Medicaid Managed Care: Are Academic Medical Centers Penalized by Attracting Patients With High-Cost Conditions?

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Objective: To determine whether case-mix and health utilization disparities exist between Medicaid enrollees within a Michigan managed care organization (MCO) who selected primary care providers (PCPs) affiliated with a major academic medical center (AMC) and enrollees who selected community providers.

Study Design: A retrospective cohort study using cost estimates obtained from claims data and based on a standardized Medicaid fee schedule.

Methods: We established the prevalence of 25 high-cost chronic medical conditions from the claims data for capitated Medicaid enrollees from January 1, 1997, through October 31, 1999. We assessed differences in healthcare cost estimates per member for Medicaid enrollees at AMC primary care sites versus other community sites using *t* tests and linear regressions, including analyses stratified for Temporary Assistance for Needy Families (TANF) and Aid to Blind and Disabled (ABAD) programs.

Results: Enrollees with AMC providers had a much higher cumulative prevalence of the 25 high-cost chronic medical conditions (95.6 per 1000 enrollees versus 65.6 per 1000; *P* < .001), and virtually all of this difference was confined to ABAD enrollees. Estimated total costs were also higher for ABAD Medicaid enrollees at the AMC sites than for those at community sites. The average total services and pharmacy cost estimates per ABAD member were $1219 higher per member per year at the AMC sites (*P* < .001), primarily from costs of inpatient hospitalizations. Regression analyses demonstrated that differences in the prevalence of the 25 high-cost chronic medical conditions accounted for about 50% of the cost differences observed between sites. These analyses suggest that at least half of the observed cost disparity was due to adverse selection.

Conclusions: This study found both significant case-mix and cost disparities for ABAD patients, suggesting that AMC primary care sites experienced substantial adverse selection. Unless approaches to account for adverse selection are put in place, this phenomenon could jeopardize ABAD Medicaid recipients' ongoing access to needed medical care.

(Am J Manag Care 2003;9:19-29)

Perhaps the most significant innovation in Medicaid since the early 1980s has been the conversion of state Medicaid programs from fee for service to managed care. All states except Alaska now have part or all of their Medicaid populations enrolled in some form of managed care program. Nationwide, the percentage of Medicaid beneficiaries enrolled in managed care plans increased from 9.5% (2.7 million people) in 1991 to 56% (18 million) as of mid-1999.[1] The passage of the Balanced Budget Act of 1997, which allows states to implement mandatory Medicaid managed care (MMC) programs without a federal waiver, significantly contributed to this growth.[2] By 1999, a total of 25 states had enrolled at least half of their Medicaid population, and 10 states had enrolled more than 80% of their beneficiaries in MMC.[1]

Proponents argue Medicaid managed care programs will reduce costs, improve the quality of care recipients receive, and enhance access to care.[3] It is hoped that providing Medicaid enrollees with better continuity of care in commercial or Medicaid health maintenance organizations (HMOs) will also result

in greater accountability to contractual standards for access and quality, while containing costs by transferring financial risk.[4] States have chosen to use several different forms of managed care.[5] In many states, such as Michigan, beneficiaries must choose (or be assigned if they fail to choose) an HMO. These HMOs assume the full financial risk of providing a comprehensive package of services. In some states Medicaid managed care has been extended only to nondisabled women and children who qualify for Aid to Families with Dependent Children (now called Temporary Assistance to Needy Families [TANF]) and the growing numbers within that group now ineligible for cash assistance but still entitled to Medicaid.[6] Other states, again including Michigan, have also extended MMC to include most of the disabled populations in the Assistance to the Blind and Disabled program (ABAD). Enrollees in ABAD comprise about 15% of all Medicaid recipients nationwide but account for almost 50% of program costs.[1]

Despite the growth of MMC, little research has been done on how this shift into managed care has affected access to and quality of healthcare for Medicaid enrollees. Preliminary research suggests that the shift from fee for service to managed care may improve Medicaid enrollees' access to care and satisfaction,[3] or at least not decrease access or quality of care.[4]

The change to MMC may generate problems, however, if associated with poorly designed and ill-financed systems in which the incentives of capitation undermine quality of care.[7] Moreover, as enrollees usually are able to choose among different HMOs and provider groups within HMOs, it is crucial to understand whether selection biases have occurred such that those Medicaid enrollees with high-cost conditions and/or greater burden of illness are systematically enrolling in certain plans or practices more than others. Such biases, also known as "adverse selection," can place health plans and providers at significant financial risk if premium payments for healthcare fail to adjust for differences in health status and fall short of actual costs.[8,9] Until recently, most states have had no mechanisms to provide risk-adjusted capitation rates for vulnerable enrollees or to reduce the possibility of adverse or favorable selection biases in other ways. Thus, if adverse selection were to occur, affected plans would bear a disproportionate cost, and inadequate compensation could potentially lead health plans to stint on care, restrict coverage, or leave the market altogether.[10] This may already be occurring: By 1998, in one third of states with MMC, health plans had withdrawn from the program, citing insufficient compensation.[11]

The question of possible adverse selection is especially crucial for academic medical centers (AMCs) participating in Medicaid managed care programs. Historically, these centers have developed particular expertise in managing complex medical illnesses[12-14] and have also provided a disproportionate amount of care to Medicaid and uninsured populations.[12] These 2 roles have often been viewed as fundamental to the clinical, teaching, and research missions of AMCs as well as to their broader social mission.[13] These roles, however, may also place AMCs at increased risk for adverse selection by MMC enrollees with high-cost chronic illnesses. At a time when AMCs are experiencing a number of threats to their financial solvency,[14] adverse selection under MMC could pose unsustainable financial risks and threaten their patient care, teaching, and research missions.[15] Concern about possible adverse selection has stimulated efforts to adjust payments for patient illness severity. For example, the state of Michigan is now considering using the Chronic Illness and Disability Payment System (CDPS) to introduce case-mix adjustment to its payments for ABAD enrollees.[16] Is the expense and complexity of risk-adjusting capitation payments truly necessary? Are AMCs systematically experiencing adverse selection vis-à-vis other nonacademic providers? If so, will current plans to risk-adjust payments be adequate? In spite of the importance of these questions, our review of the literature found only one study specifically examining the question of adverse selection for AMCs under a mandatory statewide Medicaid managed care program. In 1999, Bailey et al found that patients with high-cost chronic conditions in Tennessee disproportionately selected academic managed care organizations over other nonacademic managed care organizations.[17] However, because the authors were unable to examine actual utilization or produce cost estimates of medical care, they could not estimate the financial impact of the apparent adverse selection on the AMCs. Therefore, we sought to study one managed care organization in southeast Michigan, to examine both case-mix and cost disparities between Medicaid enrollees who chose primary care providers (PCPs) affiliated with an AMC and enrollees who chose PCPs affiliated with other nonacademic community hospitals.

METHODS

Setting and Study Population

Michigan's Medicaid program initially started contracting with HMOs in 1973 and in an effort to con-

trol costs developed a Primary Care Case Management program in 1981. Medicaid costs, however, continued to increase, reaching more than 20% of the state budget by the early 1990s.[18] To address this rise in costs, Michigan Medicaid administrators decided to restructure the program in an effort to increase efficiency without cutting eligibility or benefits. In July 1997 Medicaid mandated full-risk enrollment in HMOs for all TANF as well as other eligibility categories and most ABAD Medicaid enrollees in southeast Michigan, expanding the following year to the rest of the state. In 1997 in a competitive bidding process, 15 commercial and 10 Medicaid-only HMOs in southeast Michigan were awarded contracts to enroll Medicaid beneficiaries. Although research has shown risk adjustment by age and sex accounts for at most 5% of the variability in annual costs among HMO enrollees,[19] Michigan Medicaid capitation payments were adjusted by age, sex, Medicaid program, and county, without risk adjustments based on health status or diagnosis codes. Medicaid beneficiaries were given 30 days to choose an HMO. Every year approximately 30% of all enrollees do not select an HMO and are auto-assigned to an HMO according to a set formula based on health plan quality indicators and price bid.

The managed care organization under study was awarded one of those contracts. This organization includes both a large AMC and 6 nonacademic community hospitals in southeast Michigan. The AMC consists of a 700- to 800- bed tertiary care facility offering services for children and adults and a full range of medical and surgical specialties and a group practice consisting of approximately 1000 full-time faculty physicians, of whom about 150 are primary care physicians practicing at 30 sites, most within 20 miles of the academic center. AMC-affiliated physicians admit exclusively to the AMC hospital and refer to AMC specialists. Practicing in the same geographic area as the AMC is a 90-member primary care group practice. The other health systems are outside the home county of the AMC and constitute the remainder of the providers in the plan. Throughout the study period, the HMO paid the AMC a fixed capitation amount for all health services, including services received outside the AMC system, for the Medicaid enrollees with AMC-affiliated PCPs. This capitation amount was based on the state's set capitation rates for the health plan. Financial risk for these enrolled Medicaid members was borne by the AMC, including the faculty group practice and teaching hospital. Moreover, Medicaid enrollees within the study HMO were able to choose

freely between AMC primary care providers (PCPs) and those affiliated with the other nonacademic community hospitals. Those Medicaid enrollees who did not select a PCP (less than 10% of all enrollees) were assigned to AMC providers according to the zip code of the enrollee's residence. We can therefore examine whether adverse selection occurred within the HMO during the period under analysis.

Data Collection and Sources

All analyses were run using complete HMO claims data for Medicaid enrollees, stripped of identifiable enrollee numbers or codes, from January 1, 1997, through October 31, 1999. This data set provided comprehensive data on all healthcare services Medicaid enrollees received, except for outpatient pharmacy costs, and included information on enrollees' date of birth, sex, Medicaid program (TANF, ABAD, or other), diagnoses, and affiliation of their PCPs (AMC versus non-AMC). Analyses of outpatient pharmacy costs utilized a separate data set with all pharmacy claims during the same period that used different coded enrollee identifiers and thus were not linkable to the total services claims data set. We used the reported "fee-for-service equivalents" based on the Medicaid fee schedule as a conservative estimate of costs (many analysts have argued that the Medicaid fee schedule may underestimate true costs).[2] Although most costs in the Medicaid fee schedule are standard across sites, some payments (especially hospital payments) vary between sites in order to adjust for factors such as differences in local area wage rates, disproportionate share of care for the uninsured, and medical education programs. An argument could be made that these differential payments (which favored the AMC in this study) account for true operational cost differences and should therefore be included in our analyses. However, because these cost differentials represent differences in operating costs, they are less relevant when evaluating the impact of adverse selection. Therefore, we opted to standardize our cost estimates across all sites, thus eliminating any systematic differences among sites in the Medicaid fee schedule and producing a conservative estimate of the impact of adverse selection on the AMC sites (by not considering factors that may increase the AMC's operating costs). Moreover, because we utilized claims data, our analyses included only Medicaid enrollees for whom at least one claim had been submitted. Each year during the study period, AMC sites had higher percentages of users of

healthcare services in both the ABAD and TANF programs than did non-AMC sites.

To avoid overstating the case for adverse selection, we chose to standardize costs in a way that would err on the side of the null hypothesis (that is, not finding any adverse selection of the AMC). Accordingly, inpatient costs were standardized by replacing the reported diagnosis-related group (DRG) costs with the mean cost of each DRG across all admissions for that DRG. For outpatient claims the process was similar but utilized outpatient and procedure codes instead of DRGs. All services and outpatient medications in the data sets we analyzed were covered under capitation. Because these capitation payments were directed to a provider group based on the beneficiary's chosen PCP, we divided Medicaid enrollees on the basis of their PCP's affiliation with either the AMC or the other community providers (ie, non-AMC sites). Those enrollees who had PCPs at both AMC and non-AMC sites within a given year (3% of all enrollees) were excluded from the analyses. To allow the data to be compared across years, the 1999 cost data, which included 10 months of the year, were annualized by multiplying by 1.2.

To examine the question of adverse selection, we first selected a priori 23 high-cost conditions, using well-validated, diagnosis-based criteria proposed by Kronick et al,[20] and also included 2 additional high-cost categories, pregnancy and premature births, as per Bailey et al.[17] Bone marrow, heart, kidney, and liver transplants were grouped together into one category. We then calculated the prevalence of each of these 25 conditions, on the basis of *International Classification of Diseases, Ninth Revision, Clinical Modification* (ICD-9-CM) codes. Total prevalence of all 25 conditions was calculated, and we conducted chi-squared analyses to compare the average prevalences for enrollees with AMC PCPs versus non-AMC PCPs. The encounter data we used included fields for both a primary and secondary diagnosis. In the primary analyses, if a diagnosis occurred in either field, the patient was classified as having the condition. To check for a systematic bias related to some providers being more or less likely to report a secondary diagnosis, we conducted an alternative analysis tabulating only primary diagnoses. This had no substantial impact on the findings.

Data Analyses

For the cost analyses, we performed *t* tests to assess differences in total healthcare costs per member for Medicaid enrollees of AMC-affiliated PCPs compared with enrollees with other community PCPs for the total study period and for each year of that period. Two-sample *t* tests were run for unequal variances using Satterthwaite's approximation formula, as cost variances were unequal across years.[21] As the cost data were skewed, we performed a logit transformation of the costs for all bivariate and multivariate analyses.[22]

For linear regression analyses, the dependent variable was the log transformed cost estimates of each enrollee per year. Because the pharmacy cost data set could not be linked to the data set for all other costs, bivariate and multivariate analyses were run separately for the pharmacy data set. The primary explanatory variable was AMC or non-AMC affiliation of enrollees' PCP. In the linear regression analyses, we controlled for age, gender, and specific program within Medicaid (TANF versus other). We then conducted separate analyses including the prevalence of the 25 chronic conditions as an independent variable to examine the proportion of variance of total cost estimates explained by the prevalence of these conditions. To further assess the extent to which the risk-adjustment methods proposed for the Michigan Medicaid program would reduce the cost differences between AMC and non-AMC sites, we repeated these analyses using the weights of the Chronic Illness and Disability Payment System (CDPS) that are associated with the ICD-9 codes in our data set.[23]

We also ran alternative and separate regression analyses stratified for members of the TANF program versus members of the ABAD program. To examine specific cost components, subanalyses were run on total costs of hospitalizations for Medicaid enrollees, employing robust variance estimates to adjust standard errors for the clustering of hospitalizations by enrollee.[24] Separate regression analyses were also run on total costs of emergency room visits, primary care visits, and outpatient procedures. Finally, bivariate and multivariate analyses were run using the pharmacy data set. As an alternative approach, we repeated the above analyses using "seemingly unrelated regression model" techniques that account for the correlation of the error terms in each equation over time, thus providing more efficient linear-regression estimation and hypothesis testing.[25] Residual testing showed the assumptions of regression were met and residuals were well-calibrated.[26] First-degree interaction terms were evaluated, but none contributed significantly to the model's fit. We did analyses of outliers using scatter plots and Cook's statistics. Two influ-

ential outliers were identified (one at the AMC site and one at a non-AMC site) and were excluded from further analyses. All statistical analyses were performed using Stata 7.0 (College Station, Texas).

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RESULTS

Table 1 shows the demographic characteristics of the HMO's Medicaid enrollees who utilized any health services during each of the 3 years of the study period. Each year more Medicaid enrollees chose non-AMC PCPs than AMC PCPs—almost twice as many in 1997 and 1998. Overall, the age, sex, and Medicaid program distributions were similar between the AMC-affiliated and non-AMC-affiliated enrollees, although there was a slightly higher percentage of children and TANF enrollees at the non-AMC sites.

In the analyses of relative prevalences of 25 high-cost chronic conditions, we found Medicaid enrollees with AMC PCPs generally had a higher prevalence of high-cost conditions than did enrollees with non-AMC PCPs. As **Table 2** shows, enrollees with AMC providers were significantly more likely to have AIDS, chronic liver disease, schizophrenia, chronic renal failure, and pregnancy ($P < .05$).

Enrollees with AMC PCPs also tended to have a higher prevalence of 3 additional conditions ($P < .10$). Overall, 95.6 per 1000 enrollees with AMC providers had high-cost chronic conditions compared to 65.6 per 1000 enrollees at non-AMC sites ($P < .001$). The difference between the total prevalence of chronic conditions among AMC Medicaid enrollees and non-AMC enrollees remained highly statistically significant ($P < .001$) when pregnancy was removed from the analyses. Stratified analyses shown in Table 2 demonstrated that virtually all of this difference occurred among ABAD enrollees, and that, when pregnancy was excluded from the analyses, the number of chronic conditions was not significantly different between sites for TANF enrollees. It is worth noting, however, that these 25 conditions included for adjustment, with the exception of pregnancy and prematurity, are most relevant for the ABAD population.

Overall healthcare cost estimates (excluding pharmacy costs) were significantly higher for Medicaid enrollees with AMC PCPs than for those with non-AMC PCPs in each year of the study period in analyses with both the reported and standardized cost estimates. As **Table 3** shows for the analyses of cost estimates using the standardized Medicaid fee schedule, average annual cost esti-

Table 1. Characteristics of Medicaid HMO Enrollees by Primary Care Provider Site, 1997 to October 31, 1999*

	1997 AMC No. (%) (n = 2883)	Non-AMC No. (%) (n = 5302)	1998 AMC No. (%) (n = 4489)	Non-AMC No. (%) (n = 8075)	1999 AMC No. (%) (n = 4565)	(until 10/31/99) Non-AMC No. (%) (n = 5834)
Female	1783 (62)	3239 (61)	2773 (62)	4829 (60)[†]	2771 (61)	3440 (59)
Age						
≤18 y	1695 (59)	3326 (63)[†]	2657 (59)	5251 (65)[†]	2768 (60.5)	3933 (67.5)[†]
19 – 35 y	741 (26)	1241 (23)[†]	1075 (24)	1569 (19.5)[†]	982 (22)	972 (16.5)[†]
36 – 65 y	407 (14)	674 (13)	689 (15.5)	1146 (14)	742 (16)	850 (14.5)[†]
≥ 66 y	40 (1)	61 (1)	68 (1.5)	109 (1.5)	73 (1.5)	79 (1.5)
Medicaid Program						
ABAD	533 (19)	903 (17)	863 (19)	1449 (18)	952 (21)	1154 (20)
TANF	2311 (80)	4347 (82)[†]	3555 (79)	6529 (81)[†]	3543 (78)	4613 (79)
Other	39 (1)	52 (1)	71 (2)	97 (1)	70 (1)	67 (1)

*AMC indicates academic medical center; ABAD, Assistance to Blind and Disabled; TANF, Temporary Assistance to Needy Families.
[†]$P < .05$ using chi-squared testing to test for differences.

Table 2. Average Prevalence per 1000 Enrollees of High-Cost Chronic Conditions (1997 to October 31, 1999)*

Condition	Overall Medicaid			ABAD			TANF		
	AMC	Non-AMC	P	AMC	Non-AMC	P	AMC	Non-AMC	P
AIDS	2.7	1.1	.02	12.6	2.9	< .001	0.7	0.7	> .2
Cardiovascular									
Polyarteritis nodosa	0.1	0.2	> .2	0.0	1.0	> .2	0.2	0.1	> .2
Vena cava thrombosis	0.0	0.2	.2	0.0	1.0	> .2	0.0	0.1	> .2
Gastrointestinal									
Chronic liver disease	5.7	3.4	.005	23.7	15.6	.09	1.3	0.8	> .2
Hematology/Cancer									
Cancer of the nervous system	0.3	0.1	> .2	1.5	0.0	.08	0.0	0.1	> .2
Coagulation defects	2.9	2.8	> .2	8.9	10.3	> .2	1.5	1.1	> .2
Leukemia	0.4	0.2	> .2	0.7	0.5	> .2	0.2	0.1	> .2
Sickle cell disease with crisis	1.9	1.8	> .2	7.3	2.9	.07	1.0	1.4	> .2
Metabolic									
Type 1 diabetes	1.5	2.8	.07	5.2	12.2	.04	0.8	1.0	> .2
Type 2 diabetes	1.8	3.7	.02	9.6	16.1	.1	0.3	0.8	> .2
Obstetrics									
Pregnancy	43.2	24.7	< .001	13.2	9.8	> .2	47.3	27.3	< .001
Prematurity	3.8	3.8	> .2	0.7	2.4	> .2	4.8	4.0	> .2
Psychiatric									
Drug dependence or abuse	1.5	1.4	> .2	4.4	3.9	> .2	0.8	0.7	> .2
Profound mental retardation	3.0	3.4	> .2	15.6	12.2	> .2	0.2	0.7	.1
Schizophrenia	12.3	9.0	.01	64.7	50.9	.09	0.5	0.3	> .2
Pulmonary									
Cystic fibrosis	0.4	0.2	> .2	0.7	0.0	> .2	0.3	0.2	> .2
Tracheostomy status & attention	0.1	0.1	> .2	0.7	0.5	> .2	0.0	0.0	
Renal									
Chronic renal failure	2.7	1.1	.006	14.0	5.9	.01	0.2	0.1	> .2
Hypertensive renal disease	0.8	0.3	.1	2.9	0.5	.07	0.2	0.3	> .2
Skin/Musculoskeletal									
Decubitus ulcers	2.2	1.0	.07	8.8	3.9	.07	0.3	0.2	> .2
Juvenile arthritis	0.8	0.2	.1	0.7	0.5	> .2	0.7	0.1	.05
Osteomyelitis	2.7	1.8	.1	11.0	6.9	.2	0.7	0.7	> .2
Quadriplegia	1.4	0.6	.06	7.4	2.9	.06	0.0	0.2	> .2
Transplants	2.0	1.1	.07	10.3	5.4	.1	0.5	0.7	> .2
Transplant-related complications	1.0	0.8	> .2	6.6	3.4	.2	0.0	0.3	.2
Total prevalence of chronic conditions	95.6	65.6	< .001[†]	224.7	170.6	< .001[†]	62.4	44.0	< .001[‡]

*AMC indicates academic medical center; ABAD, Assistance to Blind and Disabled; TANF, Temporary Assistance to Needy Families.
[†]For overall Medicaid and ABAD the difference in total prevalence of chronic conditions remains statistically significant when pregnancy is removed from the analyses (P < .001).
[‡]For TANF the difference in total prevalence of high-cost conditions is no longer statistically significant when pregnancy is removed (P = .978).

mates for the ABAD program per member per year at AMC PCP sites were $776 higher than for those at the other sites ($2846 versus $2070). After controlling for age and gender, using linear regression, the cost estimate differences between sites were still statistically significant (P = .02). In the TANF program, the difference in average costs was only $53 per member per year, a difference that was not statistically significant in the regression analyses controlling for age and gender (P = .11).

Regression analyses suggest approximately 50% of the higher costs at the AMC sites results from the

higher prevalence of the 25 chronic conditions. As **Table 4** shows, adding the 25 chronic health conditions to the linear regression model of cost differences for ABAD members resulted in the beta coefficient of the independent variable for the PCP's site ("AMC site") of ABAD enrollees decreasing by almost 50% (from .130 to .075). Moreover, the variable for "PCP site" lost statistical significance once the 25 chronic conditions were added to the model. Of note, the beta coefficient for the PCP site was not statistically associated with total cost estimates for TANF enrollees either before or after adding the 25 chronic conditions to the model. The analyses using the 56 CDPS categories, a risk-adjustment method proposed for the Michigan Medicaid program, produced similar results, explaining about 50% of the higher costs at the AMC sites.

Inpatient hospitalizations accounted for 55% of the difference in overall cost estimates between ABAD enrollees with AMC and non-AMC providers (see **Table 5**). Among Medicaid enrollees in the ABAD program, the standardized cost difference per year between AMC and non-AMC enrollees was $425 ($P <$ .001). This cost difference declined to only $24 per year for TANF enrollees (P = .02).

The cost estimates reported above do not include outpatient pharmacy costs. As noted earlier, analyses of pharmacy costs used a separate claims data set that provided information on all outpatient pharmacy claims, as well as information on Medicaid program and PCP site but with different enrollee identifiers. As shown in Table 5, reported outpatient pharmacy costs were also higher for ABAD enrollees with AMC PCPs than those with non-AMC PCPs ($P < $ .001), but were not significantly higher for TANF enrollees.

Overall, then, average total standardized services cost estimates (including pharmacy, inpatient, and outpatient costs) were $4299 a year for ABAD members with AMC providers over the study period compared with $3080 for ABAD members with non-AMC providers. (See Tables 3 and 5.) Thus, these total services cost estimates were $1219 higher among ABAD members with AMC providers than members with non-AMC providers ($P < $ .001).

Table 3. Average Annual Non-pharmacy Services Cost Estimates by Primary Care Site and Medicaid Program, 1997 to October 31, 1999*[†]

	AMC[‡]	Non-AMC[‡]	Difference	P[§]
ABAD members	$2846	$2070	$776	.02
TANF members	$690	$637	$53	.11

*AMC indicates academic medical center; ABAD, Assistance to Blind and Disabled; TANF, Temporary Assistance to Needy Families.
[†]Estimates for costs (per member per year) based on a standardized Medicaid fee schedule.
[‡]Actual cost estimates unadjusted for age and sex.
[§]Shows the statistical significance of Primary Care Provider's site in linear regression models also controlling for age and sex with log transformed costs as the dependent variable.

Table 4. Amount of Higher Costs at Academic Medical Center Sites Attributable to Greater Prevalence of 25 High-Cost Chronic Conditions*

Medicaid Program	Adjusting For:	"AMC Site"[†] β Coefficient	P of "AMC Site" β Coefficient	Model R^2
ABAD enrollees	Age and gender	.130	.017	0.060
	Age, gender, and 25 chronic conditions	.075	.092	0.147[‡]
TANF enrollees	Age and gender	.031	.111	0.077
	Age, gender, and 25 chronic conditions	.016	.362	0.115[‡]

*AMC indicates academic medical center; ABAD, Assistance to Blind and Disabled; TANF, Temporary Assistance to Needy Families.
[†]AMC site variable was coded so that a positive β indicates higher costs at the AMC sites. The loss of statistical significance of "AMC site" with the addition of the 25 high-cost conditions to the models suggests the disproportionately higher prevalence of these high-cost medical conditions at AMC sites is the dominant factor in explaining the higher observed total costs at the AMC sites.
[‡]Wald test indicated the addition of the high-cost conditions significantly improves the model's predictive value ($P < $ .001).

Table 5. Total Annual Hospital and Average Annual Pharmacy Costs, 1997 to October 31, 1999*[†]

	AMC[‡]	Non-AMC[‡]	Difference	Regression P[§]
Total hospital costs				
ABAD members	$1490	$1065	$425	< .001
TANF members	$276	$252	$24	< .02
Average annual pharmacy costs				
ABAD members	$1453	$1010	$443	< .001
TANF members	$180	$165	$15	< .06

*AMC indicates academic medical center; ABAD, Assistance to Blind and Disabled; TANF, Temporary Assistance to Needy Families.

[†]Estimates for costs (per member per year) based on a standardized Medicaid fee schedule.

[‡]Actual cost estimates unadjusted for age and sex.

[§]Shows the statistical significance of Primary Care Provider's site in linear regression models also controlling for age and sex with log transformed costs as the dependent variable.

DISCUSSION

Whether and how best to risk-adjust capitated payments is currently the focus of much health policy debate. The results of our analyses suggest that initiatives to risk-adjust payments being undertaken or considered by many Medicaid managed care programs, including that in Michigan, may be extremely important. During the years under study, the prevalence of high-cost chronic conditions was significantly higher among enrollees with AMC PCPs than among enrollees with PCPs at community sites. Moreover, Medicaid enrollees with AMC PCPs had disproportionately higher total costs than those at community sites, mainly because of higher hospital and outpatient pharmacy costs, and these higher costs were strongly associated with this adverse selection within the ABAD program. Although the AMC sites experienced higher and statistically significant overall Medicaid costs, we found only very small differences between sites for TANF patients.

Caution, however, should be used in interpreting these results. First, this study does not provide any information about whether the HMO itself was favorably or adversely selected compared to other HMOs competing for Medicaid contracts in southeast Michigan. To address that question would require access to a state-level database. If the HMO did not experience overall adverse selection, then these findings have greater implications for internal capitation arrangements between the HMO and the provider and hospital groups than it does for state policy. In fact, since 1999 the HMO has adopted a number of measures to try to address the consequences of possible adverse selection. However, based on our cost estimates and the actual reimbursement levels, it appears the non-AMC sites were breaking even at best over the study period, suggesting the redistribution of funds within the HMO may mitigate but not eliminate the problem. Second, this study relied exclusively on administrative data. Systematic differences may exist in physician reporting or errors in the service utilization and diagnosis data entry, and conceivably coding differences or errors could have led to either underestimating or overestimating the differences in case-mix between sites. A recent study found that, after controlling for differences in patient case-mix and other characteristics, the service intensity of hospital outpatient department visits was higher than those made to physicians' offices. Possibly AMCs also have a tendency toward providing more intensive services for the same conditions than do community hospitals.[27] Third, we adopted a conservative approach in our methods to err toward not finding any adverse selection, by excluding AMC cost differentials possibly related to higher operating costs and not considering "within DRG" variations in our cost estimates and case-mix measures. Finally, this study focused on the experience of just one AMC. Results from this study may not be generalizable to other AMCs.

The study results suggest that the AMC studied experienced substantial adverse selection, yet determining the precise costs of adverse selection will remain difficult and controversial. Moreover, this is only circumstantial evidence and cannot prove how much of the difference in estimated costs is due to the adverse selection versus other differences, such as varying practice styles between sites. However, our analyses found no statistically significant differences in total standardized cost estimates for TANF patients, suggesting that if the variation were the

result of differences in practice styles between AMC and non-AMC sites, such differences only occurred for ABAD enrollees.

Our analyses indicate *at least* half of the cost differences between the AMC and non-AMC sites results from adverse selection, even when case-mix measures are used that rely exclusively on administrative claims data, do not adjust for greater severity of illness within diagnostic categories, and do not consider possible adverse selection by persons with multiple low-cost conditions.[16,17] Although we used case-mix measures that are among the most heavily validated and commonly used, in order to determine whether adverse selection accounts for 50%, 75%, or almost all of the higher AMC costs, we would need to apply more detailed severity and comorbidity measures, probably using chart review or patient survey.[28] Indeed, much evidence suggests that even state-of-the-art case-mix measures are inadequate to explain all of the effects of adverse selection, especially for programs targeting patients with costly or chronic illnesses.[8,29] However, the residual higher costs at the AMC sites may also be the result, in part or predominantly, of more resource-intensive practice patterns, because of overuse, higher quality, or less efficient use of resources by trainees at the AMC. These possibilities merit further evaluation.

Perhaps most importantly, our results demonstrate how difficult it is for a facility or group practice to determine whether adverse selection is causing financial losses. Part of the difficulty arises from the large variation in medical costs in which a small number of patients can account for very high costs. Therefore, systematically attracting a few more patients with very costly conditions can have devastating financial consequences, but the high variance makes it statistically difficult to determine whether such cost differences result from stochastic variation, systematic adverse selection, or practice variation. In this study a million-dollar systematic cost disparity in 1998 was not statistically significant; we needed a couple of years' worth of data to demonstrate statistically significant disparities.

Open enrollment can thus create substantial risks for any practice, institution, or health plan with a reputation for providing good secondary and tertiary care (whether the institution is an AMC, community facility, or physician practice). This risk, if not addressed, may jeopardize the access to and quality of healthcare for chronically ill Medicaid enrollees. This is especially true for a program covering the "disabled," who by definition have greater health-

care needs, especially when providers are at risk for both the reimbursement for their own services and also out-of-pocket expenses (eg, payments to a third party for medications). As noted earlier, some state Medicaid programs do not extend the option of managed care to ABAD enrollees. Individual health plans or AMCs may tailor benefit packages so as to appeal primarily to healthy enrollees, limit eligibility to a narrow geographic region, or drop the MMC contracts.[30]

This high financial risk and the statistical difficulty in determining the risk make it essential that attempts to at least temper the potential effects of adverse selection be proactive. Accordingly, the efforts of Michigan and the study HMO to explore and address these issues should be applauded, but ongoing evaluation to determine the adequacy of such efforts will continue to be important, especially for programs such as ABAD that predominantly cover the sick and disabled. Efforts to predict resource utilization have employed health-status measures, prior utilization, functional health status, self-reported health status, severity-of-illness measures, and other case-mix variables.[31-34] As demonstrated in this study, a relatively straightforward approach is the introduction of ambulatory and inpatient diagnosis-based risk adjustment of capitation payments, such as Kronick's ICD-9-based Chronic Illness and Disability Payment System (CDPS).[16,23] For the new contract with Michigan Medicaid beginning October, 2001, bidding HMOs were required to submit ICD-9 codes of ABAD enrollees to allow determination of a risk-adjuster per HMO. The initial submission by the study HMO lacked complete data, and the HMO initially was given an adjuster of only 0.9. After further analysis, the HMO was granted a risk-adjuster of 1.016 as a multiplier to the negotiated base price for its ABAD members, which would have significantly increased premiums to the HMO. Neither this risk-multiplier nor even the maximum risk-multiplier being considered in Michigan (1.1), however, would appreciably close the gap in cost differences found in this study. At the time of this article's writing, the proposed risk-adjustment program has not yet been fully implemented, in part because of the need to address inconsistencies in the quality of encounter data available from participating HMOs and concerns about rate relief for plans assigned a multiplier less than 1 (the lowest multiplier being considered is 0.9). These 2 issues constitute significant challenges for the implementation of risk adjustment: the need for uniform, high-quality data

from participating plans and the fact that, in the face of constant—and in some cases decreasing—funds allocated for state Medicaid programs, risk adjustment will create winners and losers among participating plans as existing resources are shifted from plans or groups of providers who care for healthier enrollees to those caring for sicker enrollees.[16]

Future research should continue to explore the extent to which different case-mix measures can help adjust for adverse selection, how health risk should be conceptualized and measured for adjustment, and what is the most appropriate payer and provider level at which to share risk. Research is also needed to elucidate the conditions under which the advantages of risk adjustment are worth the administrative effort, and how complete risk adjustment must be to be considered fair by those experiencing adverse selection. As mentioned earlier, some have expressed skepticism that risk-adjustment tools will ever be sufficient to prevent substantial adverse selection.[32,35-37] For example, even after detailed case-mix measures are used to adjust, past utilization remains an imperfect predictor of future use. Moreover, risk-adjustment measures do not eliminate completely the incentive to select patients according to risk, nor the inverse relationship under capitation between care delivered and profit retained. Accordingly, some researchers have proposed blended risk-adjusted capitation/fee-for-service reimbursement systems, because risk adjustment cannot perfectly compensate plans for variation in the costs of medical care. Among the risk-sharing approaches currently being experimented with to complement risk adjustment are risk corridors, reinsurance, carveouts, loss sharing, and bundled-fee arrangements. Proponents argue that combined capitation and fee-for-service systems would balance the financial incentives of fee for service to overtreat and of capitation to undertreat.[8,38,39]

In conclusion, we found Medicaid managed care enrollees who chose AMC providers from 1997 through 1999 had a disproportionately high prevalence of high-cost medical conditions and greater estimated costs than those who chose non-AMC providers. Providing highly complex care to very ill patients and ensuring the poor have access to care are important components of AMCs' historic missions. This study suggests, however, that adverse selection and high financial risk could undermine the ability of some AMCs to fulfill these crucial roles. Such adverse selection would further compound the consequences of the increasing cost constraints on

AMCs from federal and private payers.[14,40] Current measures within many state Medicaid programs, including that of Michigan, to address adverse selection are thus encouraging and deserve close evaluation.[41] We must continue to search for ways to create incentives that encourage health plans and their provider groups to provide high-quality healthcare for the sickest, most vulnerable Americans.

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