Sam Houston State University
Department of Economics and International Business
Working Paper Series

# Does the Form of Physician Compensation Affect the Quality of Care in Medicaid HMOS?

Troy Quast, David E.M. Sappington, and Elizabeth Shenkman

SHSU Economics & Intl. Business Working Paper No. SHSU_ECO_WP06-02
September 2006

## Abstract:

In the United States a growing fraction of Medicaid participants are enrolled in Health Maintenance Organizations (HMOs). The HMOs contract with physicians to provide health care services to the enrollees. Generally the physicians are compensated either via fee for service (FFS) or capitated arrangements. This paper investigates whether the means by which the physicians are compensated influences the quality of care received by enrollees. Using data for all Medicaid HMO enrollees in a large state, we find that enrollees in HMOs that pay their Primary Care Physicians (PCPs) exclusively via FFS arrangements are more likely to receive services for which the HMO's PCPs receive additional compensation. Further, these enrollees are less likely to receive services for which the HMO's PCPs do not receive additional compensation. These findings suggest that financial incentives may influence the behavior of PCPs in Medicaid HMOs, and thus the health care received by Medicaid participants enrolled in HMOs.

# DOES THE FORM OF PHYSICIAN COMPENSATION AFFECT THE QUALITY OF CARE IN MEDICAID HMOS?

by

Troy Quast*, David E. M. Sappington**, and Elizabeth Shenkman***

**SUMMARY**

*In the United States a growing fraction of Medicaid participants are enrolled in Health Maintenance Organizations (HMOs). The HMOs contract with physicians to provide to provide health care services to the enrollees. Generally the physicians are compensated either via fee for service (FFS) or capitated arrangements. This paper investigates whether the means by which the physicians are compensated influences the quality of care received by enrollees. Using data for all Medicaid HMO enrollees in a large state, we find that enrollees in HMOs that pay their Primary Care Physicians (PCPs) exclusively via FFS arrangements are more likely to receive services for which the HMO's PCPs receive additional compensation. Further, these enrollees are less likely to receive services for which the HMO's PCPs do not receive additional compensation. These findings suggest that financial incentives may influence the behavior of PCPs in Medicaid HMOs, and thus the health care received by Medicaid participants enrolled in HMOs.*

**Keywords:** managed care, fee for service, capitation, Medicaid

May 2006

* Department of Economics & International Business, Sam Houston State University. tcq001 @ shsu.edu

** Department of Economics, University of Florida.

*** Department of Epidemiology, Health Policy Research and Pediatrics, University of Florida.

## Introduction

The Medicaid program, already one of the largest social programs in the United States, is growing rapidly. Between 1996 and 2004, the number of Medicaid enrollees increased by roughly one-third, from 33 million to 44 million [1]. In an attempt to control the cost of the Medicaid program and to improve the quality of care provided to enrollees, many states have moved enrollees into health maintenance organizations (HMOs) (also known as managed care organizations). During the same 1996 to 2004 time period, the fraction of Medicaid enrollees in managed care organizations increased by approximately one-half, from 40% to over 60% [1]. The trend towards managed care does not appear to be slowing. For instance, in December 2005 the governor of Florida signed a bill that requires all of the state's Medicaid enrollees eventually be enrolled in HMOs [2].

State Medicaid programs often contract with HMOs to care for the health care needs of Medicaid participants. The HMOs, in turn, contract with doctors and other health care providers to deliver necessary health care services. HMOs employ different payment arrangements to compensate their doctors. FFS and capitated payment arrangements are common. Under a FFS arrangement, the doctor is paid according to the services she provides to an enrollee. Under a capitated payment arrangement, the doctor is paid a fixed amount per enrollee regardless of the health care services actually provided to the enrollee. Consequently, a doctor paid via FFS can increase her revenue by providing additional services, whereas a capitated doctor can not.

Preventive care is a major focus of the Medicaid program, especially for children [3]. Preventative care can both reduce treatment costs and avoid debilitating illness. Routine well-child visits and the provision of asthma medications are two important forms

of preventive care. Annual well-child visits allow doctors to monitor enrollees' health and deliver essential, routine health care services such as immunization shots. Such visits can reduce the incidence of potentially avoidable hospitalizations [4,5]. Asthma is a major public health problem affecting Americans of all ages, races, and ethnic groups. Children are particularly affected with more than six million children diagnosed with asthma. The economic burden of this disease is substantial, with national annual health care costs of $3 billion. Successful clinical management of asthma in children has the potential to decrease this burden by lowering the disproportionate costs arising from hospitalization and acute care [6]. Part of successful clinical management includes adhering to National Heart Lung and Blood Institute (NHLBI) guidelines for asthma medication. Adherence to these guidelines is associated with decreased hospitalizations, emergency room use, and outpatient acute care visits [7].

This paper investigates whether the means by which HMOs compensate their Primary Care Physicians (PCPs) influence the likelihood that Medicaid enrollees receive these important forms of preventive care and appropriate medications for the treatment of asthma. Using data for all of the Medicaid HMO enrollees in a large state,[a] we find that enrollees in HMOs that pay their PCPs exclusively via FFS arrangements are more likely to receive routine well-child visits. Further, enrollees in these HMOs who have persistent asthma are less likely to receive appropriate medications to treat their condition. These findings suggest that financial incentives may influence the behavior of PCPs in Medicaid HMOs, and thus the health care received by Medicaid participants enrolled in HMOs.

Numerous studies have analyzed whether the form of physician pay influences the level of care provided to HMO enrollees. The papers suggest such a link often is present.

For example, Hillman, Pauly, and Kerstein [8] report that hospitalization rates are higher for enrollees whose physicians are paid via FFS rather than capitation. Stearns, Wolfe, and Kindig [9] find that specialist referrals, hospital admissions, and hospital length of stays fall when an HMO switches from FFS physician payment to capitation payment. Ransom et al. [10] report that gynecologists tend to provide fewer elective surgical procedures when their payment method is changed from FFS to capitation. Shrank et al. [11] find that fewer cataract procedures are performed when physicians are moved to capitation. In contrast, Conrad et al. [12] do not find any significant effects of physician payment method on health care utilization.

Our analysis enhances the literature in three important respects. First, we examine differences in the behavior of FFS and capitated PCPs for services that have different effects on the PCPs' financial payoffs. As noted, we find that FFS PCPs deliver more services that increase their revenues than capitated PCPs. However, corresponding differences are not detected on services that do not increase physician revenue. Second, we consider services for which there are clearly stated and widely accepted norms for the proper level of care. Consequently, we are able to assess whether financial incentives affect the extent to which actual care departs from the most appropriate level of care. Third, we examine the health care services delivered to Medicaid enrollees, who often are especially at risk of not obtaining the proper level of care.

The paper is organized as follows. Section 2 describes the services we analyze and explains how the profits of FFS and capitated PCPs are affected by the delivery of these services. Section 3 describes our data and empirical specification. Section 4 presents our findings. Section 5 provides conclusions and directions for future research.

**Background Information**

While both well-child visits and asthma medications can be beneficial to enrollees, these two forms of care can affect the immediate costs of PCPs differently. In the state studied here, the cost of a well-child visit is borne by the PCP that performs the well-child visit. In contrast, the Medicaid program pays for prescribed asthma medications. Consequently, the amount of asthma medication prescribed has no direct financial impact on either the HMO or its PCPs. This difference in the incidence of the costs of well-child visits and asthma medications is an important element of the ensuing analysis.

The provision of preventive care can have differential effects on the revenue of different PCPs. Capitated PCPs receive no additional revenue when they provide well-child visits, but do incur the cost of providing the visits.[b] Conversely, because they are reimbursed for each service they provide, FFS PCPs secure additional revenue from every well-child visit they perform. Thus, capitated PCPs may be less motivated to encourage well-child visits because they are not reimbursed directly for the visits.

Prescribing asthma medications does not have an immediate financial impact on either capitated or fee-for-service PCPs. However, the longer-term effects from these prescriptions may differ. Asthma medications can reduce the costs of the capitated PCP by limiting the need for future office visits to deal with the complications of asthma. In contrast, to the extent that the prescribed asthma medications control the symptoms of asthma and thereby reduce future office visits, additional prescriptions can reduce the revenue of a FFS PCP. Thus, FFS PCPs may be less motivated to encourage this type of care.

This paper compares the extent to which FFS and capitated PCPs in Medicaid HMOs provide well-child visits and asthma medications. Given the differences in the compensation structures the FFS and capitated PCPs face, our findings may provide some useful evidence about how financial incentives affect the quality of care received by HMO enrollees.

**Data and Empirical Specification**

Our data is of two types: enrollment and encounter data and data from interviews. The enrollment and encounter data is for the population of children enrolled in a Medicaid HMO in the state in question in 2004[c,d]. This enrollment data contains demographic information for each enrollee; the encounter data records the enrollee's usage of medical services, including office visits, medical treatments, and pharmaceutical prescriptions. The encounter data also documents diagnoses made by the physician when treating the enrollee.[e]

The interview data is derived from interviews with personnel from the HMOs. The HMOs in our sample are required to answer questions posed by the state regarding various characteristics of their organization. Among the questions asked is how the HMO compensates its PCPs.[f]

The dependent variables in the analysis are based on measures established in the Health Plan Employer Data and Information Set (HEDIS) developed by the National Committee for Quality Assurance (NCQA) [13]. HEDIS measures are used to evaluate the care received by HMO enrollees and are widely used by industry participants. These measures are based on diagnosis codes and treatment codes found in enrollee encounter

data and the ages of the enrollees.[g] The measures are binary: one indicates that the proper care was provided; zero indicates otherwise. The measures are based on treatment received over a twelve month period and specify the age ranges of the enrollees to be included. The treatment period examined in the analysis below is January 2004 - December 2004.

The first HEDIS measure analyzed is whether the enrollee received at least one well-child visit during the treatment period. Two age cohorts are analyzed: children between 3 and 6 years of age; and adolescents between the ages of 12 and 21.[h] The success rates (i.e., the fraction of the relevant population receiving a well-child visit) for the younger and older age cohorts are 50% and 32%, respectively, in our sample.

The second HEDIS measure we analyze is whether children with persistent asthma had prescriptions filled for appropriate medications.[i] This measure is based on two years of data. Data from 2003 are examined for evidence of persistent asthma. Data for 2004 are examined for evidence of appropriate medication. The age cohorts employed for this analysis are 5 through 9 and 10 through 18. The success rates (i.e., the fraction of the relevant population that had a prescription for an appropriate asthma medication filled) for these cohorts on this measure in our sample are 51% and 54%, respectively.

The explanatory variables reflect HMO operating characteristics and enrollee demographics. The HMO operating characteristic of primary interest is whether the HMO compensates all of its PCPs via FFS arrangements. During the HMO interviews, each HMO is asked to report the percent of its PCPs that are paid via FFS arrangements. The distribution of answers was bimodal, with five of the eight HMOs in our sample stating that they pay roughly 100% of their PCPs via FFS[j] and three HMOs stating that they pay 85%[k]

of their PCPs via FFS. This bimodal distribution underlies our treatment of this variable as binary.

Two other variables are included to control for the practices of the HMO: whether HMO case managers work directly with the primary care physicians[l] and whether the HMO makes reminder calls to enrollees immediately prior to their well-child visits. (This latter variable is included only in the analyses of the HEDIS well-child visit measure.) The other variables included to control for characteristics of the HMO are the for-profit/non-profit status of the HMO, the number of enrollees (Medicaid and otherwise) the HMO serves, the percent of the HMO's enrollees that are in Medicaid, and the number of years the HMO has been operating in the state in any capacity.[m]

Table 1 lists the operating characteristics of the HMO attributes included in the estimation. As the table indicates, there is significant heterogeneity among the HMOs for each of the variables employed in the analysis. The smallest HMO has roughly 35,000 enrollees while the largest has approximately nine times that number. The HMOs also vary significantly in their operating practices and in the extent to which their enrollment is limited to Medicaid enrollees. Table 1 also summarizes the demographic characteristics of the enrollees of each HMO.

Table 2 presents the success rate for the two HEDIS measures for each value of the binary HMO attributes. Children in HMOs that paid all PCPs via FFS arrangements had higher well-child visit success rates than HMOs that paid only some of their PCPs via FFS. In addition, children in HMOs where case managers worked directly with primary care physicians had higher asthma medication success rates.

The demographic variables we employed are gender, race, age, and whether the enrollee resides in a rural area. Table 3 presents the values of the demographic variables in our sample. Hispanics outnumber blacks and whites, while most enrollees reside in non-rural areas. The data in Table 4 indicate that, relative to whites and blacks, Hispanic children had a higher success rate for well-child visits and lower success rate for asthma medications. Also, non-rural children had higher success rates for well-child visits and lower success rates for asthma medications.

The two equations estimated are:

(1) $WCHILD_{i,j} = \alpha + \beta_1 X_i + \beta_2 Z_j + \varepsilon_{i,j}$

(2) $ASTHMA_{i,j} = \delta + \gamma_1 X_i + \gamma_2 Z_j + \mu_{i,j}$

where

$WCHILD_{i,j}$ is the binary HEDIS well-child measure for enrollee *i* in HMO *j*

$ASTHMA_{i,j}$ is the binary HEDIS asthma medication measure for enrollee *i* in HMO *j*

$X_i$ are enrollee demographic variables

$Z_j$ are HMO attribute variables

We assume the probability of HEDIS success has a standard normal CDF, and so estimate the equations via probit.[n] To account for unobserved HMO-level effects [14], the observations are clustered by HMO and location.[o]

**Findings**

Table 5 presents the regression estimates. The first two columns in Table 5 contain the estimates for the well-child visit measure for the two age cohorts. The last two columns contain the estimates for the asthma medication measure for the two age cohorts.

The first row of data in Table 5 presents the coefficient estimates for the variable that indicates whether the HMO pays all of its PCPs via a FFS arrangement. For both age cohorts, the well-child visit success rate for enrollees in HMOs that pay all of their PCPs via FFS is six percentage points higher than for those enrolled in HMOs that pay some of their PCPs via capitation. Given the mean success rates, this difference implies that the average probability that an enrollee receives a well-child visit is 10-20% higher in an HMO that pays all of its PCPs via FFS.

The opposite conclusion arises with regard to the asthma medication measure. For both age cohorts, the success rate is lower for HMOs that pay all of their PCPs via FFS. The effect is statistically significant for the 5-9 year old cohort. The estimates imply that the probability that the recommended asthma medications are prescribed is approximately 5% lower in HMOs that pay all of their PCPs via FFS than in other HMOs.[p]

These findings suggest that financial incentives may affect the services PCPs provide to Medicaid enrollees. In particular, the services that increase the revenue of FFS PCPs (well-child visits) are provided more frequently in HMOs where all PCPs are compensated via FFS. Furthermore, the services that could reduce the future revenues of FFS PCPs (asthma medication prescriptions) are provided less frequently in HMOs where all of the PCPs are paid via FFS.

The other variables that measure HMO attributes generally are not statistically significant in our regressions. A larger number of enrollees are associated with a higher success rate on the well-child visit measure. However, the effect is of limited statistical and economic significance. The probability that an enrollee in the 5-9 year cohort receives the recommended asthma medications is higher in HMOs where the case manager works directly with the primary care physician. This effect may be due to case managers working with children with severe asthma to ensure that they receive the appropriate medications. The finding that the probability that an enrollee in the 10-18 year cohort receives the recommended asthma medication declines as the percentage of HMO enrollees in Medicaid increases may reflect practice style effects in HMOs that serve both commercial and Medicaid populations. HMOs may tend to provide relatively high service quality to commercial populations in an effort to retain these profitable clients. To the extent that Medicaid and commercial enrollees receive the same basic health care services within an HMO, HMOs with a larger concentration of commercial enrollees may provide higher quality care to their Medicaid enrollees.

Hispanic children in our sample have a higher likelihood of receiving an annual well-child visit and a lower likelihood of receiving asthma medications than black children and white children. This result is interesting in light of the “Hispanic paradox” that suggests Hispanics tend to have better health outcomes than non-Hispanics of similar socio-economic status [15,16]. Within age cohorts, younger children generally are more likely than their older counterparts to receive well-child visits and asthma medications. (The exception is for asthma medications for the 5-9 year cohort.) The finding that 4-year-olds receive well-child visits with relatively high frequency likely reflects the fact that parents

often take their children to the PCP to obtain the immunizations required to enter kindergarten. Rural residence is associated with reduced (but statistically insignificant) performance on the well-child measure and increased (and statistically significant) performance on the asthma medication measure for the younger cohort. Families that live in rural regions likely have to travel farther for well-child visits, which may reduce the likelihood of such visits. However, because they tend to live farther from the PCP's office or the emergency room, parents of rural families may take particular precautions to be sure their asthmatic children do not develop serious conditions that would require long trips to receive immediate care.

**Conclusions**

We have examined whether the form of PCP compensation affects the quality of care received by Medicaid HMO enrollees. Our findings suggest that financial incentives may influence the services that PCPs deliver to enrollees.

Further research is required to determine whether our findings persist in other settings. The HEDIS measures we employed require that an enrollee be a member of the HMO for almost the entire period in question.[q] Therefore, our findings pertain only to enrollees with relatively stable enrollment. These enrollees may not be entirely representative, as many Medicaid enrollees move in and out of Medicaid frequently.

It would be ideal to be able to identify exactly which PCPs are paid via FFS and which are paid via capitation. This information would permit more precise measurement of the effects of PCP compensation arrangements on the quality of care they provide.

Finally, time series data for each enrollee would allow for the inclusion of enrollee fixed effects. Such effects would control for time-invariant, unobservable characteristics of each enrollee, and would thereby improve the precision of the analysis.

**Notes**

a. The state is not identified, to preserve confidentiality of key data.

b. A well-child visit may reduce long-run costs by allowing the doctor to detect an ailment and treat the enrollee before complications arise and the requisite care becomes more costly. However, Medicaid enrollees often have limited spells in the program, which reduces the likelihood that a capitated doctor would bear the costs of later treatment. Furthermore, the probability of such an ailment may be sufficiently small to not justify the cost of providing a well-child visit.

c. To calculate the asthma measure, data for 2003 are used to identify children with asthmatic symptoms, while data for 2004 are used to determine if these children received appropriate medication.

d. Chronically sick children have more frequent visits to their doctor and, thus, their preventative care will likely be less influenced by their doctor's financial incentives. In order to measure the potential effect of these financial incentives on enrollees who are more likely to rely on a doctor's guidance to obtain preventative care, the sample is limited to relatively healthy children. Specifically, it is limited to enrollees with a clinical risk grouping (CRG) score of one. (CRGs classify individuals into an ordinal ranking of healthiness, with one being most healthy. For further information on CRGs,

see Neff, et al [17].) The estimates using all CRGs are largely unchanged and are reported in the appendix.

e. We validated the quality of the encounter data using the Centers for Medicare and Medicaid (CMS) Encounter Validation Protocol, which requires an analysis of missing fields, invalid fields, and comparisons between the content of the claims and encounter data to documentation in the medical record [18]. Critical information such as ICD-9-CM and CPT codes were missing or invalid in less than 1% of the cases. Comparisons between the claims and encounter data content and the medical record content revealed about an 11% under-reporting of services in the encounter data relative to the medical record documentation across all enrollees.

f. We have access only to aggregate HMO compensation data, not data on how an HMO compensates each individual provider.

g. The measures used in this paper are based on the administrative specification of the measures.

h. The two measures are named, “Well-Child Visits in the Third, Fourth, Fifth, and Sixth Years of Life” (page 177) and “Adolescent Well-Care Visits” (page 180).

i. The measure is named “Use of Appropriate Medications for People with Asthma” (page 104).

j. Specifically, the reported percentages were 100%, 100%, 100%, 99%, and 99%.

k. Specifically, the reported percentages were 84%, 85%, and 85%.

l. HMO case managers are responsible for ensuring that children with chronic conditions receive appropriate care.

m. Other HMO variables were considered for inclusion, such as whether the HMO utilizes an asthma disease management program and whether financial incentives were used to encourage doctors to adhere to clinical guidelines. However, there was little or no variation in these variables across the HMOs and thus their effect cannot be identified in the regression estimates.

n. If the enrollees in different HMOs have different unobservable characteristics that make them systematically more or less likely to obtain well-child visits or asthma medications, the endogeneity of the FFS variable could be a concern. Two factors mitigate this concern. First, the enrollee characteristics summarized in Table 1 do not reveal systematic differences between the enrollees in the HMOs that pay only via FFS and those that utilize capitation. Second, the HMOs are required to accept any qualifying Medicaid participant who wishes to enroll, and thus are unable to control directly who enrolls in their plans.

o. By clustering the observations, the estimates of the coefficient standard errors are adjusted to allow for the possibility that the observations within each group are not independent. The enrollees are grouped here by the HMO in which they are enrolled and the metropolitan area in which they reside.

p. To ensure that the findings are not driven by spurious interaction between the variables measuring HMO attributes, the model was also estimated replacing the other HMO attributes with HMO dummy variables. The results of this approach, reported in the appendix, are very similar to the results presented in the text. (The HMO attributes and

HMO dummy variables cannot be included simultaneously due to perfect multicollinearity between the two sets of variables.)

q. For the well-child visit measure, the enrollee must be enrolled in the same HMO for 11 of the 12 months in question. For the asthma medication measure, the minimum enrollment in the same HMO is 22 of the previous 24 months.

**References**


1. United States Department of Health and Human Services (US HHS) (2004). "2004 Medicaid Managed Care Enrollment Report." Downloaded on 2006-03-18 from http://www.cms.hhs.gov/MedicaidDataSourcesGenInfo/04_MdManCrEnrllRep.asp.
2. Farrington B. "Bush Signs Medicaid Overhaul into Law." *Associated Press Newswires*. 16 Dec 2005.
3. Gavin N, Adams E K, Herz E The Use of EPSDT and Other Health Care Services by Children Enrolled in Medicaid: The Impact of OBRA'89. *Milbank Q* 1998; 76: 207-250.
4. Hakim R, Bye B. Effectiveness of Compliance with Pediatric Preventive Care Guidelines Among Medicaid Beneficiaries. *Pediatrics* 2001; 108: 90-97.
5. Gadomski A, Jenkins P, Nichols M. Impact of a Medicaid Primary Care Provider and Preventive Care on Pediatric Hospitalization. *Pediatrics* 1998; 101: e1.
6. Mellon M, Parasuraman B. "Pediatric Asthma: Improving Management to Reduce Cost of Care." *J Manag Care Pharm* 2004; 10: 130-141.
7. Shireman T, Heaton P, Gay W, Cluston Jr R, Moomaw C. Relationship Between Asthma Drug Therapy Patterns and Healthcare Utilization. *Ann Pharmacother* 2002; 36: 557-564.

8. Hillman A, Pauly M, Kerstein J. How do Financial Incentives Affect Physicians' Clinical Decisions and the Financial Performance of Health Maintenance Organizations? *N Engl J Med* 1989; 321: 86-92.
9. Stearns S, Wolfe B, Kindig D. Physician Responses to Fee-for-Service and Capitation Payment. *Inquiry* 1992; 29: 416-425.
10. Ransom S, McNeeley G, Kruger M, Doot G, Cotton D. The Effect of Capitated and Fee-for-Service Remuneration on Physician Decision Making in Gynecology. *Obstet Gynecol* 1996; 87: 707-710.
11. Shrank W, Ettner S, Slavin P, Kaplan H. Effect of Physician Reimbursement Methodology on the Rate and Cost of Cataract Surgery. *Arch Ophthal* 2005; 123: 1733-1738.
12. Conrad D, Maynard C, Cheadle A, Ramsey S, Marcus-Smith M, Kirz H, Madden C, Martin D, Perrin E, Wickizer T, Zierler B, Ross A, Noren J, and Liang S. Primary Care Physician Compensation Method in Medical Groups: Does it Influence the Use and Cost of Health Services for Enrollees in Managed Care Organizations? *J Am Med Assoc* 1998; 279: 853-858.
13. National Committee for Quality Assurance (NCQA). *HEDIS 2003 Technical Specifications*. NCQA: Washington, DC, 2002.
14. Moulton, B. An Illustration of a Pitfall in Estimating the Effects of Aggregate Variables on Micro Units. *Rev Econ Stat* 1990; 72: 334-338.
15. Franzini L, Ribble J, Keddie A. Understanding the Hispanic Paradox. *Ethn Dis* 2001; 11: 496-518.
16. Morales L, Lara M, Kington R, Valdez R, Escarse J. Socioeconomic, Cultural, and Behavioral Factors Affecting Hispanic Health Outcomes. *J Health Care Poor Underserved*

2002; 13: 477-503.

17. Neff J, Sharp V, Muldoon J, Graham J, Popalisky J, Gay J. Identifying and Classifying Children with Chronic Conditions Using Administrative Data with the Clinical Risk Group Classification System. *Ambul Pediatr* 2002; 2: 71-79.
18. Center for Medicare and Medicaid Services. Medicaid Statistical Information System: Tape Specifications and Data Dictionary. http://www.cms.hhs.gov/MSIS/Downloads/msisdd05.pdf [25 May 2006].

TABLE 1
HMO Summary Information

| Attribute | HMO #1 | HMO #2 | HMO #3 | HMO #4 | HMO #5 | HMO #6 | HMO #7 | HMO #8 |
|---|---|---|---|---|---|---|---|---|
| Operating Characteristics | | | | | | | | |
| PCPs Paid Only via FFS | yes/no[1] | no | yes | yes | yes | yes | no | yes |
| Markets Served | 3 | 1 | 4 | 1 | 1 | 1 | 3 | 1 |
| Total Enrollees | 292,091 | 97,606 | 36,311 | 34,016 | 115,230 | 70,503 | 116,853 | 100,710 |
| Years in State | 6 | 8 | 5 | 4 | 17 | 5 | 6 | 7 |
| Fraction of Enrollees in Medicaid | 76% | 37% | 100% | 46% | 10% | 100% | 80% | 24% |
| For-Profit | yes | no | no | no | yes | no | yes | no |
| Check-Up Visit Reminder Calls | yes | no | no | no | no | yes | no | yes |
| Case Manager Works with PCP | no | yes | no | yes | no | yes | no | no |
| Enrollee Characteristics[2] | | | | | | | | |
| % Male | 50% | 49% | 51% | 51% | 49% | 51% | 51% | 51% |
| % Black | 22% | 8% | 27% | 2% | 9% | 23% | 11% | 26% |
| % Hispanic | 60% | 80% | 60% | 95% | 68% | 67% | 76% | 58% |
| % Other Race | 3% | 1% | 3% | 0% | 0% | 2% | 1% | 3% |
| % Rural | 2% | 9% | 1% | 1% | 33% | 4% | 5% | 1% |

[1] In two of this HMO's markets, some doctors are paid via capitation, while in the third all are paid via FFS.

[2] Based on sample used in regressions of well-child visits for children aged 3 through 6.

TABLE 2
HEDIS Success Rates by HMO Attribute

| | Well-Child Visits | | Asthma Medications | |
|---|---|---|---|---|
| | Ages 3-6 | Ages 12-21 | Ages 5-9 | Ages 10-18 |
| Total | 50% | 32% | 51% | 54% |
| Are All PCPs Paid on a Fee-For-Service Basis? | | | | |
| Yes | 51% | 35% | 50% | 54% |
| No | 48% | 30% | 52% | 53% |
| Does HMO Place Reminder Calls? | | | | |
| Yes | 51% | 33% | n/a | n/a |
| No | 47% | 31% | n/a | n/a |
| Does Case Manager Work with PCP? | | | | |
| Yes | 50% | 33% | 55% | 57% |
| No | 48% | 32% | 50% | 53% |
| Is HMO a For-Profit HMO? | | | | |
| Yes | 51% | 32% | 50% | 52% |
| No | 48% | 32% | 52% | 57% |

**TABLE 3**
**Demographic Characteristics By Population**

| | Check-Up Visits | | Asthma Medications | |
|---|---|---|---|---|
| | Ages 3-6 | Ages 12-21 | Ages 5-9 | Ages 10-18 |
| Total | 82,227 | 62,475 | 1,971 | 1,756 |
| Gender | | | | |
| Male | 41,320 | 30,899 | 1,155 | 985 |
| Female | 40,957 | 31,576 | 816 | 771 |
| Race | | | | |
| White | 10,290 | 9,153 | 288 | 291 |
| Black | 15,699 | 19,684 | 585 | 707 |
| Hispanic | 54,315 | 31,800 | 1,038 | 727 |
| Other | 1,973 | 1,838 | 60 | 31 |
| Rural | | | | |
| Non-Rural | 79,283 | 60,026 | 1,890 | 1,693 |
| Rural | 2,994 | 2,449 | 81 | 63 |

**TABLE 4**
**HEDIS Success Rates by Population**

| | Check-Up Visits | | Asthma Medications | |
|---|---|---|---|---|
| | Ages 3-6 | Ages 12-21 | Ages 5-9 | Ages 10-18 |
| Total | 50% | 32% | 51% | 54% |
| Gender | | | | |
| Male | 50% | 32% | 51% | 52% |
| Female | 50% | 33% | 51% | 56% |
| Race | | | | |
| White | 45% | 30% | 56% | 59% |
| Black | 47% | 32% | 54% | 54% |
| Hispanic | 52% | 33% | 48% | 52% |
| Other | 49% | 29% | 57% | 39% |
| Rural | | | | |
| Non-Rural | 50% | 32% | 50% | 54% |
| Rural | 45% | 30% | 70% | 57% |

TABLE 5
Marginal Effects from Probit Regressions

| Explanatory Variable | Dep. Var.: Well-Child Visit | | Dep. Var.: Asthma Medication | |
|---|---|---|---|---|
| | Aged 3-6 | Aged 12-21 | Aged 5-9 | Aged 10-18 |
| Mean Probability | 0.50 | 0.32 | 0.51 | 0.54 |
| HMO Operating Characteristics | | | | |
| PCPs Paid Only via FFS | 0.05 *** | 0.06 *** | -0.03 ** | -0.02 |
| | (3.51) | (3.27) | (2.00) | (0.53) |
| Total Enrollees (Medicaid & Commercial, hundred thousands) | 0.04 * | 0.02 | -0.02 | -0.01 |
| | (1.80) | (0.79) | (0.84) | (0.88) |
| Percent of Enrollees in Medicaid | 0.04 | -0.01 | -0.04 | -0.22 *** |
| | (0.96) | (0.19) | (1.21) | (3.90) |
| For-Profit | -0.01 | 0.02 | 0.04 | -0.02 |
| | (0.18) | (0.38) | (1.21) | (0.37) |
| Well-Child Visit Reminder Calls | -0.02 | -0.02 | | |
| | (1.16) | (0.75) | | |
| Case Manager Works with PCP | 0.005 | 0.03 | 0.09 *** | 0.02 |
| | (0.24) | (1.43) | (3.59) | (0.51) |
| Years Operating in State | 0.004 | 0.003 | 0.04 | -0.01 |
| | (0.76) | (0.49) | (0.79) | (1.32) |
| Enrollee Characteristics | | | | |
| Age Dummy 1 | 0.10 *** | | -0.03 * | |
| | (13.08) | | (1.79) | |
| Age Dummy 2 | 0.17 *** | | | 0.11 *** |
| | (38.56) | | | (3.58) |
| Age Dummy 3 | 0.06 *** | | | |
| | (14.63) | | | |
| Age Dummy 4 | | 0.23 *** | | |
| | | (19.93) | | |
| Age Dummy 5 | | 0.12 *** | | |
| | | (11.20) | | |
| Male | 0.001 | -0.01 ** | 0.01 | -0.04 * |
| | (0.20) | (2.48) | (0.76) | (1.85) |
| Black | 0.01 | 0.01 | 0.03 | -0.05 |
| | (1.39) | (1.37) | (0.61) | (1.15) |
| Hispanic | 0.07 *** | 0.03 ** | -0.06 | -0.09 ** |
| | (5.85) | (2.46) | (1.21) | (2.33) |
| Other | 0.03 ** | -0.02 * | 0.07 | -0.22 * |
| | (2.10) | (1.75) | (0.82) | (1.93) |
| Rural | -0.03 | -0.03 | 0.15 ** | -0.01 |
| | (1.62) | (1.08) | (2.32) | (0.19) |
| # Observations | 82277 | 62475 | 1971 | 1756 |
| R-squared | 0.02 | 0.02 | 0.02 | 0.02 |

Notes -

The z-statistics reported in parentheses are based on Huber-White robust standard errors clustered at the HMO-market level.

The age dummy variables differ across specifications:

In the well-child visit regressions, age dummy 1 corresponds to 3 years, age dummy 2 corresponds to 4 years, age dummy 3 corresponds to 5 years, age dummy 4 corresponds to 12-15 years, and age dummy 5 corresponds to 16-18 years.

In the asthma medications regressions, age dummy 1 corresponds to 5-7 years and age dummy 2 corresponds to 10-14 years.

TABLE A1
Marginal Effects from Probit Regressions - All CRGs

| Explanatory Variable | Dep. Var.: Well-Child Visit | | | | Dep. Var.: Asthma Medication | | | |
|---|---|---|---|---|---|---|---|---|
| | Aged 3-6 | | Aged 12-21 | | Aged 5-9 | | Aged 10-18 | |
| CRG Dummy Variables | | | | | | | | |
| CRG = 1 | -0.05 | | -0.13 | *** | -0.40 | *** | -0.35 | *** |
| | (1.41) | | (5.60) | | (5.86) | | (6.22) | |
| CRG = 2 | 0.05 | | 0.04 | * | -0.32 | *** | -0.27 | *** |
| | (1.19) | | (1.75) | | (3.74) | | (2.95) | |
| CRG = 3 | 0.04 | | -0.02 | | -0.42 | *** | -0.44 | *** |
| | (1.08) | | (1.07) | | (4.70) | | (6.39) | |
| CRG = 4 | 0.04 | | -0.02 | | 0.01 | | 0.01 | |
| | (0.94) | | (0.79) | | (0.11) | | (0.10) | |
| HMO Operating Characteristics | | | | | | | | |
| PCPs Paid Only via FFS | 0.05 | *** | 0.06 | *** | -0.03 | ** | -0.01 | |
| | (3.39) | | (3.02) | | (2.21) | | (0.57) | |
| Total Enrollees (Medicaid & Commercial, hundred thousands) | 0.04 | * | 0.02 | | -0.03 | * | -0.01 | |
| | (1.76) | | (0.74) | | (1.83) | | (1.52) | |
| Percent of Enrollees in Medicaid | 0.04 | | -0.01 | | -0.04 | | -0.12 | ** |
| | (0.92) | | (0.13) | | (1.30) | | (2.46) | |
| For-Profit | -0.01 | | 0.03 | | 0.05 | | -0.01 | |
| | (0.10) | | (0.49) | | (1.26) | | (0.24) | |
| Well-Child Visit Reminder Calls | -0.02 | | -0.02 | | | | | |
| | (1.18) | | (0.73) | | | | | |
| Case Manager Works with PCP | 0.010 | | 0.04 | | 0.07 | *** | 0.01 | |
| | (0.32) | | (1.56) | | (3.97) | | (0.20) | |
| Years Operating in State | 0.004 | | 0.002 | | 0.02 | *** | -0.002 | |
| | (0.72) | | (0.33) | | (3.47) | | (0.44) | |
| Enrollee Characteristics | | | | | | | | |
| Age Dummy 1 | 0.10 | *** | | | -0.04 | ** | | |
| | (13.18) | | | | (2.20) | | | |
| Age Dummy 2 | 0.18 | *** | | | | | 0.10 | *** |
| | (39.08) | | | | | | (3.58) | |
| Age Dummy 3 | 0.06 | *** | | | | | | |
| | (15.20) | | | | | | | |
| Age Dummy 4 | | | 0.23 | *** | | | | |
| | | | (20.23) | | | | | |
| Age Dummy 5 | | | 0.12 | *** | | | | |
| | | | (10.87) | | | | | |
| Male | -0.001 | | -0.02 | ** | 0.03 | ** | -0.01 | |
| | (0.23) | | (2.40) | | (2.05) | | (0.83) | |
| Black | 0.01 | * | 0.02 | ** | -0.01 | | -0.04 | |
| | (1.68) | | (2.16) | | (0.31) | | (1.39) | |
| Hispanic | 0.07 | *** | 0.03 | *** | -0.08 | ** | -0.07 | *** |
| | (5.70) | | (2.65) | | (2.23) | | (2.76) | |
| Other | 0.03 | ** | -0.02 | | 0.05 | | -0.15 | * |
| | (1.99) | | (1.48) | | (0.79) | | (1.73) | |
| Rural | -0.03 | * | -0.02 | | 0.03 | | -0.01 | |
| | (1.69) | | (0.97) | | (0.64) | | (0.38) | |
| # Observations | 92986 | | 71568 | | 3316 | | 2746 | |
| R-squared | 0.02 | | 0.03 | | 0.13 | | 0.09 | |

Notes -

The z-statistics reported in parentheses are based on Huber-White robust standard errors clustered at the HMO-market level.

The age dummy variables differ across specifications:

In the well-child visit regressions, age dummy 1 corresponds to 3 years, age dummy 2 corresponds to 4 years, age dummy 3 corresponds to 5 years, age dummy 4 corresponds to 12-15 years, and age dummy 5 corresponds to 16-18 years.

In the asthma medications regressions, age dummy 1 corresponds to 5-7 years and age dummy 2 corresponds to 10-14 years.

*** - 99% confidence level, ** - 95% confidence level, * - 90% confidence level

TABLE A2
Marginal Effects from Probit Regressions with HMO Fixed Effects

| Explanatory Variable | Dep. Var.: Well-Child Visit | | Dep. Var.: Asthma Medication | |
|---|---|---|---|---|
| | Aged 3-6 | Aged 12-21 | Aged 5-9 | Aged 10-18 |
| Mean Probability | 0.50 | 0.32 | 0.51 | 0.54 |
| HMO Operating Characteristics | | | | |
| PCPs Paid Only via FFS | 0.03 ** | 0.03 * | -0.04 | -0.07 ** |
| | (2.29) | (1.76) | (1.37) | (2.50) |
| Enrollee Characteristics | | | | |
| Age Dummy 1 | 0.10 *** | | -0.03 * | |
| | (13.12) | | (1.75) | |
| Age Dummy 2 | 0.18 *** | | | 0.11 *** |
| | (39.08) | | | (3.50) |
| Age Dummy 3 | 0.06 *** | | | |
| | (14.55) | | | |
| Age Dummy 4 | | 0.23 *** | | |
| | | (20.04) | | |
| Age Dummy 5 | | 0.13 *** | | |
| | | (11.27) | | |
| Male | 0.001 | -0.01 ** | 0.01 | -0.04 * |
| | (0.20) | (2.50) | (0.75) | (1.84) |
| Black | 0.02 * | 0.02 ** | 0.03 | -0.04 |
| | (1.80) | (2.04) | (0.62) | (1.10) |
| Hispanic | 0.07 *** | 0.03 *** | -0.06 | -0.08 ** |
| | (6.19) | (2.97) | (1.19) | (1.98) |
| Other | 0.03 ** | -0.02 | 0.08 | -0.21 * |
| | (2.23) | (1.59) | (0.81) | (1.80) |
| Rural | -0.03 * | -0.03 | 0.15 ** | -0.01 |
| | (1.84) | (1.40) | (2.31) | (0.19) |
| # Observations | 82277 | 62475 | 1971 | 1756 |
| R-squared | 0.02 | 0.02 | 0.02 | 0.02 |

Notes -
HMO fixed effect coefficients omitted for brevity.
The z-statistics reported in parentheses are based on Huber-White robust standard errors clustered at the HMO-market level.
The age dummy variables differ across specifications:
In the well-child visit regressions, age dummy 1 corresponds to 3 years, age dummy 2 corresponds to 4 years, age dummy 3 corresponds to 5 years, age dummy 4 corresponds to 12-15 years, and age dummy 5 corresponds to 16-18 years.
In the asthma medications regressions, age dummy 1 corresponds to 5-7 years and age dummy 2 corresponds to 10-14 years.
*** - 99% confidence level, ** - 95% confidence level, * - 90% confidence level