Pharmaceutical cost growth under capitation: a case study

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Pharmaceutical Cost Growth Under Capitation: A Case Study

The need to balance competing pressures could keep capitation from being the “magic bullet” that contains the growth in costs.

by Michael Chernew, Mark E. Cowen, Duane M. Kirking, Dean G. Smith, Paul Valenstein, and A. Mark Fendrick

ABSTRACT: Rising drug spending has generated concern among purchasers and policymakers. This paper compares drug cost growth in a capitated system with that in managed care systems that generally did not place physicians directly at risk for drug spending. We focus on cost growth because a substantial body of literature indicates that managed care interventions that reduce the level of costs may not influence the rate of cost growth. Drug cost growth under capitation initially was below that of other systems but still above targeted rates. Over time the capitation rates rose, the amount of risk transferred to physicians declined, and spending growth accelerated.

Spending for prescription drugs rose at double-digit rates throughout much of the 1990s and accounted for 55 percent of the growth in private health insurance payments since 1990. In response, many insurers have adopted strategies to restrain drug spending. A variety of studies since the 1980s confirm that the level of drug spending can be affected by benefit limits, copayments, generic substitution, formularies, and other managerial interventions. Relatively little is known, however, about managed care plans’ ability to control the growth in drug spending. This distinction between the level of spending and growth in spending is important. Numerous studies support the notion that managed care plans have a greater effect on the level of spending at any point in time as opposed to the rate of change in spending over time. Managed care

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plans typically provide relatively generous drug coverage, employing only modest copayments, but use other mechanisms such as capitation or formulary restrictions to constrain costs. In recent years patient cost sharing and rebates from drug companies have become increasingly important elements of cost containment.

This study examines drug cost growth in a setting in which physicians were capitated for their spending on drugs. Managed care plans have placed physicians at financial risk for other health care services, to control their use. However, the impact of capitation on growth in spending for prescription medications (which reflects prescribing patterns and “fill rates”) has not been studied as widely and is of growing interest.

Two aspects of the analysis are worth noting at the outset. First, growth in drug spending is not necessarily undesirable. Such spending may reduce spending on other types of health care services and, more importantly, may improve health outcomes. Second, although the data we present would allow cross-sectional comparisons between capitated and noncapitated settings, we do not have sufficiently detailed clinical or physician controls to state with confidence that capitation did or did not affect spending levels.

Framework. When physicians are placed at risk for spending, health plans can control the growth of their own spending by controlling changes in the level of capitation (how much money is paid to physicians to cover the capitated services). We emphasize real changes in drug spending as opposed to changes in the amount budgeted for drugs by the health plan.

In analyzing cost growth under capitation, it is important to distinguish between two aspects of capitation: the transfer of risk to physicians, and the level of the capitation rate. Under capitation, physicians have an incentive to prescribe fewer (and less expensive) pharmaceuticals, irrespective of the capitation rate. To the extent that physicians perceive that savings will lead to future decreases in the rate, the effect of the risk transfer will be dampened. The level of capitation also may affect behavior. Physicians with higher capitation rates may be less inclined to limit patients’ drug use if doing so requires effort or creates discomfort with practice patterns. Moreover, with higher capitation rates, physicians who compete for patients may prescribe more freely in the face of patient demand.

Study setting. The primary data for this study come from a physician-hospital organization (PHO) in the upper Midwest in 1995–1999. In 1999 this PHO covered approximately 100,000 enrollees. It received capitated payments, largely from a single insurer, and it represents a middle tier in a multitier managed care arrangement. The insurer passes the risk to the PHO through capitation.
The PHO in turn passes the risk on to providers (hospitals, physician groups, and physicians) through risk pools designed to cover specific services such as obstetric care, surgery, primary care, and pharmacy. Although the PHO assumed risk for all health care spending as early as 1990, risk was first transferred to physicians in 1996.

As with many multitier arrangements, in this PHO complex formulas allocate risk to providers. For drugs, every primary care physician receives a “target” drug spending amount for the set of members who select that physician as their primary caregiver. The target is expressed as a per member per month (PMPM) amount (capitation rate) and is based on a negotiated base rate for drug spending for all physicians and adjusted for case-mix of individual physicians using regression methods. The base rate is renegotiated each year.

At the end of each year, actual drug expenditures are computed for every patient, regardless of whether the patient’s primary physician, a specialist, or even another patient’s primary physician wrote prescriptions for the patient. For 1996 through 1998 the primary physician assigned to a patient was responsible for a negotiated percentage of the difference between actual expenditures and targets. In 1996 and 1997 this percentage was 70 percent. In 1998 it was lowered to 55.6 percent, and a small portion of the gap was financed from hospital funds. In 1999 physicians were no longer at risk if spending exceeded the target but shared 40 percent of the savings if spending fell below it.

In 1997 and 1998 selected drugs considered to be for “preventive” use were removed from the capitation system (that is, risk was retained at the PHO level). Most notable among these were cholesterol-lowering agents. These drugs were reintegrated into the capitation system in 1999, after downside risk was removed.

In some cases, the physician group employing a physician could dampen incentives (essentially self-insuring at the physician-group level). Capitated patients from this PHO represented about 40 percent of physician practices. Although there was some moderation of incentives through self-insuring, physician groups were generally small, ranging from eleven to seventy-three primary care physicians (median size, 18; mean size, 30.3). The relatively small group size limits the spreading of risk: Some physicians had to pay thousands of dollars as a result of larger-than-budgeted (although perhaps medically justifiable) drug spending.

Physicians in this system faced considerable risk for drug spending by enrollees on their panel, at least through 1998. Like most “capitation” systems, this system does not represent pure capitation. As is common, the deviations from pure capitation were designed to place bounds on the amount of risk transferred to physi-
cians. The details of these rules and institutions vary across systems, so there is no ideal setting in which to study capitation.

**Study samples.** We analyzed two separate samples. The first is based on annual cohorts of about 70,000 privately insured enrollees, continuously enrolled during each year. This eliminates the effects of any biased entry or exit from the plan during each year, which was minimal. The second is a cohort of enrollees continuously enrolled between 1997 and 1999. This sample controls for nonrandom enrollment or disenrollment during the study period.

Identifying the appropriate control group is difficult. We selected several, each with advantages and disadvantages. First, we used data from patients enrolled with the insurer dominant in the PHO but located in parts of the region that the PHO does not cover. The insurer did not place physicians serving these patients at risk for drug spending. Moreover, the insurer used the same pharmacy benefit manager (PBM) for these patients and the PHO patients. Thus, drug prices for these patients were the same as those paid by patients in the PHO. As in the PHO, the administrative cost containment and quality improvement initiatives that might affect drug spending were ongoing. We do not have detailed information on whether these were more prevalent in the capitated setting, although incentives would suggest that they might be. We view these as potential responses to financial incentives; thus, our conclusions reflect both the financial incentives placed on physicians and the variation in administrative activity that could reflect those incentives.

One drawback associated with this control group is data problems with the 1996 administrative data. Moreover, in 1999 this group experienced a change in demographics, so that trends in pharmacy spending likely reflect case-mix changes. Because of the 1996 data issues, we estimate 1996/1997 growth rates using internal documents produced at that time. To estimate the drug spending growth rates between 1997/1998 and 1998/1999 we used data from a cohort of persons enrolled continuously during 1997–1999. This sample did not suffer from the bias as a result of selective disenrollment in 1999. The relevant comparison for this group is the three-year cohort data from the capitated group. Despite these issues, we consider this group to be our primary control group because prices and the PBM were the same as in the capitated group.

As a second control group, we used HMO pharmacy data from a large national employer with employees concentrated in areas served by the PHO. Data were drawn from eight reporting health maintenance organizations (HMOs). Because of coordination-of-benefits issues, analysis was limited to approximately 120,000 active employees. We compared drug costs in this group to those in the
capitated PHO sample that used annual samples as opposed to a cohort sample. Because of benefit design issues and case-mix differences, one should be wary of comparisons of drug spending at any point in time. However, the impact of case-mix on growth in drug spending will likely be less than on the level of spending.14

National data on HMO pharmaceutical spending provides the final control.15 We selected the Novartis Pharmacy Benefit Reports because, collectively, they provided longitudinal data specific to HMOs. Because of potential variation in the sample, we examined whether our conclusions would be affected by other national data that represented only selected years or included broader plan types. The national data reflect regional variations in prescribing and fill rates as well as variations in benefit design, prices, and case-mix. Thus, as with the large-firm data, one should be wary of comparisons of the level of spending at any point in time.

**Study Results**

The capitated group was demographically similar to the patients enrolled with the same insurer but not in the PHO (primary control group) (Exhibit 1). The capitated group was modestly older and contained a slightly higher percentage of men. Because of the aging of the cohort, the cost growth in these groups will exceed that in the general population.

Every enrollee in both groups had a pharmacy copayment.16 We computed the average dollar amount enrollees paid per prescription in both groups for each year. Almost all enrollees had a single-tier, flat-fee copayment (for example, $5 per prescription) or a tiered copayment (for example, $5 per generic drug and $10 per brand-name drug) Some paid a percentage of the prescription cost. In the capitated group, the average enrollee copayment amount was slightly below $5 per prescription and rose slightly during the study period. In the control group, the average copayment was about 50

**EXHIBIT 1**  
Demographics Of Patients In The Three-Year Study Cohorts, 1997

<table>
<thead>
<tr>
<th>Age (years)</th>
<th>Capitated group</th>
<th>Primary control group</th>
</tr>
</thead>
<tbody>
<tr>
<td>0–18</td>
<td>32.7%</td>
<td>33.6%</td>
</tr>
<tr>
<td>19–30</td>
<td>10.1</td>
<td>11.2</td>
</tr>
<tr>
<td>31–45</td>
<td>28.8</td>
<td>30.6</td>
</tr>
<tr>
<td>46–64</td>
<td>28.4</td>
<td>24.5</td>
</tr>
<tr>
<td>Mean age (years)</td>
<td>31.3</td>
<td>30.4</td>
</tr>
<tr>
<td>Percent male</td>
<td>48.4%</td>
<td>46.8%</td>
</tr>
<tr>
<td>Covered lives</td>
<td>52,914</td>
<td>18,419</td>
</tr>
</tbody>
</table>

**SOURCE:** Primary data collected by the authors from delivery systems.
percent higher and rose slightly faster (Exhibit 2).

Physician visit copayments might affect pharmaceutical use. Again, the capitated group had lower physician copayments, although both groups experienced a similar increase in average copayment (Exhibit 2). Because the changes in copayments were reasonably modest and similar between groups, we do not expect that they greatly affected changes in utilization.

The data from the large employer reflect a much higher age distribution because only active workers were included. We did not have access to the precise age/sex mix of this population. Employee drug copayments in the HMOs during the study period were generally stable. The data reflect national averages for benefit design and demographic mix as well as geographic distribution of HMO enrollees. Again, enrollees were shouldering more drug spending over the study period, which would tend to slow drug spending growth.17

We focus on the growth rate for pharmaceutical spending (Exhibit 3).18 Drug spending in the capitated group was 6.65 percent higher in 1996, the first year of capitation, relative to the spending in 1995. Similarly, 1997 spending, reflecting the second year of capitation, was about 6.5 percent higher than 1996 spending. These growth rates are lower than those for all comparison groups.

The evidence for 1997–1999 is mixed regarding cost growth under capitation. Relative to the prior two years, spending growth was much more rapid (16.36 percent and 13.15 percent). The three-year cohort data reveal a higher rate of spending increases than do the data based on one-year cohorts, at least partly as a result of aging.

For both 1998/1999 and 1997/1998 the capitated group had slightly lower spending growth than the primary control group had. In 1998/1999, when downside risk was removed, spending growth in the capitated group was less than one percentage point below that in the primary control group. For 1997/1998 the capitated group had lower spending growth than the large-firm control group did. However, spending growth in the capitated group was more rapid than in the national control. It also exceeded the 15.4 percent reported nationally by Katharine Levit and colleagues and the 8.9 percent cost

### EXHIBIT 2
Enrollee Copayments For Prescription Drugs, Three-Year Study Cohorts, 1997–1999

<table>
<thead>
<tr>
<th></th>
<th>Capitated group</th>
<th>Primary control group</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1997</td>
<td>1999</td>
</tr>
<tr>
<td>Average copay per prescription</td>
<td>$4.48</td>
<td>$4.88</td>
</tr>
<tr>
<td>Average physician office copay</td>
<td>5.90</td>
<td>6.26</td>
</tr>
</tbody>
</table>

**SOURCE:** Primary data collected by the authors from delivery systems.
growth for HMOs reported for 1998 by the Segal Company.\(^1\)

Exhibit 4 presents more detailed analysis of practice-pattern changes in the capitated group. Dollars per prescription rose in both periods, but about 80 percent more rapidly in the 1997–1999 period. This likely reflects a change in the medications being prescribed, not a change in their prices. It also may reflect greater use of mail-order distribution or generic medications in the earlier period. Our data cannot distinguish among these effects.

The number of prescriptions rose only modestly between 1995 and 1997 but rose more rapidly when capitation was relaxed. For both periods this rise reflected primarily an increase in intensity

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**EXHIBIT 3**

**Growth In Drug Expenditures, 1996–1999**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Capitated group</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Target (PMPM)</td>
<td>–a</td>
<td>1.00%</td>
<td>16.50%</td>
<td>16.92%</td>
</tr>
<tr>
<td>Actual PMPM (all enrollees)</td>
<td>6.65%</td>
<td>6.51%</td>
<td>16.36%</td>
<td>13.15%</td>
</tr>
<tr>
<td>Actual PMPM (three-year cohort)</td>
<td>–</td>
<td>–</td>
<td>18.86%</td>
<td>20.32%</td>
</tr>
<tr>
<td><strong>Primary control group, actual PMPM</strong> (three-year cohort)</td>
<td>–</td>
<td>19.70b</td>
<td>22.97</td>
<td>21.03</td>
</tr>
<tr>
<td><strong>Large-firm HMO population, actual PMPM</strong></td>
<td>–</td>
<td>12.18</td>
<td>21.27</td>
<td>–</td>
</tr>
<tr>
<td><strong>National HMO control group, actual PMPM</strong></td>
<td>22.60</td>
<td>9.18</td>
<td>10.66</td>
<td>–</td>
</tr>
</tbody>
</table>

**SOURCE:** For all but the national control, the data are primary data collected by the authors from delivery systems. The national data are based on information from Novartis Pharmacy Benefit Report, Facts and Figures, 1996–1999.

**NOTES:** Growth rates represent the change in per member per month (PMPM) spending in the given year relative the preceding year. HMO is health maintenance organization.

a Not capitated in 1995.
b The 1997 growth rate is based not on the three-year cohort but on internal insurer documents.

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**EXHIBIT 4**

**Pharmaceutical Utilization Indicators For The Capitated Study Group, 1997–1999**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Dollars per prescription</td>
<td>$30.75</td>
<td>10.2%</td>
<td>18.6%</td>
</tr>
<tr>
<td>Number of prescriptions(^a)</td>
<td>0.69</td>
<td>3.1</td>
<td>11.1</td>
</tr>
<tr>
<td>Percent of patients with at least 1 prescription</td>
<td>70%</td>
<td>–1.5</td>
<td>1.9</td>
</tr>
<tr>
<td>Prescriptions per patient with at least 1 prescription</td>
<td>$11.75</td>
<td>4.7</td>
<td>8.9</td>
</tr>
<tr>
<td>Spending on antibiotics(^a)</td>
<td>$2.57</td>
<td>–29.0</td>
<td>13.1</td>
</tr>
<tr>
<td>Spending on antiproliferics(^a)</td>
<td>1.10</td>
<td>44.8</td>
<td>63.4</td>
</tr>
<tr>
<td>Spending on analgesics(^a)</td>
<td>1.59</td>
<td>–11.1</td>
<td>16.0</td>
</tr>
<tr>
<td>Spending on antidepressants(^a)</td>
<td>2.03</td>
<td>58.9</td>
<td>32.4</td>
</tr>
<tr>
<td>Spending on antihistamines(^ab)</td>
<td>1.38</td>
<td>32.9</td>
<td>35.5</td>
</tr>
<tr>
<td>Spending on antiulcer agents(^ab)</td>
<td>2.39</td>
<td>7.1</td>
<td>24.2</td>
</tr>
<tr>
<td>Spending on cardiovasculars(^a)</td>
<td>2.42</td>
<td>9.4</td>
<td>16.1</td>
</tr>
</tbody>
</table>

**SOURCE:** Primary data collected by the authors from delivery systems.

\(^a\) Per member per month.

\(^b\) Antiulcer agents include H2 receptor antagonists and proton pump inhibitors.
(prescriptions per enrollee with at least one prescription filled), as opposed to an increase in access (the likelihood that an enrollee would receive, and fill, at least one prescription).

Exhibit 4 also provides detail on all drug categories with more than 5 percent of 1995 expenditures in the study group. In some categories there were dramatic differences between the two periods. Some of these differences reflect the timing when certain products were introduced. For example, Lipitor, an anticholesterol agent, was introduced in 1997, and Celebrex, a cox-II inhibitor, in 1999. However, certain categories are more likely to be affected by capitation. For example, under the stronger capitation regime of 1995–1997, spending on antibiotics (commonly thought to be overused) dropped. As capitation weakened, spending on antibiotics began to rise.

Discussion

Drug spending in the PHO setting we studied was relatively low in the first year of capitation, compared with controls. However, as the capitation rate rose and then as risk transfer was diminished, spending growth accelerated to the double-digit rates that have worried purchasers and policymakers alike. There are several reasons why significant drug cost growth existed under capitation. A relatively low percentage of physician income was at risk from capitation of pharmaceuticals. Moreover, forces such as patient demand or the threat of litigation might promote cost growth even in a capitated system. To the extent that physicians consider increased drug spending medically appropriate, they will likely resist constraints on prescribing. Finally, capitation-related losses for providers created pressure on negotiations to increase the capitation rate and relax the transfer of risk.

Study limitations. This study has several limitations. Most notably, we examined only one capitated system, so we cannot comment on whether these findings are generalizable. Moreover, our several control groups each had limitations. For example, the 1995–1996 growth rate in the national control group seems relatively large. However, other benchmarks, which either did not pertain exclusively to HMOs or did not provide more recent data, support the conclusion that cost growth was lower in the capitated group during this period.

A second limitation is that we lack data prior to capitation. Thus, our conclusions are based on a comparison of cost growth under capitation with that in other systems, not in the same system. This design cannot control for differences in underlying trends between the capitated group and control groups. Monitoring of trends over a
broader time frame would allow stronger conclusions to be made regarding the impact of capitation on spending growth.

A third limitation is that, because of constraints on availability of data, analysis was conducted at the system level. This prevented us from more detailed comparison of case-mix differences. This is particularly problematic for the large employer and national control groups. This limitation also prevents us from computing standard errors. More detailed analysis is needed to identify the impact of case-mix adjustments on our conclusions.

A fourth limitation is that we could not address the impact of capitation on overall health care spending. Physicians might have prescribed more to save in other areas. This would imply an offset between drug spending and other health care spending. Although this is conceivable, the capitation system was such that for any patient, the physicians who prescribed would not necessarily be the same ones to gain from savings from that patient in other spending areas, because of different risk pools. This effect is compounded by the time lag between drug spending and realization of gains associated with savings in other types of health services.

Finally, we could not assess the impact of capitation on health outcomes. Many new products are more effective than existing alternatives, at least for a subset of patients, and may be worth the added expenditure. Given the aggregate nature of our data, we cannot assess the extent to which slower spending was appropriate or whether necessary care was denied. Financial incentives such as capitation are not targeted to reduce only care of minimal medical value, although administrators clearly hoped that physicians would respond that way. Actions by the PHO, such as removal of prevention drugs from the risk pool, were intended to mitigate any harm related to reduced pharmaceutical spending. Moreover, circumstantial evidence, such as the reduction in antibiotic spending, suggests that reduction in use was taken from categories that may have been overused. More detailed analysis of prescribing patterns and outcomes is required to convincingly address this issue.

Despite these limitations our study provides a unique look at growth in drug spending under capitation. It appears that capitation, for a period, was associated with slower spending growth. However, in the capitated system—and, we imagine, in many similar systems—administrators believed that it was not feasible to hold the line on capitation rates and remain attractive to primary care physicians and enrollees. The changes in capitation rates reflect the PHO’s balancing of competing interests: a desire to address physicians’ concerns over their income and their ability to
practice medicine as they wish, enrollees’ desire for access to the
latest medications, and payers’ desire for lower premiums. Physi-
cians still had the incentive to limit utilization, but they were given
sufficient funds to allow utilization to grow without loss of income.
Although health plans could directly control growth in spending by
keeping the capitation rate constant, pressure from physicians and
enrollees demanding services may make that difficult. Some evi-
dence suggests that similar forces are responsible for rising health
care spending (for all services) in nationalized health care systems. 23
If these pressures continue, capitation may not be the magic bullet
by which health care cost growth will be contained.

The authors gratefully acknowledge the assistance of Lori Kostoff, who provided
valuable insight regarding the details of the study setting and data regarding na-
tional trends in pharmaceutical utilization. They also thank David Dusseau, who
helped to clarify the details of the incentive system and issues with the administrative
data; MEDSTAT, for providing necessary data; and the Health Care Quality Con-
sortium at Ford Motor Company, for their assistance with this work.

NOTES
1. C. Copeland, Prescription Drugs: Issues of Cost, Coverage, and Quality, EBRI Issue
Brief 208 (Washington: Employee Benefit Research Institute, April 1999).
“Taming the Rx Monster,” Business and Health (August 1999): 9–10; and D. Bark-
holz, “The Cost Prescription: More Workers Being Asked to Write a Check to
3. See, for example, J.P. Weiner et al., “Impact of Managed Care on Prescription
Incentives and Drug Spending in Managed Care,” Health Affairs (Mar/Apr 1999):
189–200; D.M. Cromwell, “Can Restrictions on Reimbursements for Anti-
Ulcer Drugs Decrease Medicaid Pharmacy Costs without Increasing Hospi-
talizations?” Health Services Research (February 1999): 1593–1610; S.B. Soumerai
et al., “Effects of a Limit on Medicaid Drug-Reimbursement Benefits on the
Use of Psychotropic Agents and Acute Mental Health Services by Patients
650–655; E.J. Keating, “Maximizing Generic Substitution in Managed Care,”
Journal of Managed Care Pharmacy (Nov/Dec 1998): 1–7; and D.G. Smith, “The
Effects of Co-Payments and Generic Substitution on the Use and Costs of
4. J.P. Newhouse, “Has the Erosion of the Medical Marketplace Ended?” Journal of
Health, Politics, Policy and Law 13, no. 2 (1984): 263–268; and M.E. Chernew et al.,
“Managed Care, Medical Technology, and Health Care Cost Growth: A Re-
view of the Evidence,” Medical Care Research and Review (September 1998):
259–288.
5. R.H. Miller et al., “Managed Care Plan Performance since 1980: A Literature
1512–1519; and D.M. Oleske et al., “A Comparison of Capitated and Fee-for-Service
Medicaid Reimbursement Methods on Pregnancy Outcomes,” Health Services
6. J. Lexchin, “Improving the Appropriateness of Physician Prescribing,” Interna-
7. In some systems, including the one we studied, hospitals share some of the risk with physicians. We emphasize physicians’ role because they bear most of the risk and have the most direct control over pharmaceutical use.


9. The case-mix adjustment is based on data from the PHO and uses age and sex, as well as diagnostic categories from the Clinical Classification for Health Policy Research (CCHPR) to predict expenditures. The CCHPR was developed by Anne Elixhauser at the Agency for Health Care Quality and Research. For a more detailed description, see M.E. Cowen et al., “Case-Mix Adjustment of Managed Care Claims Data using the Clinical Classification for Health Policy Research Method,” Medical Care 36, no. 7 (1998): 1108–13. The R-square from these regressions was between .2 and .3.

10. Rebates from drug manufacturers are not included in the risk model or in the figures we present. This treatment is consistent among all of the comparisons.

11. Throughout this period, extremely high expenses incurred by individual patients were covered by a stop-loss/outrlier protection program funded by the entire network of physicians. The stop-loss provisions were based on spending from individual risk pools and aggregate spending. The provisions generally were calculated per patient. The provisions were very detailed, but in general risk to physicians or their groups was limited if the gap between actual spending and targets exceeded $20,000 for all services for which they were at risk.

12. The drop in sample size from about 100,000 enrollees to a sample of about 70,000 reflects exclusion of publicly insured enrollees and the requirement for continuous enrollment throughout the year.

13. The data available for 1997 were only as of June 1997, so we computed cost growth based on the first half of each year.

14. To the extent that pharmaceutical innovations were targeted to specific disease areas more heavily represented in certain populations, those populations would experience greater cost growth. Moreover, if case-mix differences are not constant over time, case-mix changes will affect cost growth.


16. Copayment amounts were negotiated by the health plan and employers separately from the capitation rates negotiated by the health plan and the PHO.

17. Copeland, Prescription Drugs.

18. An appendix containing spending levels is available from the authors on request. Send e-mail to Michael Chernew, <mchernew@umich.edu>.


21. There was no formal cap on the percentage of income at risk. Stop-loss provisions were applied per patient, so technically a substantial amount of income could be at risk. However, PHO administrators would not anticipate a physician’s losing more than 20 percent of his or her income in a worst-case scenario.
