Evaluation of the Arkansas Medicaid Primary Care Physician Management Program

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Arkansas implemented a primary-care case-management program in February 1994. This study evaluates the program during its first 17 months. Using quarterly data collected for the Health Care Financing Administration (HCFA), a pooled cross-sectional time series analysis (1991:4-1995:2) estimates the effect of eligibles' program enrollment on expenditure (total, inpatient hospital, outpatient hospital, physicians, prescription drugs, laboratory and X-ray) and utilization measures (outpatient visits, physician visits, prescription drugs). The Arkansas Medicaid managed care program appears to have somewhat reduced growth in total vendor payments and also appears to have improved access to primary medical services.

INTRODUCTION

Since 1981, many States have experimented with various forms of managed care to control rising Medicaid expenditures and improve access to medical services for recipients. In early 1993, the Arkansas Department of Human Services submitted a waiver request (section 1915(b)(1)) to HCFA to establish a primary-care case-management program called the Arkansas Medicaid Primary Care Physician (PCP) Management program. HCFA approved the application with the requirement that the program be evaluated by September 30, 1995. This article describes the important features of this program and reports on its effectiveness in the first 1½ years of operation.

The effectiveness of the Arkansas PCP program is determined by a cross-sectional pooled time series analysis of quarterly data routinely collected by State Medicaid agencies participating in the Medicaid Statistical Information System (MSIS). The adjudicated claims data permit estimating the impact of managed care programs by expenditure classes and by recipients' maintenance assistance, or eligibility group. The time series analysis design can, with appropriate modifications, be replicated in other States participating in the MSIS data base project. The Arkansas PCP evaluation examines two critical questions: (1) Has the program been effective in controlling the State's Medicaid expenditures? (2) Has the program changed Medicaid recipients' health care utilization patterns consistent with managed care goals?

Features and Implementation of the Arkansas PCP Program

The Arkansas Medicaid PCP Management Program was patterned after Kentucky's KenPAC program (Beaulieu, 1991) and is a fee-for-service (FFS) primary-care gatekeeper enrollment program (Hurley, Freund, and Paul, 1993). Under this type of managed care, the Arkansas Department of Human Services contracts with five primary-care physician specialties (family practice, general practice, internal medicine, obstetrics/gynecology,

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and pediatrics) who, in exchange for a $3 per person per month fee, assume certain patient management responsibilities, including the provision of comprehensive primary care, referral to specialists when medically necessary, and 24-hour per day live-voice access for referral to a physician on call. Medicaid eligibles are required to sign up with a primary-care provider and use this provider first, except for true medical emergencies.

The Arkansas Department of Human Services began recruiting primary-care physicians in October of 1993; by September 1995, 1,287 primary-care physicians had agreed to participate in the Medicaid PCP provider network. Each network provider was allowed to enroll up to 1,000 persons. However, some providers were permitted to enroll more Medicaid eligibles, if they had a large Medicaid patient load prior to program implementation or no other participating providers were located within reasonable distance of the Medicaid eligible.

The Arkansas Medicaid PCP program exempts 30 percent of all Medicaid-eligible persons from participation. The exempted groups are Medicaid eligibles who: (1) have Medicare as their main insurance, (2) reside in nursing homes, (3) reside in intermediate care facilities for the mentally retarded, (4) are eligible for Medicaid as a result of medically needy spend-down, (5) receive children's medical services, (6) are temporary residents outside Arkansas State boundaries, or (7) are retroactively eligible.

The Arkansas Medicaid PCP program was implemented statewide with enrollment that was supposed to be staggered by Medicaid eligibility group. Enrollment of Medicaid eligibles began with Aid to Families with Dependent Children (AFDC) recipients on February 1, 1994, followed by 'other Medicaid' recipients on May 1, and Supplemental Security Income (SSI) recipients on August 1, 1994. The actual enrollment of the three Arkansas Medicaid Aid classes is shown in Figure 1 and the composition of the three aid classes is cross- referenced in Table 1. The three aid classes required to participate in the PCP program represented 200,936 eligibles out of a total of 286,049 Medicaid eligibles in February 1994. About one-half of all Medicaid eligibles required to participate in the PCP program had voluntarily signed up with a primary-care physician within 7 months from the start of the program. As of June 30, 1995, AFDC eligibles had the highest enrollment rate, with a 78 percent sign-up rate, followed by 'other' Medicaid with 74 percent and SSI eligibles with 71 percent. The remaining unassigned Medicaid eligibles were supposed to be automatically assigned to a PCP participating provider, but this waiver provision had not been implemented as of June 30, 1995. It should also be recalled that about 30 percent of Arkansas Medicaid eligibles are excluded from PCP participation. Thus, 51.8 percent of the total Arkansas Medicaid population participated in the PCP program as of June 1995.

Expected Effects of Arkansas PCP Program

The Arkansas PCP program is an FFS primary-care case-management program; a form of managed care considered least restraining from the provider's perspective (Hurley, Freund, and Paul, 1993). It allows for voluntary participation by primary-care providers and provides financial incentives—a monthly $3 fee—to assume the patient management role. The monthly fee is paid per enrollee regardless of whether the enrollee uses services. Therefore, the program neither provides incentives to prescribe unnecessary medical services, nor does it put the provider at risk by

Table 1

Arkansas Medicaid Aid Categories and PCP Program Data, by HCFA-2082 Classification

HCFA-2082: Maintenance Assistance/Eligibility Category	Arkansas Medicaid Aid Code	Enrollment Period[1]	Percent Eligibles Enrolled 6/95	Analysis Sample
1. Category: Needy, Receiving Assistance				
1.1 Aged	13-14 (SSI)	3	0.93	Yes
1.2 Blind	33-35 (SSI)	3	37.53	Yes
1.3 Disabled	43-45 (SSI)	3	49.02	Yes
1.4 AFDC Children	20 (AFDC)	1	93.65	Yes
1.5 AFDC Adults	20 (AFDC)	1	87.52	Yes
1.6 Title XIX	—	—	N/A	No
2. Category: Needy, Not Receiving Assistance				
2.1 Aged	11 (Other)	2	0.43	Yes
2.2 Blind	31 (Other)	2	4.17	Yes
2.3 Disabled	41,49 (Other)	2	24.41	Yes
2.4 AFDC Children	21 (AFDC)	1	29.10	Yes
2.5 AFDC Adults	25 (Other)	2	11.30	Yes
2.6 Title XIX	22,51,52,91,92 (Other)	2	68.32	Yes
3. Medically Needy				
3.1 Aged	16 (Other) **17**	2	6.03	Yes
3.2. Blind	36 (Other) **37**	2	N/A	No
3.3 Disabled	46 (Other) **47**	2	12.82	Yes
3.4 AFDC Children	26 (Other) **27**	2	55.22	Yes
3.5 AFDC Adults	**26,27**	1	43.34	Yes
3.6 Title XIX	56,63,76,96 (Other) **57,77,97**	2	89.65	Yes
4. Other Coverage, Pre-1987				
4.1 Aged	—	—	N/A	No
4.2 Blind	—	—	N/A	No
4.3 Disabled	—	—	N/A	No
4.4 AFDC Children	61,62 (Other)	2	59.48	Yes
4.5 AFDC Adults	61,62,65,66 (Other) **67**	2	45.03	Yes
4.6 Title XIX	80,81,86 (Other) **87**	2	N/A	No
5. Other Coverage, 1988 and Later				
5.1 Aged	**18**	—	0.00	Yes
5.2 Blind	**38**	—	N/A	No
5.3 Disabled	**48**	—	0.00	Yes
5.4 AFDC Children	—	—	N/A	No
5.5 AFDC Adults	—	—	N/A	No
5.6 Title XIX	70-72 (AFDC) **88**	1	22.37	Yes

[1] Period designation: 1=2/1/1994-4/30/1994; 2=5/1/1994-7/31/1994; 3=8/1/1994-10/30/1994.

NOTES: Bolded numbers indicate Arkansas aid classes exempted from PCP participation. PCP is primary-care physician. SSI is Supplemental Security Income. AFDC is Aid to Families with Dependent Children. N/A is not applicable.

SOURCE: (Arkansas Department of Human Services, 1995: Section 2700.1, F-5).

financial withholds. The primary-care provider refers patients to specialists when medically necessary in order to ensure access to more expensive medical services as needed.

The Arkansas Medicaid PCP program, however, restricts the enrolled recipient's choice of provider by requiring that the person contact his or her primary-care physician before accessing specialist care, except in the event of a true emergency. Through this requirement, the program is expected to direct Medicaid recipients to primary-care practitioners rather than to more expensive specialists, except when medically necessary. The rerouting of medical service demand to primary-care practitioners is expected to result in overall cost savings, due to less use of specialist services, expensive laboratory tests, and non-urgent hospital emergency room services. In addition, enhanced access and

regular use of primary-care services is likely to result in fewer hospital admissions, provide more continuity of care, and may prevent the risk of duplicate prescription of drugs.

Selection of Data and Analysis Sample

Initially, the evaluators proposed to study the impact of the Arkansas PCP program using monthly adjudicated claims records from July 1991 to June 1995 for the six major Federal maintenance assistance/eligibility groups (aged, blind, disabled, AFDC adults, AFDC children, and title XIX). However, two significant problems arose. Monthly data were not available by Federal Medicaid classifications, but instead were available by Arkansas Medicaid Aid class. A special computer run of approximately 56 million records would have been required to produce monthly data in the required form. To avoid undue expense and project delay, quarterly data of adjudicated claims by Federal classification were obtained in hardcopy form (HCFA-2082) from the Arkansas Department of Human Services, Division of Medical Services. Similar data should be available in States participating in MSIS.

Table 1 cross-references Federal and State Medicaid classifications and specifies the groups included in the statistical analysis. To be included, the number of Medicaid recipients had to be $n > 24$ per group and quarter. In addition, eligibility groups with no recipients for several consecutive quarters (empty cells) were eliminated from the analysis. The selection criteria were designed to protect the statistical analysis from large, erratic drifts due to small base numbers. A panel of 21 Federal eligibility groups was retained for the statistical analysis. The nine excluded groups represent 3.6 percent of Arkansas Medicaid recipients and 1.9 percent of Medicaid vendor payments. The analysis sample nearly reflects the complete expenditure experience of the Arkansas Medicaid program for the analysis period.

Table 1 also reports Medicaid eligibles' PCP enrollment rates as of June 30, 1995, by Federal maintenance assistance/eligibility groups. The percentage figures show that PCP enrollment varies substantially by Federal eligibility group. A separate computer run was needed to determine the enrollment trends, since these data are not contained in the HCFA-2082 reports.

Data Entry, Verification, and Data Transformation

As the first step, selected quarterly utilization and expenditure data were entered into a spreadsheet. The data base of approximately 24,000 numbers was verified by two persons comparing each spreadsheet entry with the corresponding quarterly report entry. Data verification indicated a .3 percent error rate; the incorrect entries were subsequently corrected. The data base for the following analysis ought to be identical with data in the quarterly (HCFA-2082) reports prepared by the fiscal intermediary Electronic Data Systems (EDS).

Since the HCFA-2082 report presents quarterly data cumulatively for each Federal fiscal year (FFY), the data had to be differenced and the first FFY quarter value was replaced with the corresponding value in the original series. This operation was applied to all expenditure and utilization series; it yields time series of quarterly data. The transformed time series starts with the first quarter of FFY 1992 (October to December) and ends with the third FFY quarter of 1995 (April to June) and consists of 15 quarterly observations for 21 Federal eligibility groups. The maximum sample

size only contains (n = 303) observations because two time series started in 1993.

All expenditure series were adjusted for price inflation by dividing by the national urban Consumer Price Index for medical care and then multiplying by 100 (Donham, Maple, and Sensenig, 1994). The expenditure data are expressed in constant dollars with a base period of 1982-84. Since Medicaid eligibility group sizes vary strongly, the data were further transformed into natural log (ln) units. This transformation stabilizes the variation between groups, and has the additional salutary effect that regression coefficients can be interpreted approximately as percentages.

Statistical Method and Model

The statistical method used for this evaluation is known as pooled cross-sectional time series analysis, or panel analysis in the econometrics literature (Stimson, 1985; Hsiao, 1986; Sayre, 1989). Panel analysis involves the simultaneous analysis of several contemporaneous time series for different units. Units refer to the 21 Federal eligibility groups, denoted by the subscript {i}, while time series, denoted by subscript {t}, refer to the 15 quarters spanning the period October 1991 to June 1995.

There are several program-related and statistical reasons for choosing a cross-sectional pooled time series analysis design for the Arkansas Medicaid PCP evaluation. Since the program was implemented statewide, there was no opportunity to create a true control group consisting of Arkansas Medicaid recipients. In addition, the Arkansas PCP implementation protocol exempted certain groups, i.e., aged, from PCP participation and staggered implementation of other groups, thus permitting multiple, lagged comparison groups. The simultaneous analysis of multiple time series also significantly increases the number of time series observations and, thus, the statistical power to detect small PCP program effects. The inclusion of a sufficient number of observations pertaining to the time before the PCP program allows control of trends and seasonality unrelated to PCP effects. Moreover, the effects of other potentially confounding variables, i.e., demographic characteristics of the Medicaid population, can be efficiently controlled in a panel analysis. The general form of the statistical model is stated in equation 1.

$$Y_{it}=b_kPCPR_{it}+b_1R_{it}+b_2F_{it}+b_3W_{it}+b_4T_{it}+b_5Q_{i1}+b_6Q_{i2}+b_7Q_{i3}+b_8A_{it}+b_iG_i+e_{it} \quad (1)$$

Where:

- Y_{it} = dependent variables (expenditure/utilization measure, ln transformed);
- b_k = multiple regression coefficients for subgroups of blind, disabled, AFDC adults, AFDC children, title XIX;
- $PCPR_{it}$ = Medicaid eligibles' enrollment rate (percent) for group (it);
- R_{it} = Number of Medicaid recipients (ln) for group (it);
- F_{it} = Percent female population for group (it);
- W_{it} = Percent white population for group (it);
- T_{it} = Linear time trend consecutively numbered for group (i);
- Q_{i1} = Dummy variable for FFY quarter 1 group (i);
- Q_{i2} = Dummy variable for FFY quarter 2 group (i);

Q_{i3} = Dummy variable for FFY quarter 3 group (i);
A_{it} = Dummy variable for FFY-93 quarter 1 group (i);
G_i = Dummy variables (21) for each Federal eligibility group; and
e_{it} = error, IN $(0,\sigma^2)$.

Equation 1 does not require a constant term when all 21 eligibility group dummy variables (G_i) are included. The specification of the equation centers the regression analysis at the mean of the dependent variable. The statistical model is estimated by ordinary least squares (OLS) multiple regression using the computer algorithm in RATS 4.10 (Doan, 1994) unless otherwise noted. The PCP program effectiveness is determined by the statistical significance of the multiple regression coefficients (b_k) associated with the Medicaid eligibles enrollment rate variable.

Since several large outliers were detected in the analysis of model residuals, the regression analyses were rerun removing outliers.[1] The latter analysis determines how sensitive the PCP effects are to exceptional observations. In addition, the standard errors of the regression coefficients were adjusted for remaining heteroscedasticity in residuals by the ROBUSTERRORS option contained in the RATS software (Doan, 1994). The method, developed by White (1980), controls for all sources of heteroscedasticity, not just those arising from variation in cell frequencies. The residuals were also tested for first-order autoregression and reestimated when necessary. The adjustment for autocorrelation is indicated in the models by regression coefficients labeled AR(1).

[1]Outliers are defined as model residuals which exceed $z > 2.57$ standard errors. The inspection of the five outliers in the expenditure model strongly suggests that outliers are due to data entry errors or reporting lags in the source document.

Model Series

PCP Enrollment Rates

The overall PCP program impact is measured by the number of Medicaid eligibles enrolled with PCP physicians during a given quarter. The measure is expressed in percent and is based on the average number of eligibles within each Federal eligibility group during a stated quarter.

Group-specific PCP program effects are measured by multiplying the enrollment rate with dummy variables representing major eligibility groups, i.e., blind, disabled, AFDC children, AFDC adults, and title XIX. A dummy variable is coded 1 when the characteristic is present, i.e., "disabled" and 0 otherwise. Since nearly all "Medicaid Aged" were excluded from enrollment in the PCP program, no separate effects are estimated in the eligibility group specific regression models. However, the data pertaining to the aged subgroups are included in the regression analyses and serve as a comparison group (Table 1).

Medicaid Recipients

Since the number of Medicaid recipients varies over time and is a main determinant of service use and expenditure, it must be controlled in the analysis. Otherwise, a downward trend in the number of Medicaid recipients coinciding with the PCP program implementation could be mistaken for program savings, or program-related utilization decreases.

Sex and Race Distribution

Since age, sex, and race are significant determinants of health care use and expenditures, changes in those characteristics in the Arkansas Medicaid population had to be controlled. The percent of females and

the percent white population are used to measure changes in the demographic composition of the Arkansas Medicaid population. A measure of change in the age distribution was initially included in the regression analysis, but was found to be highly correlated with eligibility group dummy variables, creating multicollinearity.

Trends and Seasonality

To control the analysis for secular time trends unrelated to PCP program implementation, a linear time counter is included in the analysis. In addition, three dummy variables capture seasonality in the expenditure and utilization analyses.

Reimbursement Adjustments

Another dummy variable was created to measure the effect of an exceptionally large volume of Medicaid payments occurring during the last calendar quarter of 1992. The atypical volume of provider payments during this quarter was due to a State fiscal crisis, resulting in a furlough earlier in the year that delayed provider payments.

Eligibility Groups

Since each Federal Medicaid maintenance assistance/eligibility group has a distinct utilization and expenditure experience, 21 dummy variables were created to represent each group. Eligibility group specific dummy variables control for much of the variation in utilization, or expenditure experience unrelated to PCP program implementation.

Arkansas Medicaid Expenditure Analysis

The following section estimates the impact of Arkansas PCP enrollment on Medicaid vendor payments (expenditures) during the first 17 months. The results of the regression analysis (Tables 2 and 3) are presented for total Arkansas Medicaid expenditures[2] and selected types of expenditures: hospital inpatient, hospital outpatient, physicians, prescription drugs, and laboratory and X-ray expenditures. These expenditure classes were chosen because they are standard Medicaid reporting categories and are likely to show the impact of the PCP program.

The statistical results are presented in two specifications. The italicized row in Tables 2 and 3 presents regression coefficients measuring the overall impact of the Arkansas PCP program. The coefficients were estimated by weighted least squares (Maddala, 1988) using the inverse of the number of recipients as weight. The rationale for the weighted regression is that entries based on large eligibility group sizes are more reliable than those based on small ones. Therefore, the weighted regression estimate is more likely to be representative of the overall impact of the PCP program than the corresponding OLS estimate, which gives each observation equal weight. The specification of the weighted regression is identical to equation 1, except that eligibility group-specific PCP effects were replaced by an overall measure of program effect. The other weighted regression coefficients are not shown, but they tend to be similar in size and direction to the ones shown in the OLS specification.

The result of the second model specification is presented below the italicized entries. The model estimates five eligibility group specific PCP program effects in addition to the other variables stated in equation 1. It excludes outliers and was estimated by OLS with standard errors of the regression coefficients adjusted for

[2]It should be noted that the analysis sample represents 98.1 percent of all vendor payments.

Table 2

Regression Results for Arkansas Medicaid Expenditures, by Type

Measure	Total Expenditures		Inpatient Hospital		Outpatient Hospital	
	b	*t*	*b*	*t*	*b*	*t*
PCP Enrollment Rate—All Groups[1]	**-0.130*	**-2.24*	*-0.166*	*-1.60*	**-0.153*	**-2.99*
PCP Enrollment Rate—Blind	-0.085	-0.40	*-1.550	*-1.82	0.313	1.23
PCP Enrollment Rate—Disabled	-0.006	-0.04	-0.023	-0.05	0.198	1.21
PCP Enrollment Rate—AFDC Children	*-0.170	*-2.18	-0.301	-1.15	-0.089	-0.97
PCP Enrollment Rate—AFDC Adult	*-0.279	*-2.79	-0.155	-0.51	0.008	0.08
PCP Enrollment Rate—title XIX	-0.124	-0.82	*-0.551	*-1.83	*-0.226	*-1.68
Number of Recipients	0.968	29.18	0.931	21.10	0.992	36.37
Percent Female	-0.038	-1.48	-0.106	-2.28	-0.017	-0.63
Percent White	-0.001	-0.169	-0.027	-1.87	0.011	1.59
Linear Trend	-0.010	-1.26	-0.049	-3.34	-0.008	-0.93
FFY Quarter 1	0.425	12.16	0.98	11.77	0.973	22.64
FFY Quarter 2	0.191	4.91	0.434	6.92	0.485	12.24
FFY Quarter 3	0.267	6.86	0.382	6.70	0.359	9.56
Fiscal Adjusted FFY 1993: Quarter 1	0.124	2.66	-0.028	-0.30	0.148	3.17
AR(1)	—	—	0.282	4.44	—	—
Degrees of Freedom	264	—	235	—	262	—
R^2 adjusted	.990	—	.974	—	.988	—
s.e.e.	.204	—	.325	—	.209	—
Durbin-Watson	2.17	—	2.10	—	2.13	—
Mean	14.345	—	12.820	—	10.892	—

*PCP effects statistically significant at $t > |1.960|$; $p = .05$ (two-tailed test); $t > |1.645|$; $p = .10$ (two-tailed test).

[1]The italicized entries are based on weighted least squares regressions, deleting the PCP group-specific variables.

NOTES: Outliers and 21 multiple-regression coefficients for Federal eligibility groups are deleted. PCP is primary-care physician. AFDC is Aid to Families with Dependent Children. FFY is Federal fiscal year. AR(1) is autoregressive term, lag 1. s.e.e. is standard error of estimate.

SOURCE: Health Care Financing Administration, Medicaid Statistical Information System: HCFA-2082 Reports for Arkansas, 1991:4-1995:2.

heteroscedasticity according to White's method (1980).

Total Medicaid Expenditures

The PCP enrollment rate is negatively related to Arkansas Medicaid expenditures indicating a cost savings effect. For instance, the weighted PCP enrollment rate coefficient ($b = -.13$, $t = -2.24$) implies that if the PCP program were to cover all Medicaid eligibles, vendor payments would be reduced by 13 percent per recipient.[3] Since 30 percent of the Medicaid population was exempted from program participation and not all PCP eligibles were enrolled by the second quarter 1995, all regression estimates need to be adjusted for enrollment levels. Therefore, the best overall cost savings estimate is 6.7 percent, because about 52 percent of the Arkansas Medicaid population were PCP enrolled during June 1995.

The eligibility group-specific model specification shows that AFDC adults and AFDC children are largely responsible for the total expenditures reductions. The regression coefficients are statistically significant for both groups and indicate that AFDC adult-related expenditures per recipient could be reduced by approximately 28 percent, if all eligibles in this group had been PCP enrolled. Since only 58.4 percent of AFDC adults were actually PCP enrolled in June 1995, cost savings are estimated to be 16.3 percent. The corresponding cost savings estimate adjusted for PCP enrollment for AFDC children is 13.2 percent in June 1995.

[3]A reviewer correctly pointed out that this interpretation assumes that health care use of unenrolled Medicaid recipients parallels that of PCP enrolled recipients. We do not put much faith in this assumption, since most persons exempted from PCP program participation are nursing-home-bound Medicare beneficiaries. For this reason, we caution against extrapolating the weighted regression estimates beyond the PCP eligible Medicaid population (70 percent of all Arkansas Medicaid eligibles) and restricted the cost savings estimates to the AFDC groups.

Table 3

Regression Results for Arkansas Medicaid Expenditures, by Type

Dependent Variable	Physicians		Prescription Drugs		Laboratory and X-Ray	
	b	*t*	*b*	*t*	*b*	*t*
PCP Enrollment Rate—All Groups[1]	*-0.08*	*-1.27*	*0.01*	*0.12*	**-0.216*	**-4.15*
PCP Enrollment Rate—Blind	0.265	0.90	0.035	0.09	*0.928	*1.76
PCP Enrollment Rate—Disabled	-0.036	-0.23	-0.024	-0.11	*-0.350	*-2.00
PCP Enrollment Rate—AFDC Children	-0.101	-1.06	0.071	0.72	-0.093	-0.92
PCP Enrollment Rate—AFDC Adult	-0.073	-0.79	*-0.259	*-2.76	*-0.196	*-1.91
PCP Enrollment Rate—title XIX	-0.005	-0.03	*-0.333	*-1.86	-0.239	-1.57
Number of Recipients	0.918	25.06	1.018	15.34	0.902	30.87
Percent Female	-.048	-1.55	0.023	0.54	-0.005	-0.12
Percent White	-0.099	-0.16	0.021	3.29	0.013	1.67
Linear Trend	-0.011	-1.29	0.026	2.94	0.003	0.23
FFY Quarter 1	0.522	10.89	0.762	12.40	0.830	14.42
FFY Quarter 2	0.316	7.66	0.449	9.11	0.446	9.19
FFY Quarter 3	0.199	5.04	0.244	4.91	0.252	5.26
Fiscal Adjusted FFY 1993: Quarter 1	0.083	1.74	0.009	0.12	0.044	0.73
AR(1)	—	—	—	—	—	—
Degrees of Freedom	262	—	266	—	257	—
R^2 adjusted	.988	—	.988	—	.985	—
s.e.e.	.213	—	.234	—	.239	—
Durbin Watson	2.06	—	2.22	—	2.04	—
Mean	12.208	—	11.352	—	9.954	—

*PCP effects statistically significant at $t > |1.960|$; $p = .05$ (two-tailed test); $t > |1.645|$; $p = .10$ (two-tailed test).

[1]The italicized entries are based on weighted least squares regressions, deleting the PCP group-specific variables.

NOTE: Outliers and 21 multiple-regression coefficients for Federal eligibility groups are deleted. PCP is primary-care physician. AFDC is Aid to Families with Dependent Children. FFY is Federal fiscal year. AR(1) is autoregressive term, lag 1. s.e.e. is standard error of estimate.

SOURCE: Health Care Financing Administration, Medicaid Statistical Information System: HCFA-2082 Reports for Arkansas, 1991:4-1995:2.

Medicaid Inpatient Hospital Expenditures

The overall effect of PCP enrollment on inpatient hospital expenditures is negative; the regression coefficient is nearly statistically significant. The eligibility group specific PCP effects model specification suggests that hospital inpatient expenses per recipient decreased for blind and title XIX recipients. The effect for blind recipients is unreasonably large and reflects an unstable estimate due to small group size.[4] Adjusting the effects to the PCP enrollment level prevailing in June 1995, inpatient hospital expenses for title XIX recipients decreased by 39.9 percent. The linear time trend coefficient also indicates that Arkansas Medicaid inpatient hospital expenses have decreased, in constant dollars, over the analysis period, but this decrease is unrelated to the PCP program implementation.

[4]The corresponding weighted regression estimate was not statistically significant.

Medicaid Outpatient Hospital Expenditures

The PCP enrollment effect for all eligibility groups combined also indicates a statistically significant negative effect on hospital outpatient expenses. Full enrollment in the PCP program could reduce outpatient hospital expenditures by 15.3 percent. Since enrollment was about 52 percent in June 1995, the reduction effect is estimated at 7.9 percent for the same month. The eligibility group-specific PCP coefficients suggest that much of the cost savings are due to title XIX recipients.

Medicaid Physician Expenditures

The overall PCP enrollment rate effect on physician expenditures is negative, but not statistically significant. The eligibility group specific PCP effects turn out to be statistically insignificant as well. The finding that physician expenditures did not increase is remarkable, because physician visits sub-

stantially increased with the implementation of the PCP program (see the section on Arkansas Medicaid Visits Analysis).

Medicaid Prescription Drug Expenditures

The overall PCP enrollment effect on prescription drug expenditures is not statistically significant, suggesting no related cost savings due to the PCP program. However, the eligibility group specific model specification indicates statistically significant cost reductions for AFDC adults and title XIX recipients. The regression coefficients indicate that full enrollment could save about 26 percent and 33 percent of prescription drug expenditures per recipient, respectively. The corresponding enrollment adjusted estimates are 15.1 percent and 24.1 percent for June 1995. The regression model further indicates that Medicaid prescription drug expenditures increased by 2.8 percent per quarter over the analysis period controlling for the number or recipients. The substantial increase in prescription drug outlays per user is a national trend unrelated to the Arkansas PCP program implementation (Health Care Financing Administration, 1995).

Medicaid Laboratory and X-Ray Expenditures

Overall, PCP enrollment appears to have significantly reduced Medicaid laboratory and X-ray expenditures per recipient. The weighted regression coefficient indicates that full enrollment could save 21.6 percent of those expenditures. The corresponding enrollment adjusted estimate is 11.2 percent as of June 1995. Moreover, the eligibility group specific model specification shows that cost savings are due to the disabled (-35 percent) and AFDC adults (-19.6 percent). As of June 1995, the enrollment adjusted estimates are -15.8 percent and -11.5 percent, respectively. The PCP-related regression coefficients also indicate that full enrollment of blind recipients could nearly double (92.8 percent) their laboratory and X-ray related expenses per recipient. Since PCP enrollment among the blind was only 36.6 percent in June 1995, the enrollment adjusted effect is only 35.5 percent. But, it must be cautioned that this effect is only marginally statistically significant in the OLS specification and not significant in the weighted least squares specification.

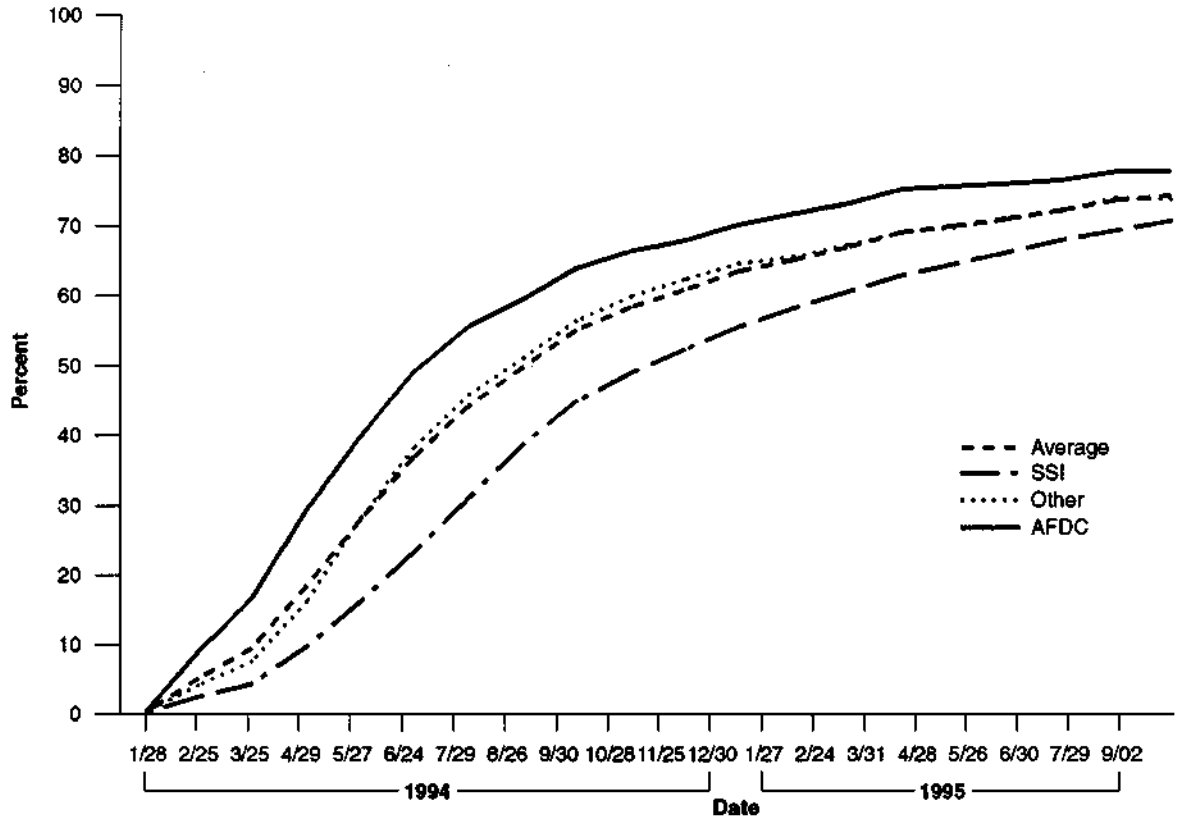
Estimated Cost Savings

According to the enrollment-adjusted regression estimate, the Arkansas PCP program is estimated to have reduced total vendor payments by 6.7 percent as of June 30, 1995. This figure will overestimate program cost savings, if applied to the entire PCP implementation period. Since Medicaid eligibles gradually enrolled during the implementation period (Figure 1), PCP-related cost savings should have increased correspondingly. A rough estimate can be derived by dividing the 6.7 percent estimate by 2 and multiplying this figure by the Arkansas vendor payments for the same time ($1.7 billion), resulting in estimated cost savings of approximately $57 million in the first 17 months of PCP program operation.

Figure 2 presents a more conservative estimate of PCP program cost savings and a detailed simulation for the two AFDC groups for whom statistically significant PCP effects were found. The figure is based on the regression results presented in Table 2 and quarterly enrollment data for the AFDC groups. The simulation indicates that vendor payments would have been about $5 million higher for AFDC adults and about $3.7 million higher for AFDC children without the PCP program during the second quarter of 1995. Figure 2 also provides an estimate of how much

Figure 1

Medicaid Eligibles' Enrollment in Arkansas PCP Program, by Broad Aid Group: January 1994-September 1995



NOTE: PCP is primary-care physician. AFDC is Aid to Families with Dependent Children. SSI is Supplemental Security Income.
SOURCE: Data provided by Electronic Data Systems.

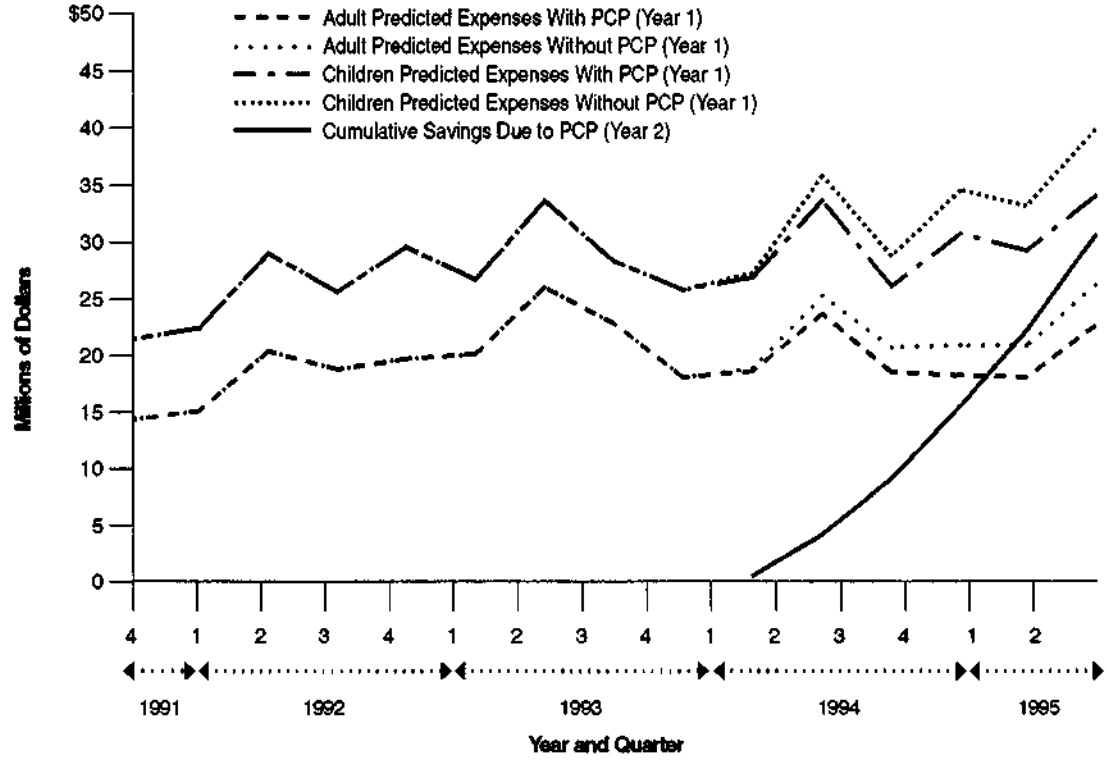
money the Arkansas PCP program saved since AFDC eligibles enrolled in it. The cumulative cost savings series, combining both AFDC categories, indicates that $30.7 million additional vendor payments would have been spent by the second quarter of 1995 if the program had not been in place. This estimate is more conservative than the prior estimate mainly because it ignores the potential cost savings contribution of other eligibility groups.

Arkansas Medicaid Visits Analysis

The Arkansas PCP program was designed to provide greater access to primary-care practitioners and, as a result, was expected to decrease Medicaid recipients' use of hospital outpatient services, particularly the emergency room. The HCFA-2082 quarterly data allow a partial examination of those expectations. Unfortunately, the HCFA-2082 does not report emergency room visits separately. A visit is defined as a billed unit of service indicated by the presence of a procedure code on the physician visit claim form (Arkansas Department of Human Services, 1995). During a physician visit, at least one service will be rendered. The following analysis estimates the effect of PCP enrollment on visit volume for hospi-

Figure 2

Estimated AFDC Expenses With and Without PCP Program, by Recipient Group: Arkansas, Fourth-Quarter 1991 to Second-Quarter 1995



NOTE: PCP is primary-care physician. AFDC is Aid to Families with Dependent Children.
SOURCE: (Baker et al., 1996).

tal outpatient, physician, and prescription drug visits. Since the visit trend of the aged comparison group was found to depart substantially from those of other eligibility groups, the regression models were corrected by adding a linear trend for the aged group in the outpatient hospital and physician visit model specifications. In other respects, the regression analyses correspond to those shown in Tables 2 and 3.

Medicaid Outpatient Hospital Visits

The weighted regression coefficient indicates that full enrollment could reduce hospital outpatient visits by about one-third. Adjusting for enrollment levels of June 1995, the effect is -16.9 percent. The reduction in hospital outpatient visits appears to be mainly due to sharp reductions in visit rates by AFDC and title XIX recipients. By June 1995, AFDC and title XIX recipients are estimated to have used between 29 percent and 38 percent fewer hospital outpatient visits per recipient than before PCP program implementation.

Medicaid Physician Visits

Table 4 indicates that full enrollment in the PCP program could increase physician visits by about one-half (47.5 percent). The enrollment level-adjusted estimate is 25 percent as of June 1995. In addition, the eligibility group-specific analysis indicates

Table 4

Regression Results for Arkansas Medicaid Visits, by Type and Prescription Drugs

Measure	Outpatient Hospital		Physicians		Prescription Drugs	
	b	t	b	t	b	t
PCP Enrollment Rate—All Groups[1]	**-0.326*	**-1.99*	**0.475*	**5.67*	*-0.028*	*-0.34*
PCP Enrollment Rate—Blind	0.547	0.92	*4.410	*5.92	0.092	0.31
PCP Enrollment Rate—Disabled	-0.402	-1.51	*1.220	*3.77	-0.091	-0.48
PCP Enrollment Rate—AFDC Children	*-0.462	*-2.60	0.283	1.43	0.018	0.20
PCP Enrollment Rate—AFDC Adult	*-0.495	*-2.64	*0.441	*2.05	*-0.140	*-1.92
PCP Enrollment Rate—title XIX	*-0.521	*-2.09	0.364	1.47	-0.153	-0.98
Number of Recipients	0.891	27.20	0.967	16.20	0.986	41.98
Percent Female	0.067	1.39	0.063	1.25	0.021	0.63
Percent White	0.003	0.22	-0.011	-0.99	0.008	1.48
Linear Trend	0.055	2.89	0.028	1.75	0.011	1.31
Linear Trend-Aged	0.188	11.62	-0.032	-2.48	—	—
FFY Quarter 1	0.949	14.09	0.557	6.91	0.730	17.38
FFY Quarter 2	0.380	6.01	0.296	5.08	0.461	11.35
FFY Quarter 3	0.284	4.36	0.150	2.36	0.262	6.97
Fiscal Adjusted FFY 1993: Quarter1	-0.117	-1.24	0.042	0.41	-0.022	-0.49
Degrees of Freedom	258	—	264	—	268	—
R^2 adjusted	.975	—	.979	—	.992	—
s.e.e.	.347	—	.350	—	.198	—
Durbin Watson	1.69	—	1.90	—	2.20	—
Mean	7.707	—	8.491	—	8.933	—

*PCP effects statistically significant at $t > |1.960|$; $p = .05$ (two-tailed test); $t > |1.645|$; $p = .10$ (two-tailed test).

[1]The italicized entries are based on weighted least squares regressions, deleting the PCP group-specific variables.

NOTE: Outliers and 21 multiple-regression coefficients for Federal eligibility groups are deleted. PCP is primary-care physician. AFDC is Aid to Families with Dependent Children. FFY is Federal fiscal year. s.e.e. is standard error of estimate.

SOURCE: Health Care Financing Administration, Medicaid Statistical Information System: HCFA-2082 Reports for Arkansas, 1991:4-1995:2.

particularly pronounced increases in physician visits for blind and disabled recipients. As of June 1995, blind and disabled recipients are estimated to have used 160 percent and 50 percent more physician visits, respectively, than they would have before the PCP program. The regression estimates for blind and disabled recipients remained statistically significant when estimated by weighted least squares. It should be noted that the data do not distinguish between primary care and specialist visits.

Medicaid Prescriptions

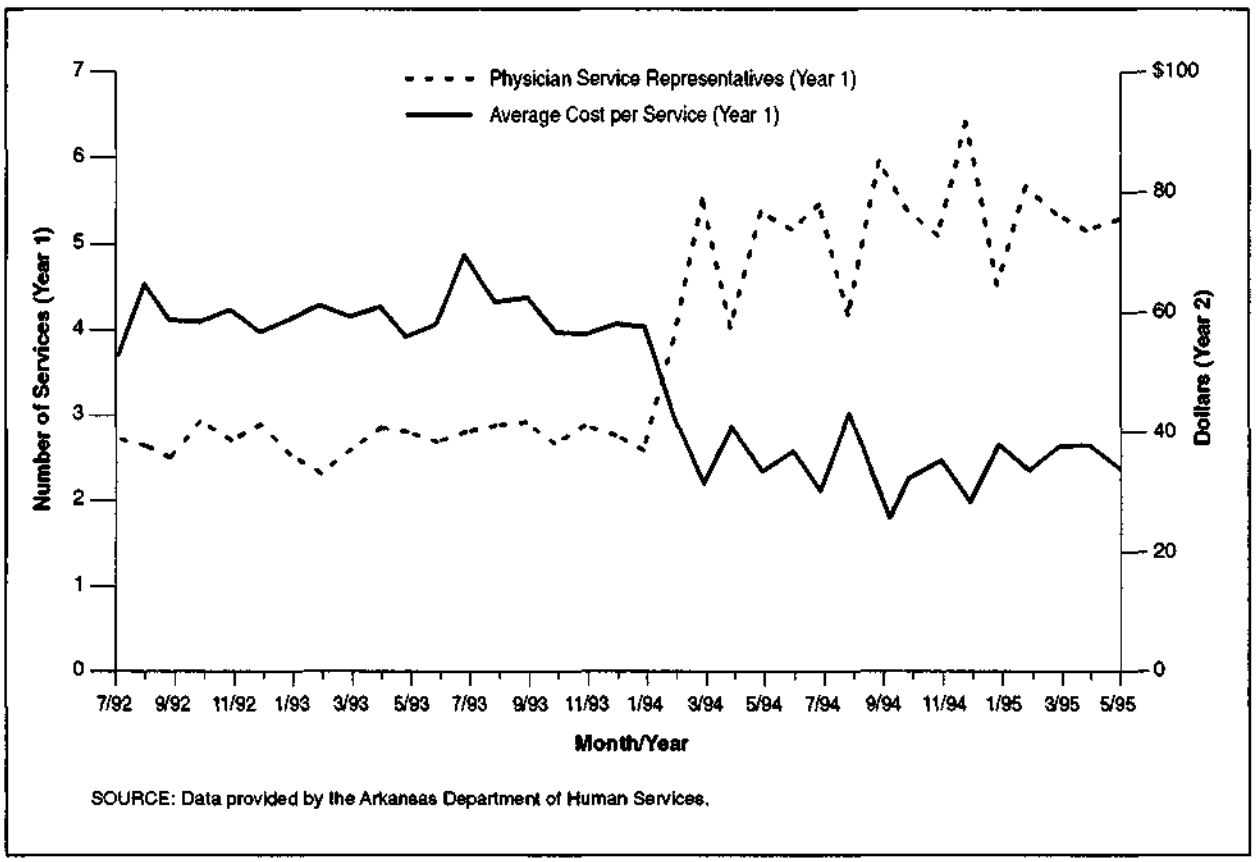
Table 4 also presents the results for PCP enrollment effects on the number of prescriptions per recipient. Overall, no statistically significant reduction in the number of prescriptions per recipient is observed. However, the regression coefficient for AFDC adults is marginally statistically significant suggesting that prescription drugs per recipient may have decreased for this group by 8 percent by June 1995.

DISCUSSION

The validity of the prior results is dependent upon several important assumptions; the specification of time trends is one of them. Since panel analysis regression results are quite sensitive in this regard, several tests were performed. The common linear trend for all eligibility subgroups was replaced by eligibility group specific linear trends and the total expenditure equation was reestimated. The variable trend specification left the overall weighted PCP effect nearly unaffected (-.127; t = -1.99) but reduced the adjusted R^2 value. In contrast, the outpatient hospital and physician visit analyses showed substantially different time trends for the aged subgroup. The PCP effects would have been overstated, if the rapid rise in outpatient hospital visits for the aged had not been included in the

Figure 3

Medicaid Physician Services per Recipient and Average Cost per Service: Arkansas, September 1992-May 1995



SOURCE: Data provided by the Arkansas Department of Human Services.

model. In most model specifications, however, the more parsimonious common trend specification was empirically supported. The regression results were also tested for a common non-linear time trend by replacing the linear time counter with a set of quarterly dummy variables. This less parsimonious model specification did not alter the regression results substantially.

The effect of changing the PCP impact measure was also examined. Instead of using the percent enrollment measure, the Medicaid expenditure analysis was repeated using dummy variables which are cruder measures of PCP program impact. The regression analyses produced consistent results with those presented before (not shown), although some PCP effects were no longer statistically significant.

The effect of different price deflators was tested since the Consumer Price Index for Medical Care for urban consumers may overstate the medical care price inflation for the State of Arkansas. The PCP effects were found to be unaffected in size and statistical significance, when the expenditure series were deflated by the weighted state implicit price deflator for local government purchases and compensation. Other price deflators will not change the estimated PCP effects either; they will merely change the regression coefficient for the linear time counter.

In any quasi-experimental study design, there is the possibility of misattribution of effects. That is, the observed PCP effects may measure not only program effects, but other simultaneously occurring events not

controlled in the study design. This threat to the external validity of the findings is unlikely to be significant, because enrollment in the PCP program was staggered by eligibility groups, occurred at different speeds, and some groups (aged) were excluded from program participation. Those conditions make time-related biases of the overall PCP effect improbable. Moreover, equation 1 controls for at least 29 effects which consistently account for a large amount of variation in the dependent variables reducing the chance of omitted variable bias.

Other studies of the Medicaid managed care case-management program found cost savings per beneficiary between 5-15 percent, a range consistent with the findings of this study (Hurley, Freund, and Paul, 1993). The cost savings estimates reported here are gross savings, since not all PCP program-related expenditures are considered. Additional PCP program-related costs due to administration, utilization review, marketing, policing of program abuses and changes in computer routines would need to be determined.[5] It should also be noted that the estimated cost savings figures do not need to be adjusted for the added expenses on PCP provider case-management fees, since they are already included in the vendor payments. According to a monthly report (HMGR621J) on expenditures and utilization, total payment of managed care fees amounted to $409,008 in June 1995. If the number of eligibles enrolled remains at levels reached during this month, Arkansas is expected to spend $4.9 million annually.

This study found increased physician utilization due to PCP implementation, which parallels the findings of prior fee for service gatekeeper program evaluations (Hurley, Freund, and Paul, 1993). Yet, more remarkable is the finding that the Arkansas PCP program appears to have increased physician visits per recipient without increasing the overall expenditure on physician services per recipient. This result suggests that less costly primary-care services have been substituting for more expensive specialist services. Such an interpretation is also supported by monthly time series of physician services per recipients and average cost per physician service shown in Figure 3. Both time series clearly show that, with the implementation of the PCP program in February 1994, physician service per recipients increased from 2.7 to about 5.2 services per recipient, while concurrently the average cost per service decreased from $59 to about $34. However, a comparison of visit trends by physician specialty before and after program implementation would provide more conclusive evidence. Hurley, Freund, and Gage (1991), analyzing individual beneficiary records, found persuasive evidence supporting substitution effects in a FFS primary-care case-management program.

A 5-year interrupted time series evaluation of the KenPAC program (Miller and Gengler, 1993), which is most similar to the one in Arkansas, also found increased use of physician services per enrollee during the initial 18-month enrollment period, but decreasing physician service use thereafter. This finding alerts to the possibility that program effect may change over time as utilization review and other PCP program management activities mature. Consistent with this study, Miller and Gengler's evaluation found substantial reduction in outpatient hospital use and laboratory services use and no significant effect on prescription drug use. Unfortunately, the study did not directly assess KenPAC's effect on Medicaid

[5]According to some preliminary cost figures provided by staff of the Arkansas Department of Human Services, program expenditures should not have exceeded $1.5 million for the implementation period.

Table 5

Comparison of Arkansas Medicaid PCP Program With Prior System of Care, PCP Eligible Respondents: September 1995

Item	Percent Much Better or Better	Percent Worse or Much Worse	Ratio Better/Worse
	Percent		
Quality of Care	40.7	3.4	12.0
Your Family's Medical Care	36.6	4.2	8.7
Access to Primary-Care Physician	38.3	4.6	8.3
Access to Emergency Care	41.3	7.5	5.5
Distance You Have to Travel to See Doctor	25.4	6.8	3.7
Choice of Physician	39.0	11.2	3.5
Time You Have to Wait Before Appointment	31.9	9.1	3.5
Time You Have to Wait in the Waiting Room	28.3	11.7	2.4

NOTE: Data are based on a random sample of 642 respondents; "unchanged" responses are deleted.

SOURCE: (Baker et al., 1996).

expenditures. The time series analysis of physician visits reported in this study also suggests that access to medical services improved for Arkansas Medicaid recipients. As part of the broader evaluation (Baker et al., 1996), survey data were collected to assess this managed care objective. A random sample of PCP-enrolled Medicaid eligibles was asked to compare their current experience with that before the PCP program was implemented. The results, presented in Table 5, clearly show that the 642 respondents perceived improvements in quality of care and access to primary care.

The time series analysis produced less clear findings relating to blind recipients. PCP enrollment of blind recipients appears to have substantially increased physician visits and may have also increased lab and X-ray expenditures per recipient. The exceptional increase in physician visits per blind recipient may indicate much improved access to physician services or some duplication of medical services as a result of PCP enrollment. It seems reasonable that primary-care providers cannot readily substitute for ophthalmologists' specialized services. It is also possible that the effect reflects a temporary surge in services that will disappear when new patient-provider relationships have become established. The PCP effect on blind recipients will need to be further investigated, preferably with less aggregated data.

In conclusion, the results of this study indicate that the Arkansas PCP program appears to have reduced the rate of growth in Medicaid vendor payments and also seems to have improved access to primary medical services in the first 17 months of operation.

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