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COST MANAGEMENT ACTIVITIES OF PPOs

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ABSTRACT

Insurance coverage through preferred provider organizations (PPOs) now dominates the market for health insurance, covering more than 40 percent of insured employees. Yet there are few analyses of PPO performance, much less of how PPOs achieve results and report these results to employers. This article presents accounting-based reports of PPO cost savings that result from management activities and features regression analysis of costs among plan designs. On average, accounting-based reports of *average* cost savings (10 percent of total cost) are only two-thirds as large as regression-based estimates of *incremental* cost-savings (14 percent of total cost). Further, the correlations between accounting-based reports and regression-based estimates are quite low. Accounting-based reports should be viewed as complementary evidence on plan performance, not as a substitute for statistical analysis.

INTRODUCTION

Although preferred provider organizations (PPOs) were virtually nonexistent in 1980, they grew to cover 20 percent of persons by 1990 and 40 percent of persons by 1998 (Prospective Payment Assessment Commission, 1990; Rauber, 1999). PPOs have grown as a financing alternative by providing a more tightly managed approach to financing medical services than traditional indemnity plans, but a less restrictive approach than health maintenance organizations. Analysts of the healthcare market suggest that PPOs need more justification of cost control over traditional plan designs if their rate of growth is to be sustained (Rice et al., 1990).

Most evaluations of PPOs' effectiveness have used case studies. One case study found that a single employer's outpatient costs were similar for employees using PPO and non-PPO providers (Wouters, 1990). Another study of a single PPO found that out-

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patient charges and hospitalization rates were similar for employees using PPO and non-PPO providers (Diehr et al., 1990). A study of three employers' experiences with PPOs found lower total costs for one of the employers and mixed results for the two other employers (Hosek et al., 1990). A report of one insurer's experience suggested that PPOs saved 11 percent relative to traditional plan designs (Johnson, 1994). A study involving a national chain of PPOs found savings of 12 percent over traditional plans, with most of the savings being attributed to reduced utilization (Smith, 1998). At a market level, the growth of PPOs has been associated with hospital cost containment (Bamezai et al., 1999). Finally, to the extent to which premiums are based on medical service costs, in addition to administrative costs and supply and demand factors, PPOs have a \$300 per person per year premium advantage over indemnity plans with utilization review and a cost growth trend of 10 percent versus 12 percent (DataWatch, 1999; Buck, 1999).

Insurers have developed accounting-based systems of cost reporting to monitor and report costs internally and to purchasers. One common component of many accounting-based systems is a section on cost saving associated with specific cost management activities. Activities include payment denials, application of coinsurance differentials, preferred provider contract discounts, and other actions that reduce payments. These estimates are often based on the assumption that providers do not respond to cost management activities. For example, the amount charged for a visit to a network provider may be multiplied by the agreed-on discount percentage to yield provider "cost-savings." An assumption that providers do not alter the number of visits or the charge per visit might be quite reasonable when managed care plans are in the distinct minority. However, as managed care plans grow in market share, the significance and reality of reported cost savings may be called into question (Boland, 1985).

Some but not all cost management activities have been examined for true cost savings. Investigations of utilization review programs have found that this activity is associated with cost savings of 4 to 6 percent over plans without utilization review (Khandker et al., 1992; Wickizer, 1990). Reports that include utilization review savings are useful in quantifying the results of PPOs' activities but may not represent the unique differential cost savings of PPOs over indemnity plans with utilization review. No published studies are available on PPOs' unique cost management characteristics, namely (i) a restricted panel of providers, (ii) a restricted set of covered benefits, and (iii) acceptance of a particular fee schedule. Further, it is not known whether preferred provider contracting affects the effectiveness of utilization review and other cost management activities.

Separating the real cost savings associated with PPOs from utilization management alone and other types of cost management is often addressed with statistically based analysis, especially multiple-regression analysis. Valid statistical analysis should compare costs associated with enrollment in PPOs to costs that a similar population would incur if enrolled in a non-PPO benefit plan. True cost-savings estimates are thought to require control for other factors that influence costs, such as the features of the benefit plan and demographic characteristics of employees, employers, and the markets in which care is received. Relating to the unique characteristics of PPOs listed above, data are not generally available on (i) style of practice characteristics for a restricted panel of providers or (ii) the administrative operations that lead to a re-

stricted set of covered benefits. However, PPOs typically contract with physicians on a fee schedule or discounted fee-for-service basis (Hoechst Marion Roussel, 2000).

The purpose of this article is to report and compare the cost-savings reports from an accounting-based system and estimates from statistically based analysis of a set of PPOs. Despite the use of the terms "real" and "true" in the preceding paragraph, the authors do not suggest the superiority of regression analysis over accounting-based reports in evaluating the effectiveness of PPOs (although most methodologists would argue that statistical analysis is superior to accounting-based reports in terms of demonstrating carefully controlled marginal effects). Rather, the authors merely present a comparison of two sets of numbers and examine the differences between them. An accounting-based method is quick and easy to implement and may have intuitive appeal. The statistical approach can be time consuming and costly and requires a high level of sophistication to interpret. If the findings of both methods arrive at similar conclusions, good reason exists for having the accounting-based reports, perhaps as a substitute for statistical analysis. If the findings yield different conclusions, caution should be employed in the interpretation of reports, and both sources of information should be provided as complements to one another.

This type of comparison is analogous to comparisons of accounting reports of corporate earnings and analyses of stock price changes. A long line of literature, much having been stimulated by Ball and Brown (1968), suggests that accounting information is correlated with "real" stock market results and that it is useful since financial markets are not fully strong-form efficient. Accounting information does not fully reveal the value of the firm for either equity markets or debt markets (Ingram and Copeland, 1984). But there is still a demand for accounting information, a demand that varies based on a variety of firm characteristics (Chow, 1992). In the same way, the accounting-based reports may not provide the same information as statistical analyses of cost data, but there is still a demand for demonstrating activities. And, a close relationship between the accounting-based reports and statistical analyses would enhance the value of the accounting-based reports.

Thus, the two questions addressed in this article are: (1) what are the cost savings derived from accounting-based reports and statistically based methods and (2) what is the association between these two estimates?

DATA AND METHODS

Data for this study come from 1,365 small and mid-sized employer groups that purchased insurance from a single national managed-care company that served most states in 1989 and 1990. In the study, 112 employer groups were enrolled in traditional health insurance plans without utilization review, 726 employer groups had indemnity plans with utilization review, and 527 employer groups were enrolled in one of 13 large PPOs or 57 smaller PPOs. The unit of analysis is the employer group, which includes covered employees of a firm and their dependents. The sample only includes employer groups where employees and dependents were not given choices among alternative plans, therefore eliminating the possibility of individual self-selection (Brown, 1992; Brown and Doeringhaus, 1993). To employees of large firms, choice of health plans is common. At small and medium-sized firms, most employees do not have choices (Cutler, 1995; Cantor et al., 1995). The median employer group

size was 285 covered lives. Still, employers might select PPO plans based on a non-random process; thus, this study would not necessarily represent the experience of a random sample of employers (Wickizer, Travis, and Feldstein, 1998). Caution should be taken in the application of results from this study to other populations, particularly to populations in which individuals have choices among a range of health plans.

This study uses two separate but related sources of information: (1) an accounting-based report using initial entry of claims and (2) a completed, closed claims file. (Although a number of changes are made to claims in the adjudication process, the use of initial entry claims versus completed, closed claims does not make a material difference in results.) Accounting-based reports were prepared for a limited number of the employer groups—only groups that experienced accounting-based savings during the year. Therefore, groups with no accounting-based savings, and by implication, groups with no incurred claims, are not included in the sample. As a result, mean claims costs for the sample (\$3,565 per person per year) are higher than mean per capita claims costs for all groups enrolled by the managed care company in 1989 and 1990. In essence, many small employers are excluded from this analysis.

Other data from the insurer's files include basic demographic data on the groups covered: number of lives covered, industry of the employer, and percentage of lives that are female and dependents. In addition, a crude adjustment is included for case mix. Case mix is measured as the percentage of claims that are in different diagnostic categories: surgery, tumors and neoplasms, maternity and childbirth, and mental-health services. Other control variables obtained from administrative data include cost-sharing rates and the funding status of the employer—i.e., whether the plan is self-funded (minimum premium plan) or insurer-held.

The data available for this study are unique in a couple of regards. First, accounting-based reports, claims files, and administrative data are available for all groups. No prior studies have presented accounting-based reports. These reports are often used for internal purposes and are not available to investigators. Second, complete and verified counts of employees and dependents are available in the administrative data. Counts of employees and dependents are often available from health maintenance organizations, where counts are required for assignment of primary care providers. Accurate counts of dependents are not always available from other insurance companies. This company underwent an intensive effort to collect accurate counts of covered lives. Only employer groups that had complete files and verified counts of lives were included. One reason that the number of observations is 1,365 (more than 3,500 firms purchased insurance from this company) is the requirement of having accurate counts of covered lives.

Accounting-Based Reports

One component of this study is accounting-based cost-savings reports that aggregate savings at the level of the employer group. Again, in an environment in which PPOs are new, these reports are likely to represent real savings to employers. That is to say, the first company that negotiates a 20 percent discount from hospital charges may realize a true 20 percent reduction in costs. In a more mature managed-care environment, costs and patterns of care may become similar between managed- and nonmanaged-care patients. Furthermore, if activities counted as savings are com-

pletely independent from other activities and services, accounting reports would be perfectly accurate. A dollar saved through the denial of a claim for services deemed inappropriate would be a true dollar saved. However, if a dollar saved through a denial of a specific medicine results in a hospitalization, overall costs may increase. This is the particular example Roemer et al. (1975) used in describing some cost-sharing efforts as "penny-wise and pound foolish." Many healthcare services are complements and substitutes for other services, meaning that accounting reports may under- or overestimate true savings.

The cost management activities included in accounting-based reports are listed in Table 1. Cost savings are divided into three categories. The first category refers to claims for services that are not covered at all or that exceed benefit limits. Claims for these services are entered, but the payment is later denied. Since these claims are entered, the specific service denied is available (prescription drugs, laboratory tests,

TABLE 1
Cost Savings Based on Accounting-Based Reports (per Person per Year)

	Traditional		UR Only		PPO	
	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation
Payment Denials "Specific Service"						
Pharmacy	\$ 0.60	\$ 2.86	\$ 0.42	\$ 3.76	\$ 0.18	\$ 0.44
Laboratory	0.93	2.31	0.70	3.06	0.68	2.92
Radiology	1.41	11.15	0.23	0.97	0.43	1.81
Other Outpatient	6.57	34.84	3.66	11.24	3.47	8.15
Prevention Services	22.97	92.69	10.17	9.21	10.86	12.30
Misc. Services	16.48	52.25	5.17	10.58	6.72	49.28
Benefits (Exam)	11.01	56.73	5.98	20.21	6.73	28.11
Benefits (System)	52.99	159.87	26.94	52.16	32.61	49.57
Subtotal	\$112.96		\$53.27		\$61.68	
Payment Reduced "Cost Sharing"						
Coinsurance Savings	\$170.25	\$ 444.08	\$105.24	\$78.06	\$117.97	\$103.91
Deductibles (Exam)	0.01	0.11	0.06	0.74	0.03	0.20
Deductibles (System)	187.83	1,064.29	74.75	46.42	80.78	53.51
Subtotal	\$358.09		\$180.05		198.78	
Payment Reduced "PPO Contracts"						
PPO Coinsurance	\$ 1.01	\$ 3.61	\$ 0.03	\$ 0.53	\$ 7.17	\$ 8.32
PPO Discount	25.07	93.60	6.68	31.34	75.33	106.17
UR Penalty	3.07	13.79	5.00	6.00	3.88	14.02
Subtotal	\$29.15		\$11.71		\$86.38	
Total Savings	\$500.20	\$1,903.21	\$245.03	\$178.28	\$346.84	\$258.40

X-rays and other radiological service, other medical or surgical services, and preventive services). For other services, claims may never be entered because the claim is identified through a claim processor's investigation of a suspect account (exam) or through a computerized comparison of benefit plan designs with claims (system). These latter sets of benefits include no detail on the specific service denied, but they are known to consist mostly of hospital services. In essence, many of these benefits may be viewed as consumer cost sharing, since the services have been rendered and the provider is likely to bill the patient.

The second category refers to savings associated with coinsurance and deductibles paid by the individual. These are savings to the insurer (and employer) but not the medical care system (assuming that consumers pay providers). Cost sharing is not only associated with reductions in use of services, but also at times an increase in the intensity of visits (Jung, 1998). The net effect of reductions in use and increase in intensity is typically a cost reduction. The relationship between the savings reported from copayments (the cost transfer to employees) and the net cost reduction (cost transfer minus change in use plus change in intensity of visits) is not well known. Cost sharing can be an effective means of cost control but may not be preferred to more selective means employed by managed-care plans.

The third category refers to savings from provider contracting activities. These savings are at the core of PPO cost-savings claims. Saving for PPOs can arise from (1) higher coinsurance charges for use of providers not in the preferred panel, (2) contractual discounts from providers in the preferred panel, and (3) utilization review (UR) penalties for use of providers not in the preferred panel.

Regression Methods

The statistical method employed for estimating the effects of insurance plan type on claims payments is regression analysis of expenditures per person per year with controls for employer and employee characteristics, healthcare market characteristics, and plan design features. This same method was used in a related study of the effects of PPOs on overall use and costs (Smith, 1998). As with most studies of health insurance claims, per capita spending data for employer groups tend to be highly skewed. Because a significant fraction of the groups do not incur any claims in a given quarter, no spending can be observed from these groups—a phenomenon known as censoring. Failure to account for censored observations leads to biased estimates of the potential savings (or costs) of the group's characteristics (Achen, 1986).

The analysis accounts for the skewness of the distribution in costs and censoring using a two-part model. First, a probit model is calculated to determine factors that affect the likelihood of a group incurring any claims. Although the comparisons include only employer groups with accounting-based savings, the regression method is based on all available observations on a sample of 1,977 employer groups. The probit model assumes that an unobserved normally distributed likelihood function results in a dichotomous observed outcome: zero spending or greater than zero spending.

In the second step, only the nonzero claims are included in the regression of independent variables (insurance plan, employer, employee, and market characteristics) on total costs per person per year (the dependent variable). A further complication is the nature of the data pooled over a time series of four quarters. Because repeated

observations on the same groups tend to result in correlations between those observations, they violate the assumptions of standard ordinary least squares regression and potentially lead to biased and inconsistent parameter estimates. After a Hausman test rejected a fixed-effects model to account for heteroscedasticity, the authors estimated a random-effects model to account for the correlation induced by the time series using a Generalized Estimating Equations approach (Zeger and Liang, 1986).

After estimating a set of parameters for the regression model coefficients that eliminated the biases from selection and correlations between observations, the savings from the individual PPOs were estimated by the smearing technique, developed for analysis of the Rand Health Insurance Experiment (Manning et al., 1987; Duan, 1983). The smearing technique takes account of the logarithmic transformation of the dependent variable, which creates inconsistent predictions of the error terms when retransformed to create a dollar savings estimate. Operationally, the smearing estimate incorporates a transformation factor that is the mean of the exponentiated (inverse natural log) residuals of the second step, least squares regression.

RESULTS

The cost savings based on the accounting reports are presented in Table 1. All amounts are presented on a per-person (employees and dependents) per-year basis. Benefits covered by the traditional plans include groups with both high and low benefit options. Benefit denials are more common for traditional benefit plans than for other plans, particularly for the low benefit options. The underlying benefits covered by the utilization review only groups and the PPO groups are nearly identical, and, as expected, benefit denials are similar. Benefit denials averaged \$113 for persons covered by a traditional plan, \$53 for persons covered by a plan with utilization review only, and \$62 for persons covered by a PPO.

Since traditional plans use consumer cost sharing as the only means to control costs (rather than utilization review or provider contracting), cost sharing is much more extensive in traditional plans. Cost sharing averaged \$358 for persons covered by a traditional plan, \$180 for persons covered by a plan with utilization review only, and \$199 for persons covered by a PPO.

As expected, PPOs realize more savings in provider-contracting activities than do other plans. PPO-specific savings average \$29 for persons covered by a traditional plan, \$12 for persons covered by a plan with utilization review only, and \$86 for persons covered by a PPO.

All plans show savings in the PPO-specific savings categories. Investigating these reports was highly time consuming since errors were originally suspected in either accounting systems or patient/employer plan classification. These amounts are not accounting or classification errors. Savings in the traditional and utilization review only plans is attributable to providers' contracting with PPO plans seeing non-PPO patients. Health plans commonly have the same set of providers in networks for different product lines (Gold and Hurley, 1997). Many examiners and systems do not (or cannot) appropriately separate claims for adjudication under PPO or non-PPO contract terms. Providers who are members of a PPO panel and submit claims for their non-PPO patients were sometimes paid the PPO rate, thereby accepting the PPO discount. This has been termed "shadow PPO" savings. Surprisingly, few pro-

viders complained of errors in payments. (Perhaps they were so happy to get paid at all, that being paid a lesser amount than charged was not noticed.)

Based on the information from accounting-based reports only, PPOs and utilization review only plans deny fewer services than traditional plans (reflecting both broader benefit packages and better patient and provider education on benefit packages) and have lower levels of cost sharing than traditional plans. PPOs and traditional plans achieve higher levels of total cost savings than Utilization Review Only plans, mostly through provider discounts. Average cost savings for PPOs are \$347 per person per year. Incremental cost savings for PPOs over utilization review only plans are \$102 per person per year. The incremental cost savings for PPOs as compared to traditional plans are \$153, but this comparison is somewhat less valid, given the differences in plan coverages and cost sharing rates.

Table 2 presents the predicted level of expenditures from the regression model for each of the independent variables along with sample characteristics. The relatively high mean expenditures are attributable to the restriction to groups with accounting-based savings. Again, to obtain the estimated savings from PPOs using the regression model, the authors calculated an estimated regressions of plan design and control variables (independent variables) on expenditures per person per year (dependent variable). The authors then obtained one set of estimated expenditures by including parameters for all of the individual PPOs and another set of estimated expenditures with the PPO coefficients omitted and all other model parameters left the same. This latter model generates an estimate of expenditures if the groups that had been enrolled in PPOs were instead in the default category of utilization review only.

The accounting-based cost savings estimates are presented next to the regression-based savings, by PPO, in Table 3. The accounting-based savings estimates again average \$347, or about 10 percent of estimated expenditures. The statistically based saving estimates average \$505, or about 14 percent of estimated expenditures. However, looking only at the total hides the story. Accounting-based savings range only from 8 to 16 percent, while the regression-based savings range from -1 to 36 percent. In the middle, there is only a four percentage point difference in the estimates. This average applies reasonably to only one-third of the employer groups. For the remaining two-thirds of employer groups, the difference between the savings reports are more than double the average (some positive, some negative), and for one PPO, the difference is four times the average. As depicted in Figure 1, when cost savings are sorted by the regression results, the accounting reports exhibit a much lower slope from lowest to highest.

The simple Pearson correlation between the two estimates is 0.27, which is significantly different from zero ($p < .001$) but not large in an absolute sense. Although a simple correlation permits one to look at the relationship between the two estimates, it does not permit the direct test of whether the accounting-based and statistically based estimates may be used as proxies for one another. However, results for a series of four common nonparametric tests for differences between the two estimates by PPO yield similar results (analysis of variance, a Wilcoxon 2-Sample Test, a Kruskal-Wallis Test and a Median Score Test). The relationship between accounting-based reports and statistically based estimates of cost savings is not strong.

TABLE 2
Sample Characteristics and Predicted Expenditures

	Predicted Expenditures		N	Percent of Sample
	Mean	Std. Dev.		
Industry				
Manufacturing	3,051	1,587	439	32%
Agriculture/Mining	3,585	1,733	46	3%
Construction	3,887	1,775	77	6%
Transportation	3,584	1,915	94	7%
Wholesale	3,416	1,750	165	12%
Retail	3,253	1,755	94	7%
Finance	3,771	1,787	120	9%
Services	4,271	1,986	321	24%
Mean Age of Covered Employees				
Younger than 35	4,094	1,615	634	47%
Between 35-39	2,506	1,481	539	40%
Older than 39	4,847	1,871	183	13%
Minimum Premium Plan				
Not MPP	3,690	1,864	1,156	85%
MPP	2,840	1,445	200	15%
Submission of Claims				
Employee submits	3,552	1,872	1,006	74%
Employer submits	3,600	1,717	350	26%
Coinsurance Rate				
80% coinsurance	3,649	1,836	1,082	80%
Not 80%	3,230	1,785	274	20%
Percentage of Covered Lives That Are Female				
<20	3,632	1,730	59	4%
20-39	3,853	1,628	120	9%
40-59	4,005	1,732	356	26%
60-79	3,237	1,921	601	44%
80-100	3,569	1,709	220	16%
Percentage of Covered Lives That Are Dependents				
<20	3,897	1,917	147	11%
20-39	3,708	1,924	386	28%
40-59	3,545	1,803	445	33%
60-79	3,359	1,736	313	23%
80-100	3,082	1,548	65	5%

Continued on next page.

TABLE 2, CONTINUED
Sample Characteristics and Predicted Expenditures

	Predicted Expenditures		N	Percent of Sample
	Mean	Std. Dev.		
Region				
New England	3,443	1,717	28	2%
Mid Atlantic	3,523	1,371	51	4%
South Atlantic	3,893	1,794	375	28%
West South Central	3,763	1,826	133	10%
East South Central	2,310	1,538	55	4%
West North Central	2,012	1,236	67	5%
East North Central	3,357	1,766	332	24%
Mountain	2,539	1,491	38	3%
Pacific	4,058	1,878	277	20%

FIGURE 1
PPO Savings Based on Regressions and Accounting Reports

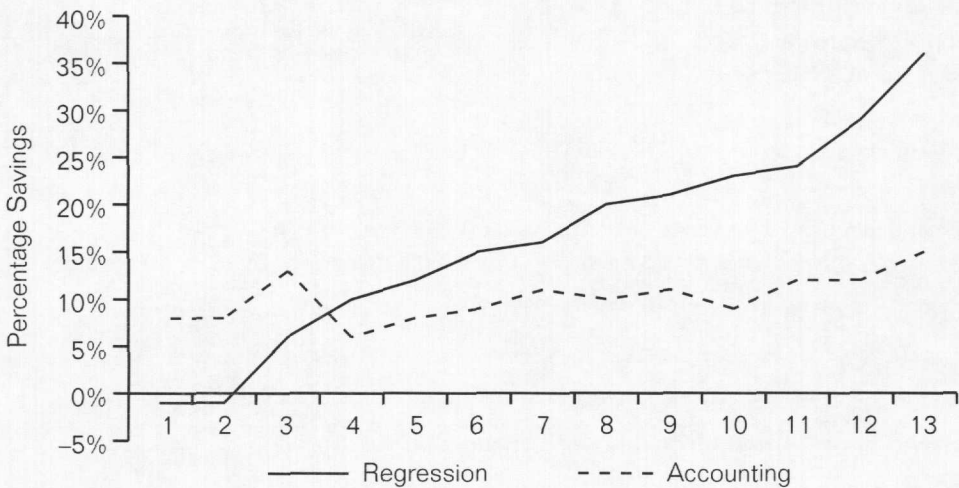


TABLE 3
Comparison of Accounting and Regression Results

PPO	N	Accounting-Based Savings	Regression-Based Savings	Difference in Savings
<i>PPO 1</i>	23	15.5% \$390	35.6% \$896	-20.1% (\$506)
<i>PPO (Small)</i>	102	12.3% \$304	29.3% \$725	-17.0% (\$420)
<i>PPO 2</i>	12	8.6% \$199	23.5% \$541	-14.9% (\$342)
<i>PPO 3</i>	10	11.8% \$295	23.9% \$594	-12.0% (\$299)
<i>PPO 4</i>	20	11.2% \$319	21.3% \$607	-10.1% (\$288)
<i>PPO 5</i>	40	10.1% \$351	19.7% \$683	-9.6% (\$332)
<i>PPO 6</i>	45	8.7% \$234	15.0% \$404	-6.3% (\$170)
<i>PPO 7</i>	120	11.4% \$462	16.3% \$656	-4.8% (\$194)
<i>PPO 8</i>	32	7.8% \$348	12.2% \$548	-4.5% (\$200)
<i>PPO 9</i>	15	6.0% \$216	9.7% \$348	-3.7% (\$132)
<i>PPO 10</i>	19	12.8% \$240	5.9% \$112	6.8% \$128
<i>PPO 11</i>	9	9.5% \$470	1.4% \$72	8.0% \$398
<i>PPO 12</i>	9	8.0% \$400	-0.7% (\$33)	8.6% \$433
<i>PPO 13</i>	69	8.1% \$330	-1.2% (\$48)	9.2% \$378
<i>Total - All PPOs</i>	525	9.7% \$347	14.2% \$505	-4.5% (\$158)

DISCUSSION

As is the case with the evaluation of many services and financial products, evaluations of "what works" and "which is better" are often elusive. To remedy this situation, many insurers have developed estimates of their cost savings using either accounting-based reports of their activities or statistically based analyses of differences in costs and use of services. Accounting-based reports are easy to prepare and can be made available on a real-time basis without relying on external sources of information. Accounting-based reports are also "objective" in the sense that reports can be completely automated without any analyst-specific judgments on the appropriateness of independent variables, distributional assumptions, and the like. Simply put, accounting-based reports are subject to audit and verification in a way that is not feasible for statistical analyses.

However, statistically based analyses are appealing to academicians and many consultants. Statistical analyses of the type presented here permit correction for many of the problems involved with comparisons of claims data, particularly the problems involving differences among employer groups in the characteristics of markets, employers, employees, and benefit plans. A well-documented and justified multivariate regression may well be the gold standard for analysis of the effect of the introduction of a benefit plan design.

This study compares a particular format of an accounting-based cost-saving report with a particular multivariate regression analysis. Clearly, there is much room for debate over the format of the accounting-based report. Should standard coinsurance and deductibles be included, or should PPO savings be presented as just the value of PPO-specific items (which in this case averaged \$87)? Should data be updated frequently to adjust for changes in area-wide charges when adjustments for managed care contracting are being made frequently? Similarly, there is even more room for debate over the regression presented. A multitude of choices were made concerning methods, selection of variables, selection of combinations of interaction terms, and other factors. Although the authors tested a number of alternative models and found roughly similar results, changing a combination of these choices could yield differing results. Condensing the regression results into management reports enables a deception that might be undetectable to all but those sophisticated analysts who would attempt to replicate the regressions.

Assuming that the accounting-based reports could be audited to verify their accuracy and that the statistically based analyses are robust to a variety of specifications, then PPOs as a whole are estimated to save either 10 or 14 percent of claims costs, depending on the method employed. For an evaluation of the effects of PPOs in general, these estimates are reasonably close and consistent with other findings.

However, PPOs vary substantially in their level of cost-savings. For 80 percent of the PPOs, cost savings are statistically different from zero in the regression model; all are significant in the accounting reports. The results here also suggest that for the majority of observations (the same 80 percent), accounting-based reports underestimate statistically based analyses of cost savings from 4 to 20 percent. For the other 20 percent of PPOs, accounting-based reports overestimate statistically based analyses of cost savings from 7 to 9 percent.

The statistical model estimates cost savings that exceed the accounting-based report for most but not all PPOs. The average level of cost savings in the statistical model is some \$158 per person per year higher than the accounting reports, but the range is from \$400 lower to \$500 higher. Given the focus on statistical analysis on incremental effects and on accounting-based reports' presentation of average amounts, a more appropriate comparison would be to compare the statistical estimate to the difference between accounting-based reports for PPO and utilization review only plans. The statistical estimate (\$505) is some \$403 higher than the accounting-based incremental cost savings (\$102). The distribution of incremental cost savings is similar to the distribution of total cost savings.

The suggestion from these results is that easy-to-produce and timely reports will always show cost savings and will likely show cost savings that are tightly clustered around the mean. One can audit the numbers and verify that the activities occurred. But the accounting information may not yield the "real" or "true" savings. Accounting-based reports cannot *account* for individual, employer, market, and plan design characteristics like statistical analyses. (Statistical analysis of accounting-based reports can be conducted to adjust reported savings using the same types of characteristics employed in the statistical analysis of claims. But if one is going to conduct statistical analysis, the claims data should be used directly.)

Accounting-based reports in this analysis suggested lower cost savings than did the statistical analysis. This should not be taken as a general rule. Accounting-based reports are not necessarily "lower" bounds for the results that might be found using statistical analyses. By controlling for numerous factors that influence use and costs of services, statistical analyses may show higher or lower results than accounting-based reports.

Accounting-based reports will continue to be issued as an analysis tool for insurers and a service to employers, but caution should be used in the acceptance of these reports and the cost savings actually achieved by a health plan. Accounting-based reports and regression-based estimates provide different information on plan performance. Accounting-based reports demonstrate how some cost savings may be occurring, but they fail to reflect the larger picture of the overall pattern of medical services use and costs. These two sources of information are complements, rather than substitutes, in developing an understanding of the effects of PPOs.

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