was taken prior to estimation because of skewness and the presence of outliers.

The predisposing variables used in these two models are age, sex, race, education, employment, family size, marital status, and urban residence (Figure 1). Based on the research summarized earlier, the following groups should be more likely to see a physician as well have a higher number of physician visits:

- Older people.
- Females.
- Married people.
- Urban residents.
- High school graduates.
- White people.
- Members of small families.
- People employed during 1980.

The enabling variables used in these models are annual family income, Medicare coverage, and regular source of care (Figure 1). The Medicare coverage variable indicates that respondents are dually enrolled in both Medicare and Medicaid. Each of these variables should increase the probability of a physician visit. The illness variables used in these

models are perceived health status, activity limitations, bed days, and death during 1980. The death indicator permits the examination of physician utilization and expenditures during the last year of life. Previous research by McCall (1984) found that Medicare recipients in their last year of life were an exceptionally high utilization and high cost group.

Dummy variables are included for each State (with Michigan excluded as a reference variable) and for each enrollment group (with State-only enrollees excluded as a reference group). These variables determine whether any State or enrollment group specific factors influence either the probability of a physician visit or number of physician visits.

Regression analysis: Physician visits

Probability of a physician visit

As shown in Table 3, the best predictor of the probability of a physician visit for full-year enrollees is regular source of care (b = .170). Those respondents who reported having a regular source of ambulatory care were 17 percent more likely than others to have had a physician visit during 1980, controlling for all other significant predictors. Family size, sex, perceived health status, race, and number of bed days were also important predictors of the probability of a physician visit. Enrollees from small families, women, those who evaluated their health as either fair or poor, white people, and individuals with a high number of bed days were more likely than others to visit a physician. California Medicaid enrollees were 6.4 percent more likely to visit a physician, and SSI blind and disabled enrollees were 6.2 percent less likely to visit a physician.

Number of physician visits

For all full-year enrollees, the most significant determinant of (log) number of physician visits was health status (b = .206) followed by regular source of care (b = .439), sex, family size, and bed days (Table 4). Enrollees in poor health who had a regular source of care, were female, were from small families, and had a higher than average number of bed days visited physicians more than other full-year enrollees. Enrollees dying during 1980, white persons, and California enrollees also had significantly higher numbers of physician visits.

For all full-year enrollees with one or more physician visits, perceived health status (b = .177) was the most significant predictor of (log) number of physician visits (Table 5). Respondents who died during 1980 had considerably more physician visits than nondecedents, controlling for all other significant predictors (b = 1.217). Members of small families, those with a regular source of care, females, white persons, and those with a higher than average number of bed days had more physician visits than other service recipients. Texas Medicaid enrollees and AFDC child enrollees had fewer physician visits than other enrollees.

Table 3

Effects of predisposing, enabling, health status, and other variables on the probability of a physician visit for full-year Medicaid enrollees

Predictors	Regression coefficient (*b*)	*t*	Significance
Health status	0.033	4.39	<0.0001
Bed days	0.001	3.74	0.0002
Regular source of care	0.170	6.73	<0.0001
Female	0.067	5.29	<0.0001
Black	−0.068	4.20	<0.0001
Family size	−0.019	6.36	<0.0001
California	0.064	4.24	<0.0001
Supplemental Security Income, blind or disabled	−0.062	3.65	0.0003
Intercept	0.590		

R^2 = .069
F = 42.77
at (8,200) degrees of freedom
Significance = <0.0001
N = 7,643
Dependent variable mean = 0.779

NOTES: R^2 is the percent of variance explained. *F* is the ratio of explained to unexplained variance. *N* is the number of cases.

SOURCE: Health Care Financing Administration and National Center for Health Statistics: Data from the State Medicaid household survey, National Medical Care Utilization and Expenditure Survey, 1980.

Table 4

Effects of predisposing, enabling, health status, and other variables on the log number of physician visits for full-year Medicaid enrollees

Predictors	Regression coefficient (*b*)	*t*	Significance
Health status	0.206	10.26	<0.0001
Died during 1980	0.951	4.47	<0.0001
Bed days	0.003	5.76	<0.0001
Regular source of care	0.439	9.12	<0.0001
Female	0.229	8.42	<0.0001
Black	−0.164	4.60	<0.0001
Family size	−0.068	7.62	<0.0001
California	0.221	4.71	<0.0001
Intercept	0.599		

R^2 = .176
F = 123.44
at (8,200) degrees of freedom
Significance = <0.0001
N = 7,643
Dependent variable mean = 1.384

NOTES: R^2 is the percent of variance explained. *F* is the ratio of explained to unexplained variance. *N* is the number of cases.

SOURCE: Health Care Financing Administration and National Center for Health Statistics: Data from the State Medicaid household survey, National Medical Care Utilization and Expenditure Survey, 1980.

Physician visit expenditure models

Models for physician visit expenditures were estimated for all full-year enrollees as well as for all full-year enrollees with one or more physician visits. Both physician visit expenditure models use the same independent variables used in the models for physician visits (Figure 1).

Regression analysis: Physician visit expenditures

Full-year enrollees

Perceived health status (b = .375) was the most important predictor of (log) physician visit expenditures (Table 6). It was followed in statistical significance by sex (b = .515) and regular source of care (b = .962). These variables were shown earlier to be significant determinants of physician utilization.

Death during 1980 (b = 3.323) was also a strong predictor of physician visit expenditures. Although decedents were no more likely than other enrollees to have seen a physician, their high number of visits resulted in high expenditure levels. Members of small families, persons with high numbers of bed days, white persons, and urban residents had higher than average physician visit expenditures.

California enrollees had higher than average physician visit expenditures. In contrast, both New York and Texas had lower than average physician visit expenditures (using the State of Michigan as a reference point). Because Medicaid covered expenditures comprised a large portion of total physician expenditures, program factors such as the ratio of Medicaid to Medicare physician reimbursement and limits on mandatory services may have had a substantial impact on expenditures (McDevitt and Buczko, 1985).

One or more physician visits

The most important predictor for the regression model for (log) physician expenditures was health status (b = .253) as shown in Table 7. Death during 1980 (b = 4.146) was also an important predictor in this model. It supplements the findings of the previous model in suggesting that decedents visited physicians more and, consequently, had higher physician expenditures in their last year of life. Members of small families, females, urban residents, recipients with a high number of bed days, and recipients with a regular source of care also had higher expenditures for physician visits than other recipients.

State program and enrollment group were important variables in this model. Medicaid physician visit recipients in California (b = .382) had higher than expected physician visit expenditures. In contrast, New York and Texas had lower than expected physician visit expenditures as in the previous equation. AFDC children receiving physician services

Table 5

Effects of predisposing, enabling, health status, and other variables on the log number of physician visits for full-year Medicaid enrollees with one or more physician visits

Predictors	Regression coefficient (*b*)	*t*	Significance
Health status	0.177	10.44	<0.0001
Died during 1980	1.217	5.25	<0.0001
Bed days	0.002	5.01	<0.0001
Regular source of care	0.215	4.50	<0.0001
Female	0.118	4.71	<0.0001
Black	−0.075	2.36	0.0179
Family size	−0.049	6.09	<0.0001
Texas	−0.137	4.47	<0.0001
AFDC Child	−0.155	5.24	<0.0001
Intercept	1.350		

R^2 = .176
F = 74.28
at (9,200) degrees of freedom
Significance = <0.0001
N = 5,823
Dependent variable mean = 1.777

NOTES: R^2 is the percent of variance explained. F is the ratio of explained to unexplained variance. N is the number of cases. AFDC is Aid to Families with Dependent Children.

SOURCE: Health Care Financing Administration and National Center for Health Statistics: Data from the State Medicaid household survey, National Medical Care Utilization and Expenditure Survey, 1980.

Table 6

Effects of predisposing, enabling, health status, and other variables on the log total physician expenditures for full-year Medicaid enrollees

Predictors	Regression coefficient (*b*)	*t*	Significance
Health status	0.375	8.75	<0.0001
Died during 1980	3.323	5.40	<0.0001
Bed days	0.006	5.64	<0.0001
Regular source of care	0.962	7.56	<0.0001
Female	0.515	8.40	<0.0001
Black	−0.362	4.19	<0.0001
Family size	−0.139	7.49	<0.0001
California	0.625	5.31	<0.0001
New York	−0.313	2.57	0.0100
Texas	−0.312	2.97	0.0029
Urban	0.286	2.42	0.0154
Intercept	2.045		

R^2 = .156
F = 73.49
at (11,200) degrees of freedom
Significance = <0.0001
N = 7,643
Dependent variable mean = 3.822

NOTES: R^2 is the percent of variance explained. F is the ratio of explained to unexplained variance. N is the number of cases.

SOURCE: Health Care Financing Administration and National Center for Health Statistics: Data from the State Medicaid household survey, National Medical Care Utilization and Expenditure Survey, 1980.

Table 7

Effects of predisposing, enabling, health status, and other variables on the log total physician expenditures for full-year Medicaid enrollees with one or more physician visits

Predictors	Regression coefficient (*b*)	*t*	Significance
Health status	0.253	8.91	<0.0001
Died during 1980	4.146	6.18	<0.0001
Bed days	0.004	4.79	<0.0001
Regular source of care	0.201	2.83	0.0046
Female	0.165	4.13	<0.0001
Family size	−0.065	4.63	<0.0001
California	0.382	5.06	<0.0001
New York	−0.400	5.70	<0.0001
Texas	−0.336	4.93	<0.0001
Urban	0.312	3.70	0.0002
AFDC child	−0.360	7.09	<0.0001
Intercept	4.068		

R^2 = .200
F = 66.55
at (11,200) degrees of freedom
Significance = <0.0001
N = 5,823
Dependent variable mean = 4.905

NOTES: R^2 is the percent of variance explained. F is the ratio of explained to unexplained variance. N is the number of cases. AFDC is Aid to Families with Dependent Children.

SOURCE: Health Care Financing Administration and National Center for Health Statistics: Data from the State Medicaid household survey, National Medical Care Utilization and Expenditure Survey, 1980.

during 1980 had significantly lower physician visit expenditures than other enrollment groups.

Summary

The regression analyses strongly support the previous research employing the Andersen-Newman model for physician visit utilization. As in prior studies, health status variables were the strongest predictors of both physician visit utilization and expenditures. Perceived health status was the best predictor of number of physician visits and physician visit expenditures, and it was also a significant predictor of the probability of a physician visit. Bed days, another health status variable, attained significance in each of the expenditure and utilization equations.

Although death was not a significant predictor of the probability of a physician visit, it was a significant predictor of the number of physician visits and total physician expenditures. This supports the research of McCall (1984) that found substantially higher physician utilization and expenditures by Medicare enrollees in their last year of life.

Regular source of care (an enabling variable) was the most important predictor of the probability of a physician visit. It also was a strong predictor of number of physician visits and total physician visit expenditures for full-year enrollees. However, this variable was not an important predictor in equations for full-year enrollees with one or more physician visits.

A few demographic (predisposing) variables were very important across equations. Sex was especially important as a predictor for each dependent variable. Even after controlling for other relevant demographic, enabling, and health status factors, females had higher physician utilization rates and expenditures than males. Respondents living in small families had higher utilization and expenditure levels than those in large families.

The literature review cited substantial evidence that the probability of physician visit utilization increased with age. In this study, age was not a significant predictor of utilization or expenditures. This may be the result of the inclusion of health status variables, employment status, and dummy variables for SSI aged enrollees and Medicare recipients. Because these predictors are correlated with age, they may reduce the direct effect of age upon utilization and expenditures in a multivariate context even if no overt multicollinearity is present (Gordon, 1968).

State was a significant determinant of both physician utilization and expenditures. The effects observed resulted from differences in either economic factors (costs of care, supply of physicians) or physician practice patterns. State Medicaid program effects may also influence utilization and expenditures. For example, as the Medicaid physician reimbursement rate increases, access is improved because physicians are less likely to refuse to treat Medicaid patients. Also, as limits on utilization are imposed, especially for mandatory services, utilization and expenditures should both decline.

These findings have several implications for Medicaid policy. The strength of health status as a predictor suggests that expansion of the medically needy population, whose members tend to be in poor health, will increase Medicaid expenditures per enrollee for physician services. In contrast, AFDC children are less expensive as a group. Expansion of Medicaid coverage to low income children may provide preventive coverage at a relatively low cost per enrollee.

Finally, given the impact of regular source of care as a predictor of utilization, improved case management for new enrollees who do not have a regular source of ambulatory care would provide them with improved access to physician services. Enrolling those without a regular source of care in a capitated group program such as a health maintenance organization on entering the Medicaid program would be one strategy for improving access for this group and increasing physician services utilization.

References

Aday, L. A., and Andersen, R.: The national profile of access to medical care: Where do we stand? *Am J Public Health* 74(12):1331-1339, Dec. 1984.

Andersen, R., and Newman, J.: Societal and individual determinants of medical care utilization in the United States. *Milbank Mem Fund* 51(1):95-124, Winter 1973.

Andersen, R.: Health service distribution and equity. In Andersen, R., Kravits, J., and Anderson, O. W., eds. *Equity in Health Services: Empirical Analyses in Social Policy*. Cambridge, Mass. Ballinger, 1975.

Berki, S. E., and Kobashigawa, B.: Socioeconomic and need determinants of ambulatory care use: Path analysis of the 1970 Health Interview Survey. *Med Care* 14(5):405-421, May 1976.

Berki, S. E., and Ashcraft, M.: On the analysis of ambulatory care utilization: An investigation of the roles of need, access and price as predictors of illness and preventive visits. *Med Care* 17(12):1163-1181, Dec. 1979.

Branch, L., Jette, A., Evashwick, C., Polansky, M., Rowe, G., and Diehr, P.: Toward understanding elders' health service utilization. *J Community Health* 7(2):80-92, Winter 1981.

Davis, K., and Reynolds, R.: Medicare and the utilization of health care services by the elderly. *J Hum Resour* 10(3):361-377, Summer 1975.

Duncan, O. D.: *Introduction to Structural Equation Models*. New York. Academic Press, 1975.

Evashwick, C., Rowe, G., Diehr, P., and Branch, L.: Use of health care services by the elderly. *Health Serv Res* 19(3):357-382, Aug. 1984.

Freeland, M., and Schendler, C. E.: National health expenditure growth in the 1980's: An aging population, new technologies, and increasing competition. *Health Care Financing Review*. Vol. 4, No. 3. HCFA Pub. No. 03149. Office of Research and Demonstrations, Health Care Financing Administration. Washington. U.S. Government Printing Office, Mar. 1983.

Fullenbaum, R., and Sarich, J.: Ambulatory Care Utilization and Expenditures Among Medicaid Recipients in Four States. Draft Report. Baltimore, Md. Office of Research and Demonstrations, Health Care Financing Administration, Sept. 1985.

Gordon, R. A.: Issues in multiple regression. *American Journal of Sociology* 73(3):592-616, Jan. 1968.

Hershey, J., Luft, H., and Gianaris, J.: Making sense out of utilization data. *Med Care* 8(10):838-854, Oct. 1975.

Holt, M. M.: *SURREGR: Standard Errors of Regression Coefficients from Sample Survey Data*. Research Triangle Park, N.C. Research Triangle Institute, 1982.

Hulka, B. S., and Wheat, J. R.: Patterns of utilization: The patient perspective. *Med Care* 23(5):438-460, May 1985.

Kasper, J. A., and Howell, E. M.: Health status of the Medicaid population. Unpublished report. SysteMetrics/McGraw-Hill, Inc., 1985.

Kronenfeld, J.: Provider variables and the utilization of ambulatory care services. *Journal of Health Soc Behav* 19(1):68-85, June 1978.

Kronenfeld, J.: Sources of ambulatory care and utilization models. *Health Serv Res* 15(1):3-20, Spring 1980.

Lewis-Beck, M.: *Applied regression: An introduction*. Beverly Hills and London. Sage Publications, 1980.

McCall, N.: Utilization and costs of Medicare services by beneficiaries in their last year of life. *Med Care* 22(4):329-342, Apr. 1984.

McDevitt, R., and Buczko, W.: Medicaid program characteristics and their consequences for program spending. *Health Care Financing Review*. Vol. 7, No. 2. HCFA Pub. No. 03220. Office of Research and Demonstrations, Health Care Financing Administration. Washington. U.S. Government Printing Office, Winter 1985.

McMillan, A., Pine, P., Gornick, M., and Prihoda, R.: A study of the crossover population: Aged persons entitled to both Medicare and Medicaid. *Health Care Financing Review*. Vol. 4, No. 4. HCFA Pub. No. 03152. Office of Research and Demonstrations, Health Care Financing Administration. Washington. U.S. Government Printing Office, Summer 1983.

McMillan, A., and Gornick, M.: The dually entitled Medicare and Medicaid population living in the community. *Health Care Financing Review*. Vol. 6, No. 2. HCFA Pub. No. 03195. Office of Research and Demonstrations, Health Care Financing Administration. Washington. U.S. Government Printing Office, Winter 1984.

Muse, D., and Sawyer, D.: The Medicare and Medicaid Data Book, 1981. *Health Care Financing Program Statistics*. HCFA Pub. No. 03128. Office of Research and Demonstrations, Health Care Financing Administration. Washington. U.S. Government Printing Office, Apr. 1982.

Phelps, C. E.: Effect of insurance on demand for medical care. In Andersen, R., Kravits, J., and Anderson, O. W., eds. *Equity in Health Services: Empirical Analyses in Social Policy*. Cambridge, Mass. Ballinger, 1975.

Rymer, M., Burwell, B., and Madigan, D.: Short-Term Evaluation of Medicaid: Selected Issues. *Health Care Financing 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.

Tanner, J., Cockerham, W., and Spaeth, J. L.: Predicting physician utilization. *Med Care* 21(3):360-369, Mar. 1983.

Wan, T.T.H., and Soifer, S.: Determinants of physician utilization: A causal analysis. *J Health Soc Behav* 15(2):100-112, June 1974.

Wan, T.T.H.: Use of health services by the elderly in low income communities. *Milbank Mem Fund Q* 60(1):82-107, Winter 1982.

Whitmore, R. W.: Medicare and Medicaid Best Estimation for the National Medical Care Utilization and Expenditure Survey. Unpublished report. Research Triangle Institute, 1983.

Wilensky, G., and Bernstein, A.: Contacts with physicians in ambulatory settings: Rates of use, expenditures, and sources of payment. *National Health Care Expenditures Study*. Data Preview 16. DHHS Pub. No. (PHS) 83-3661. Hyattsville, Md. National Center for Health Services Research, Public Health Service, 1983.

Wolinsky, F. D.: Assessing the effects of predisposing, enabling, and illness-morbidity characteristics on health services utilization. *J Health Soc Behav* 19(4):384-396, Dec. 1978.