

WHY ARE MANAGED CARE PLANS LESS EXPENSIVE: RISK SELECTION, UTILIZATION, OR REIMBURSEMENT?

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ABSTRACT

This article develops a new method of decomposing the cost difference between HMO and non-HMO plans into observed risk selection, unobserved risk selection, utilization differences, and differences in provider reimbursement rates. We implement this method using a large national sample of employer-sponsored health insurance enrollees from the Community Tracking Study Household Survey. We find no evidence that HMO plans attract a disproportionate share of low-risk enrollees; the US\$188 difference between HMO and non-HMO medical expenditures per enrollee can be explained by the relatively low provider reimbursement rates paid by HMO plans. This indicates there may be little need for employers to risk adjust insurance premiums or otherwise restrict employee choice of plan types.

INTRODUCTION

Employees had little choice in the type of employer sponsored health plan they could select prior to the growth of managed care plans as an alternative to indemnity insurance plans. Today, various plan types exist; some with strict controls on enrollee use of medical services (i.e., Health Maintenance Organizations (HMOs)), and others with fewer restrictions such as indemnity plans and preferred provider organizations (PPOs).¹ The mean premium for a family policy in 2001 was US\$6500 for an HMO

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¹ Enrollees in indemnity plans are generally able to choose any physician and hospital but must pay a co-insurance rate for the medical care they receive. PPOs offer enrollees reduced payments at the point of care if they choose to be treated by physicians and hospitals who have agreed to accept discounted payments from the health insurer. Relative to PPOs, HMOs generally have a more restricted network of physicians and hospitals, evaluate the medical necessity of medical care more rigorously (e.g., require approval before a patient can be referred to a specialist), and are more likely to provide physicians and hospitals with financial incentives to encourage judicious use of resources (e.g., by paying physicians a fixed amount per enrollee per year, regardless of how much medical care the enrollee requires).

plan, US\$7700 for an indemnity plan, and US\$7200 for a PPO plan.² Despite the strict controls on medical service use, HMOs have been able to capture a 45 percent share of the large-employer market by charging considerably lower premiums than indemnity plans and PPOs.

To what can we attribute these lower premiums? We will consider utilization, reimbursement, and risk selection as possible explanations for the lower premiums. First, we consider the utilization effect, which would occur if lower premiums reflect the success of HMO plan managers at restricting access to medical care they believe is worth less to enrollees than it costs HMOs. Second, we consider the reimbursement effect, which would occur if the lower premiums are due to the ability of HMOs to pay physicians and hospitals less than non-HMOs by promising to channel more patients to medical care providers who agree to accept discounted payments. Third, we consider the risk selection effect, which would occur if lower premiums reflect the ability of HMOs to enroll a disproportionate share of people who have a relatively low demand for medical care.

Which stakeholders have been influenced the most by managed care penetration depends largely on which of these explanations tend to dominate. If HMO plans are less expensive because they are designed and managed differently, there are efficiency gains due to the more efficient use of health care resources and consumer welfare gains due to greater product selection. If HMOs are less expensive because they pay hospitals and physicians less than non-HMO plans, this transfers money from medical care providers to consumers or health insurers. And finally, if HMO plans are relatively inexpensive because HMOs attract low-risk enrollees who have low expected costs, policy makers, high-risk enrollees, and employers should be concerned because HMOs may be distorting services to create disincentives for high-risk enrollees and because this differentiation could lead to market disequilibrium (Chernew and Frick, 1999). As the potential economic distortions from risk selection can reduce social welfare, this effect has been the primary focus of the existing literature.

There is some evidence that HMOs do in fact attract a disproportionate share of low-risk enrollees rather than use resources more efficiently. Altman, Cutler, and Zeckhauser (2000) examine differences between indemnity and HMO enrollees in the incidence rates of eight medical conditions, the method used to treat patients with these conditions, and the amount paid to providers. They find that almost half of the expenditure difference between indemnity and HMO plans for these eight diseases is due to a lower incidence rate among HMO patients (favorable risk selection), with the remaining difference largely explained by lower provider reimbursement rates paid by HMOs. They find no evidence that HMO patients receive a relatively low amount of medical care, conditional on being treated. Cutler and Zeckhauser (1998) measure risk selection by comparing medical expenditures in the initial year for people who chose to switch from an indemnity plan to an HMO, with the

² Data on the number of employees enrolled in each type of health plan and the average premium per plan are from the Kaiser Family Foundation *Employer Health Benefits, 2001 Annual Survey*.

expenditures in the initial year for the people who remained in the indemnity plan in both years.³ They conclude that the 1994 medical expenditures of Massachusetts state and local employees who were in an indemnity plan in 1994 and decided to enroll in an HMO in 1995 were 32 percent lower than the expenditures of employees who decided to remain in the indemnity plan.⁴ This evidence is based on case studies of a single employer or employer coalition, which may not be representative of national conditions.

In this article, we use a large, nationally representative data set of nonelderly persons who receive health insurance from their employer to estimate a risk selection effect between HMOs and non-HMO plans. We also decompose the risk selection effect into an observable and an unobservable component and decompose the remaining cost difference between these plan types into a utilization effect due to different plan design and management and a reimbursement effect.

Eighty percent of the nonelderly in the United States who had health insurance in 1999 received it from their employer or from a family member's employer.⁵ Employers and employees share the health insurance premium, with employees paying an average of 27 percent of the premium in 2001.⁶ Since few employers adjust the employee premium contribution to reflect the employee's unique expected costs (or the expected costs of his family) in that plan (Keenan et al., 2001), employees can gain by selecting their health plan based on their health risks or expected health expenditure. As a result, young workers generally pay the same premium as old workers, and workers with strong preferences for medical care pay the same premiums as their coworkers. A person's premium will depend, therefore, on the *average* cost of *all* enrollees in a plan, and therefore on the enrollees' health and preferences for medical care, not merely on the individual's *own* expected costs (Cutler and Zeckhauser, 1998).

Since premiums are rarely adjusted for an enrollee's expected costs, low-risk enrollees will be more profitable than high-risk enrollees and health plans have an incentive to distort their service provision to attract low-risk enrollees. They may offer benefits that appeal to low-risk enrollees but cost more than they are worth (e.g., health club discounts) or reduce benefits that appeal to high-risk enrollees (e.g., drop doctors who treat a lot of high-risk patients from the plan). These service distortions are inefficient and the sorting of enrollees by risk into health plans could lead to disequilibrium in the health insurance market. An employee who might have chosen a non-HMO, if premiums were risk adjusted to reflect his unique expected costs, is more likely to choose an HMO if that plan is already populated with relatively healthy employees (Cutler and Zeckhauser, 1998; Chernew and Frick, 1999). Perfect risk adjustment would eliminate risk selection, but this would require risk adjustment based on both observable (e.g.,

³ Examining expenditures when both groups were enrolled in the indemnity plan (the initial year), and therefore when both were subject to the same plan rules, captures utilization differences due to individual characteristics and preferences for medical care.

⁴ Cox and Hogan (1997) and Hill and Brown (1990) obtained similar results in the Medicare population using a switcher methodology.

⁵ Current Population Survey, 1999.

⁶ *Employer Health Benefits, 2001 Annual Survey*.

age or presence of a chronic condition) and unobservable (e.g., willingness to pay to be able to schedule a appointment with a specialist without first seeing a primary care physician, as is required in some HMOs) enrollee characteristics.⁷ Risk adjustment can only be done based on observables. In this article, in addition to estimating risk selection, we estimate the degree to which risk selection is observable, which can help employers decide whether they need to risk adjust premiums or whether the risk adjustment would be effective at eliminating risk selection.

Risk selection may be much more limited in the employer-sponsored health insurance market relative to the over-65 insurance market. It is estimated that 48 million people, or 20 percent of the employer-sponsored health insurance market, are enrolled in self-insured plans. Under these arrangements, health insurers receive a fixed fee per employee rather than bearing the risk of high medical expenditures, and therefore they will have no incentive to design plans to attract low-risk employees (McDonnell and Fronstin, 1999; InterStudy, 2000). Furthermore, about 50 percent of the people covered by employer-sponsored health insurance were offered a plan, or plans, from a single health insurance company, which should remove incentives for the health insurer to target low-risks since the insurer will service all of the firm's employees (Marquis and Long, 1999). Firms may also be implementing implicit risk adjustment systems by setting the employer contribution for plans that are experiencing adverse selection higher than the employer contribution for plans experiencing favorable risk selection. Finally, the growing popularity of PPOs may limit the ability of HMOs to induce favorable risk selection.

In this article, we develop a new method for measuring the degree of risk selection between HMO and non-HMO plans (i.e., indemnity and PPOs) and implement this method using a national sample of employer-sponsored health insurance enrollees from the 1996-1997 Community Tracking Study Household Survey (CTSHS). We take advantage of the fact that some employers do not offer their employees a choice of health plan type. Among this subset of workers, we estimate the utilization effect—the cost difference between HMOs and non-HMOs due to the amount of medical resources used to treat the same type of enrollees. We measure risk selection—the cost difference between HMOs and non-HMOs due to differences in enrollee characteristics—among the subset of employees who do have a choice of plan type. We then segment the overall difference in per enrollee cost between HMO and non-HMO plans into observed risk selection, unobserved risk selection, utilization differences due to plan design and management, and differences in provider reimbursement rates. We find no evidence that HMO plans attract a disproportionate share of low-risk enrollees; the US\$188 difference between HMO and non-HMO medical expenditures per enrollee can be explained entirely by the relatively low provider reimbursement rates paid by HMO plans. This indicates there may be little need for employers to risk adjust insurance premiums or otherwise restrict employee choice of plan types.

⁷ The federal government, for example, adjusts the premium that a Medicare HMO receives based on an enrollee's observed characteristics (i.e., county, age, gender, whether the person lives in a nursing home, and whether the person is also enrolled in Medicaid), and then discounts the payment by 5 percent in an attempt to counter unobserved risk selection.

EMPIRICAL MODEL

Consider a market where households enroll in either an HMO plan ($H = 1$) or a non-HMO plan ($H = 0$). An insured person's medical care use (M) is determined by both the medical care supplied and the medical care demanded at a given price. The supply of medical care is largely a function of competition among providers and utilization management practices instituted by the health plan. The demand for medical care is a function of potentially observable enrollee characteristics (X), such as age, gender, and self-reported health, and characteristics (Z) that are typically unobserved, such as an individual's preferences for medical care and his unmeasured health status. The amount of medical resources used by HMO and non-HMO enrollees can differ as a result of the extent to which the plans engage in utilization management and differences in the enrollees' demand for medical services. We define the *utilization effect* as the differences in medical resources used between HMO and non-HMO enrollees that result from differences in plan design and management. We define the *risk selection effect* as the differences in medical resources used between HMO and non-HMO enrollees that result from differences in enrollee characteristics.

If all enrollee characteristics were observed, including characteristics that health insurers usually observe (X) and those that are typically unobserved (Z), the utilization effect and the risk selection effects could be estimated in the following regression:

$$M_i = \beta_1 H_i + \beta_2 X_i + \beta_3 Z_i + \varepsilon_i$$

$$\text{utilization effect} = \hat{\beta}_1 \tag{1}$$

$$\text{risk selection effect} = [\hat{\beta}_2 X_{H=1} - \hat{\beta}_2 X_{H=0}] + [\hat{\beta}_3 Z_{H=1} - \hat{\beta}_3 Z_{H=0}],$$

where M_i measures individual i 's aggregate utilization of medical services, H_i is an HMO indicator variable that equals one for HMO enrollees, and the expression $X_{H=1}$ is the HMO enrollees' mean observed characteristics. Note that the risk selection effect has both an observable and an unobservable component represented by the two expressions in brackets. Estimating Equation (1) allows us to decompose the difference in average medical resource use between HMO and non-HMO enrollees into the utilization and risk selection effects:

$$E(M | H = 1) - E(M | H = 0) = \text{utilization effect} + \text{risk selection effect}. \tag{2}$$

Since enrollee characteristics Z are typically unobserved, separately identifying the utilization and risk selection effects from Equation (1) is not possible if unobserved characteristics are correlated with both medical resource use and health plan choice. Such a correlation will occur when an individual's expected demand for medical services (largely unobservable) will be better met by one health plan than another, causing him to choose the more favorable plan. The statistical issue is that $\hat{\beta}_1$ will be biased:

$$M_i = \beta_1 H_i + \beta_2 X_i + v_i$$

$$\text{if } v_i = \beta_3 Z_i + \varepsilon_i, \text{ and } Z_{H=1} \neq Z_{H=0}, \text{ then } \text{Corr}(H_i, v_i) \neq 0 \Rightarrow \hat{\beta}_1 \text{ biased} \tag{3}$$

$$\text{if } v_i = \varepsilon_i \text{ then } \text{Corr}(H_i, v_i) = 0 \Rightarrow \hat{\beta}_1 \text{ unbiased.}$$

Since risk selection between health plans is driven by an enrollee's choice of one plan over another, it follows that risk selection will be restricted when health plan choices are restricted. Therefore, we use a restriction of health plan choice to estimate the utilization effect and the risk selection effect in an unbiased fashion. This pseudonatural experiment arises from the fact that some employers provide only one type of health plan to their employees, thereby restricting choice, whereas other employers offer a choice between types of insurance plans—at least one HMO and at least one non-HMO plan. Among individuals who are not offered a choice of plan type by their employer, the employer (rather than the employee) formally chooses H in Equation (1). If individuals were randomly assigned to employers, an unbiased estimate of β_1 could be obtained by estimating Equation (1) among individuals with no choice of plan type, because H and Z would be uncorrelated.

Our identifying assumption is that among the group of people whose employer offers only one type of health plan, H and Z are uncorrelated, conditional on observed characteristics (X); individuals do not choose their employer based on the type of plan offered and their demand for medical care. The nontrivial cost of switching jobs makes our assumption more plausible. Workers who are offered both an HMO and a non-HMO plan by their employer can select their preferred plan type by essentially checking a box; some workers who are offered either an HMO or a non-HMO plan by their employer must switch jobs in order to select their preferred plan. Reschovsky (1999) uses a similar assumption regarding the exogeneity of plan types among workers who are offered only one type of plan.

Our empirical approach consists of several steps. The first step is to derive an unbiased estimate of the utilization effect. We estimate Equation (3) on those enrollees with no choice of health plan type. That is, we estimate the medical utilization of individuals who were offered *either* an HMO plan only or a non-HMO plan only (but not both) on observed enrollee characteristics (X) and an indicator variable that equals one if they were offered an HMO plan. The coefficient β_1 should be an unbiased estimate of the utilization effect because with restricted choice, the distribution of unobserved enrollee characteristics that affect the use of medical services, Z , should be the same among the workers offered HMO plans only, as it is among the workers offered non-HMO plans only (i.e., $\text{Corr}(H_i, v_i) = 0$). We can calculate the observed risk selection effect in the sample of people offered no choice of plan type ($C = 0$) as follows: $(\beta_2 X_{H=1,C=0} - \beta_2 X_{H=0,C=0})$. If the observed risk selection effect is close to zero in the no-choice sample, this provides some support for our identifying assumption that the HMO and non-HMO enrollees without a choice of plan types also have similar unobserved characteristics.

The second step is to estimate the risk selection effect where it will be most pronounced—among individuals who are offered a choice of plan type by their employer (the “choice” subsample, or $C = 1$). We estimate the observed risk selection effect, $[\hat{\beta}_2^{NC} X_{H=1,C=1} - \hat{\beta}_2^{NC} X_{H=0,C=1}]$, using the observed characteristics of the choice subsample and the unbiased coefficient estimates of Equation (3) derived from the no-choice subsample (NC). The unobserved risk selection effect is estimated by calculating the residual of the difference in mean expenditures between HMO enrollees and non-HMO enrollees among those offered a choice of health plan once we have accounted for the utilization and risk selection effects:

$$\begin{aligned} \text{unobserved risk selection effect} = & [E(M | H = 1, C = 1) - E(M | H = 0, C = 1)] \\ & - \hat{\beta}_1^{NC} - [\hat{\beta}_2^{NC} X_{H=1, C=1} - \hat{\beta}_2^{NC} X_{H=0, C=1}]. \end{aligned} \quad (4)$$

The total risk selection effect will be the sum of the unobserved and observed risk selection effects.

Up until this point we have compared M , medical resource use, between HMO and non-HMO enrollees. By analyzing differences in medical resource use instead of differences in medical expenditures between health plan enrollees, we have simplified the comparison between plan types by assuming that HMO and non-HMO plans pay physicians and hospitals the same amount for each medical service. We estimate the reimbursement effect by examining differences in health plan expenditures, controlling for the amount of medical resources their enrollees use.

We define medical resource use for enrollees of HMOs ($H = 1$) and non-HMOs ($H = 0$) as the weighted sum of K medical services (i.e., hospital admissions, nights in hospital, ER visits, doctor visits, medical practitioner visits, and nursing home care): $M_i = \sum_{k=1}^K p_{H=0}^k S_i^k$, where $p_{H=0}^k$ is the weight for the medical service k , and S_i^k the number of units of service k that enrollee i received (e.g., days in the hospital). Here, $p_{H=0}^k$ is the payment rate, or price, that plans pay to providers (e.g., daily payment to a hospital). Note that the weight used to estimate medical resource use is the same for all i , regardless of plan type. If we use prices of medical services charged to HMO enrollees ($p_{H=1}^k$) to estimate M_i for all i in HMOs and prices of medical services charged to non-HMO enrollees ($p_{H=0}^k$) to estimate M_i for all i in non-HMOs, M_i becomes an estimate of medical expenditures. The difference in medical expenditures (using each plan's own prices) minus the difference in medical resources use (using one plan's prices as weights) yields the amount of expenditure difference attributable to the differences in reimbursement between plans, which we refer to as the reimbursement effect. The reimbursement effect is estimated as follows:

$$\begin{aligned} \text{Reimbursement effect} = & \left(\sum_{k=1}^K p_{H=1}^k S_{i,H=1}^k - \sum_{k=1}^K p_{H=0}^k S_{i,H=0}^k \right) \\ & - \left(\sum_{k=1}^K p_{H=0}^k S_{i,H=1}^k - \sum_{k=1}^K p_{H=0}^k S_{i,H=0}^k \right). \end{aligned} \quad (5)$$

DATA

We use data from the 1996-1997 Community Tracking Study Household Survey (CTSHS) to estimate the utilization and risk selection effects. This survey, administered to more than 60,000 people, was designed to be representative of the civilian, noninstitutionalized population in 60 U.S. communities and the country as a whole (Kemper et al., 1996). Respondents were asked about their health insurance coverage, access to medical care, medical care use, and health status. Our study focuses on the subsample of individuals who receive health insurance from their employer. We exclude people older than 64 years of age, individuals who receive insurance in the individual market, people who have publicly-provided health insurance, and the

uninsured. The study sample consists of 32,395 household members who live in one of the 60 study sites and receive health insurance from their employer or the employer of a spouse or parent.

We divide the overall sample into four groups according to whether a choice of plan type was available to the respondent (i.e., the employer offered both an HMO and a non-HMO plan) and whether the respondent enrolled in an HMO or a non-HMO plan. In the CTSHS, the person in the household who is most knowledgeable about the family's health care indicates whether each health plan in which a family member is enrolled is an HMO. For each policyholder of an HMO plan, the respondent is asked whether their employer also offered them a choice of a non-HMO plan. Similarly, for each policyholder of a non-HMO plan, the respondent is asked whether their employer also offered a choice of an HMO plan.

All members of a household in which the main health plan policy holder could select an HMO or a non-HMO plan from his or her employer are considered to be part of the "choice" subsample. Members of households that are covered by more than one employer-sponsored health plan, which typically occurs when both spouses take coverage from their respective employers, are also considered to have a choice of plan type if one household member is offered an HMO plan only and another was offered a non-HMO plan only. All other individuals are considered part of the "no-choice" subsample. Within the choice and no-choice subsamples, each individual is then classified as being enrolled in an HMO or a non-HMO plan depending on whether the "main" health plan is an HMO or a non-HMO.

Health plan type is self-reported on the CTSHS based on the answer to the question "Is [plan name] an HMO, that is, a Health Maintenance Organization?" If necessary, the interviewer elaborates as follows: "With an HMO, you must generally receive care from HMO doctors; otherwise, the expense is not covered unless you were referred by the HMO or there was a medical emergency." People who indicate they are in an HMO also report that their health plan manages care more aggressively than the non-HMO enrollees, as expected (Table 1).⁸ HMO plans are much more likely than non-HMO plans to use a gatekeeper system, to require approval for specialty referrals, and to provide enrollees with financial incentives to visit network providers. Non-HMO plans do manage care, although to a lesser degree. For example, 41 percent of the enrollees in non-HMO plans must obtain approval to see a specialist *versus* 84 percent for HMO enrollees.

The final variable we need for our analysis is medical resource use. CTSHS respondents report the quantity of the following medical services they received during the

⁸ Consumers do not always know how their health plans work (Cunningham, Denk, and Sinclair, 2001). Therefore, when people self-report whether they are in an HMO, we do not know for certain the extent to which the HMO group consists of group and staff model HMOs, point of service plans, or even some preferred provider organizations. However, since risk selection is driven by enrollee choice, which is largely a function of enrollee perceptions of their plan characteristics, the self-reported plan type is the preferred indicator of health plan type for our purposes.

TABLE 1
Characteristics of HMO and Non-HMO Plans

	HMO	Non-HMO
	(percentage of enrollees in plan responding affirmatively)	
Does the plan require its member to sign up with a certain primary care doctor, group of doctors, or clinic, with they must go to for routine care?	81%	27%
Under your plan do its members need approval or a referral to see a specialist or get special care?	84%	41%
Is there a book, directory, or list of doctors associated with the plan	94%	63%
If you do not have a referral, will your plan pay for any of the costs of visits to doctors who are not associated with the plan?	44%	85%

previous year: the number of nights spent in the hospital; the number of emergency room visits, physician office visits, other medical practitioner visits, and whether they received any nursing home care. We combine this information into a single measure of medical resource utilization (i.e., medical expenditures) by estimating resource weights per unit of medical care (i.e., unit prices) for each of the reported medical services. Manning et al. (1985) and Goldman, Leibowitz, and Buchanan et al. (1998) use a similar method. The resource use weights are estimated from the 1996 Medical Expenditure Panel Survey (MEPS), which contains total annual medical expenditures and the quantity of medical services for the same types of services as reported in the CTSHS for a nationally representative sample of individuals.

We derive unit prices by regressing an individual's total annual medical expenditures in the MEPS survey on the number of hospital admissions, the number of nights spent in a hospital, the number of outpatient visits by type of visit (physician, emergency room, and other medical practitioner), and an indicator variable if the individual received nursing home care. We also add indicator variables for individuals with hospital nights or visits above the top-coded levels in the CTSHS survey.⁹

We estimate separate regressions for individuals in the MEPS survey who were enrolled in an HMO and a non-HMO plan. Coefficient estimates are reported in Table 2. Non-HMO plans spend an average of US\$206 per physician visit, US\$795 per emergency room visit, and US\$5285 per hospital admission plus US\$576 per night in the hospital. In our baseline model we use the prices per unit of service from the non-HMO regression to derive the aggregate measure of resource utilization.¹⁰ By using the same prices for non-HMO and HMO enrollees, the utilization and risk selection effects are

⁹ The CTSHS restricted file has a top-code of 15 for hospital nights and a top-code of 30 for physician visits to ensure confidentiality.

¹⁰ If prices per unit from the HMO regression are used in the baseline model instead of from the non-HMO regression, the results would not change in any meaningful way.

TABLE 2

Resource Use Weights: Coefficient Estimates of MEPS Expenditure Regressions

	HMO Enrollees <i>n</i> = 4,472	Non-HMO Enrollees <i>n</i> = 4,625
Hospital admissions	4801 (177)	5285 (178)
Nights in hospital	1008 (70)	575.7 (74)
ER visits (no overnights)	374 (92)	794.5 (99)
Doctor visit	187 (9)	206 (10)
Medical practitioner visits	115.0 (8)	111 (8)
Nursing home care	995.3 (557)	7676 (492)
Top coded nights in hospital	12389 (1086)	13332 (959)
Top coded physician visits	397 (673)	3171 (668)
R-squared	0.66	0.70

measuring differences in resource use between the plan types rather than expenditure differences. We use both HMO and non-HMO prices to estimate the reimbursement effect.

Certain types of medical services are included in the total medical expenditure variable in MEPS but are not recorded by the CTSHS. These omitted expenditures are loaded into the estimated resource weights. For individuals with no recorded medical service use in the CTSHS, we assume medical expenditure is zero.¹¹ We can benchmark our CTSHS estimates of resource utilization by comparing them with the expenditure totals from MEPS. Non-HMO enrollees in MEPS have mean expenditures of US\$1751 *versus* an estimated US\$1928 for non-HMO enrollees in CTSHS. HMO enrollees in MEPS have mean expenditures of US\$1533 *versus* an estimated US\$1752 for HMO enrollees in CTSHS. This discrepancy between the two surveys can be accounted for by higher utilization in the CTSHS sample across all medical services.

RESULTS

Sample means are presented in Table 3, separately for the four subsamples: no choice of plan type where a person was offered a non-HMO plan, no choice of plan type

¹¹ Individuals in MEPS who also have no service use recorded for the CTSHS items do have an average expenditure of US\$216 (with a median of US\$0). Our assumption that individuals who report no medical care in CTSHS all had zero expenditures has no meaningful impact on our results.

TABLE 3

Sample Characteristics by Plan Type and Choice of Plan Type and Choice of Plan Type

Characteristic	No Choice of Plan Type		Choice of Plan Type	
	HMO	Non-HMO	HMO	Non-HMO
Number in sample (<i>n</i>)	7550	9702	8467	6676
Age Group (%)				
Younger than 2	2.2	2.3	2.9	2.2
2 to 17	26.3	27.2	28.2	25.1
18 to 40	38.1	36.0	36.8	30.5
40 to 55	25.1	24.9	26.1	30.0
55 to 64	8.3	9.7	6.7	12.2
Female (%)	49.4	49.3	51.0	50.1
Family Structure%				
Married/with children	52.3	58.9	56.9	55.1
Married/no children	16.8	18.8	16.6	22.8
Single adult/children	10.8	7.5	10.9	8.0
Single adult/no children	20.1	14.8	15.6	14.1
Race (%)				
White	72.7	86.2	72.4	81.4
African American	11.0	6.2	13.0	9.1
Native/Asian/Pacific/Other	5.0	2.6	5.0	3.6
Hispanic	11.3	5.1	9.6	5.9
Education (%)				
Did not complete high school	35.8	36.3	35.5	30.9
High school degree	26.6	25.5	20.4	20.3
College degree or some college	32.5	32.8	37.4	39.2
More than bachelor's degree	5.1	5.4	6.7	9.6
Self Rated Health (%)				
Excelent	33.4	36.4	35.8	35.8
Very Good	37.7	38.7	38.1	38.9
Good	21.2	18.5	19.4	19.2
Fair	6.5	5.3	5.6	5.1
Poor	1.2	1.1	1.1	1.0
Family Income (%)				
Less than \$10,000	7.8	6.7	4.9	5.8
\$10,000 to \$50,000	58.5	55.5	46.3	38.8
\$50,000 to \$100,000	29.4	32.5	41.5	44.7
More than \$100,000	4.4	5.3	7.3	10.7

where a person was offered an HMO, choice of plan type where a person chose a non-HMO, and choice of plan type where a person chose an HMO. Among those with a choice, the non-HMO group is substantially older, more likely to be white, more likely to have a college education, and more likely to have an income greater than US\$50,000. Among those without a choice, the non-HMO group is again more likely to be white but is not more likely to have a higher income, be older, or more educated.

Table 4 reports the estimated medical expenditure and medical resource use for the four groups. Medical expenditure estimates use each plan type's own prices as resource weights, while the medical resource use estimate uses a fixed price for both plan types. Among the no-choice subsample, medical expenditures are US\$184 higher in non-HMOs than HMOs, while medical resource use is either US\$38 or US\$25 higher in HMOs depending on whether non-HMO or HMO prices are used as weights. Among the choice subsample, the differences are similar: –US\$188 medical expenditure difference and either a US\$81 or a US\$20 difference in medical resource use. The choice of which weight to use is not empirically meaningful, so for the rest of this article we use the non-HMO price weights.

The reimbursement effect, the expenditure difference due to differences in provider reimbursement amounts between plan types, is –US\$269 (95 percent confidence interval: –US\$367 to –US\$49). We estimate this effect by taking the mean difference in medical expenditure (–US\$188) between the HMO and non-HMO enrollees, and subtracting the difference in medical resource use using non-HMO prices (US\$81). Note that if we instead analyzed the no-choice group or conditioned on HMO prices, the reimbursement effect would not be substantially different.

Table 5 presents coefficient estimates of the ordinary least squares regression of Equation (3) for the 17,252 individuals in the CTSHS survey who did not have a choice of plan type. The authors regress total medical resource use, derived using the resource weights from the MEPS data set, on four indicator variables for a respondent's age, indicator variables for the respondent's family structure (e.g., married with children), race, gender, educational attainment, household income, self-reported health status, and an indicator variable for each of the 60 communities in which respondents were surveyed. We include the community indicators to control for differences across markets in the quality of HMO and non-HMO plans, the extent of advertising, and acceptance by the general population.¹²

The coefficient of 46.2 on the HMO indicator variable is the estimate of the utilization effect. Controlling for enrollee characteristics, HMO enrollees use an estimated US\$46.2 more in medical resources than non-HMO enrollees (or 2.4 percent more) due to differences in the design and management of the two plan types. The 95-percent confidence interval of this coefficient ranges from –US\$98 to US\$191. Thus, even at the extreme lower end of this confidence interval, HMO enrollees would be using only 5.1 percent fewer medical resources than non-HMO enrollees due to differences in plan design and management. This result indicates that the utilization management methods used by HMO plans are either having a relatively small effect on enrollee utilization, or these methods are having a spillover effect on the utilization of non-HMO enrollees. Some of the other coefficients in Table 5 are interesting. Individuals

¹² The literature on risk adjustment concludes that in a cross section regression only about 15 to 20 percent of the total variance in medical expenditures is predictable based on individual characteristics (Newhouse 1996; Newhouse et al., 1989; McCall and Wai, 1983). Demographic characteristics such as age and gender usually explain only 1 to 2 percent of the variance, whereas self-reported health status has greater predictive power. The R^2 of 0.09 in Table 5, therefore, implies that based on the available data we are able to explain one-half to two-thirds of the predictable portion of medical expenditures.

TABLE 4
Medical Expenditure, Medical Resource Use, and Reimbursement Effect by Plan Type and Choice of Plan Type

	No Choice of Plan Type			Choice of Plan Type		
	HMO (N = 7550) Mean (SD)	Non-HMO (N = 9702) Mean (SD)	Difference Mean (95% C.I.)	HMO (N = 8467) Mean (SD)	Non-HMO (N = 6676) Mean (SD)	Difference Mean (95% C.I.)
Medical Expenditure	1684 (4543)	1868 (4703)	-184 (-322 to -46)	1821 (1360)	2009 (4774)	-188 (-344 to -32)
Medical Resource Use (weights are non-HMO prices)	1906 (4719)	1868 (4703)	38 (-103 to 179)	2090 (5005)	2009 (4774)	81 (-81 to 243)
Medical Resource Use (weights are HMO prices)	1684 (4543)	1659 (4476)	25 (-110 to 160)	1821 (4690)	1801 (4598)	20 (-134 to 174)
Reimbursement Effect (estimated if both plan types faced non-HMO prices)			-222 (-338 to -80)			-269 (-367 to -49)
Reimbursement Effect (estimated if both plan types faced HMO prices)			-209 (-370 to -74)			-208 (-355 to -63)

TABLE 5

Coefficient Estimates for the Determinants of Medical Care Use Among People With No Choice of Plan Type

Variable Name	All Enrollees	
	Coefficient	<i>p</i> -value
HMO (i.e., Utilization Effect)	46.2	0.531
Age Group (%)		
Younger than 2	4637.3	0.000
2 to 17	−564.6	0.005
18 to 40	−334.1	0.020
40 to 55	−683.2	0.000
55 to 64		
Female (%)	543.1	0.000
Family Structure%		
Married/with children		
Married/no children	175.7	0.174
Single adult/children	−20.7	0.853
Single adult/no children	−159.0	0.137
Race (%)		
White		
African American	−280.8	0.036
Native/Asian/Pacific/Other	−330.0	0.080
Hispanic	−360.9	0.014
Education (%)		
Did not complete high school		
High school degree	−81.3	0.587
College degree or some college	254.3	0.089
More than bachelor's degree	216.1	0.294
Self Rated Health (%)		
Excelent		
Very Good	370.7	0.000
Good	1293.5	0.000
Fair	2605.7	0.000
Poor	8289.1	0.000
Family Income (%)		
Less than \$10,000	759.9	0.000
\$10,000 to \$50,000	309.5	0.067
\$50,000 to \$100,000	130.0	0.441
More than \$100,000		
Constant	1030.4	0.000
Site fixed effect		
	F(60,17169) = 0.005	
	F-stat = 1.5	
Number of observations (<i>N</i>)	17252	
<i>R</i> -squared	0.09	

TABLE 6

Estimate of Risk Selection Effect and Summary of All Effects

	All Enrollees		Singles Only	
	Mean	(95% CI)	Mean	(95% CI)
A. Total Difference in Medical Expenditure (from Table 4)	-188	(-344 to -32)	-168	(-475 to 139)
B. Reimbursement Effect (from Table 4)	-269	(-367 to -49)	-236	(-550 to 77)
C. Total Difference in Medical Resource Use (A - B)	81	(-81 to 243)	68	(-352 to 488)
D. Utilization Effect (from Table 5)	46	(-98 to 191)	13	(-324 to 350)
E1. Total Risk Selection Effect (C - D)	35	(-100 to 170)	55	(-278 to 388)
E2. Two components of risk selection				
Observed risk selection effect	22	(-113 to 157)	27	(-306 to 360)
Unobserved risk selection effect	13	(-122 to 148)	28	(-307 to 361)

with relatively low household income use more medical services and non-white persons use fewer. The coefficients from Table 5 can be used to predict the mean medical resource use for the people in the no-choice subsample who enroll in an HMO *versus* a non-HMO plan. Based on their observed characteristics, HMO enrollees are predicted to use US\$25 more medical resources than non-HMO enrollees. This small difference confirms that the enrollees in the two types of plans are similar, and lends some credence to our identifying assumption that the HMO and non-HMO enrollees in the no-choice subsample also have similar unobserved characteristics.

We use the estimated utilization effect from the no-choice group to calculate the total risk selection effect in the choice group.¹³ As displayed in Table 6, the risk selection effect is US\$35, which is calculated by taking the total difference in medical resource use (US\$81) and subtracting the utilization effect (US\$46). This estimate is not statistically different from zero, and with mean annual expenditures of US\$2009 (Table 4), the magnitude of the risk selection effect is essentially zero. The 95 percent confidence interval for this estimate is (-US\$100 to US\$170). Even if the true risk selection estimate were at the low end of the 95 percent confidence interval (-US\$100), the magnitude would be economically small. Under this scenario, HMO plans would incur medical expenditures that are 5.0 percent lower than non-HMO plans (US\$100/US\$2009) due to differences in enrollee characteristics.

In order to estimate the observed risk selection effect, the coefficients from Table 4 are used, rather than the coefficient on the HMO indicator variable (β_1), to predict

¹³ We were concerned that the differences in the enrollee characteristics between the no choice and choice groups might result in a different magnitude for the utilization effect in the choice group relative to the no-choice group. We tested this by including an interaction between *H* and *X* in Equation (3), which allows the effect of the structure and management of HMO plans on utilization to differ according to enrollee characteristics. The interactions were small and insignificant suggesting that the utilization effect estimated in the no-choice sample was a good estimate of the utilization effect in the choice sample.

medical expenditures for each of the respondents offered a choice of plan types. The predicted mean expenditure for HMO enrollees is US\$22 larger than for non-HMO enrollees based on their observed characteristics.¹⁴ This small effect indicates that the enrollees in the two plan types are observably similar, which can also be seen in Table 3 where the characteristics non-HMO and HMO enrollees from the choice group (third and fourth columns of Table 3) are shown to be quite similar.¹⁵ The unobserved risk selection effect of US\$13 (US\$35 – US\$22) is also surprisingly small, which suggests that HMO and non-HMO plans are attracting enrollees who have similar medical resource needs, based on observed and unobserved characteristics.

We also perform a separate expenditure decomposition analysis for single adults since risk selection may be stronger among this group. Families are more constrained than single adults because within a family some members might be better off in an HMO and others in a non-HMO, but the family usually chooses one plan to cover everybody. Results for single adults are reported in the last two columns of Table 6. While the confidence intervals are much wider due to the smaller sample size ($N = 2188$), the magnitudes of all three estimated effects are nearly identical to the estimates using all enrollees. This sensitivity analysis suggests that our finding of very little risk selection is not driven by family structure.

DISCUSSION

Among people who had a choice of health plan type, average expenditure was US\$2009 for those who chose a non-HMO plan and US\$1821 for those who chose an HMO plan (Table 4). Expenditures per enrollee are US\$188, or 9.3 percent, lower for HMOs relative to non-HMOs. Decomposing this –US\$188 difference into its component parts, it is estimated that US\$46 is due to different utilization of medical services due to differences in plan design and management (the utilization effect), US\$22 is due to differences in observed enrollee characteristics, US\$13 is due to differences in unobserved enrollee characteristics, and –US\$269 is due to relatively low HMO provider reimbursement levels (Table 6). The large reimbursement effect combined with the small estimated utilization and selection effects indicates that HMO plan expenses are lower than non-HMO plan expenses due to superior negotiating power, rather than superior utilization management or favorable risk selection.

Employers can mitigate risk selection by adjusting an employee's premium contribution for his specific expected costs or by only offering a single plan. Risk adjusting premiums is straightforward if selection occurs on the basis of characteristics that can be observed by an employer, but is more complicated if selection occurs based

¹⁴ Health plans probably do not observe as many of the enrollee characteristics as we do. When we predict enrollee expenditures using only variables a health plan is likely to observe (age, gender, and firm size), HMO enrollees have predicted expenditures that are US\$14 lower than non-HMO enrollees. This result is similar in magnitude to the US\$22 observed risk selection effect we estimate using a more comprehensive set of enrollee characteristics.

¹⁵ We also estimated risk selection in the no-choice group. These estimates were even smaller than the risk selection effect estimates in the choice group, which supports our assumption that our assumption that there is no risk selection based on unobserved enrollee characteristics in the no-choice group.

on unobserved enrollee characteristics or characteristics that are potentially observable but expensive to collect. We find no evidence of risk selection between HMOs and non-HMOs in a large national sample. Our estimated unobserved risk selection estimate is US\$13 per enrollee, which is less than 1 percent of average medical expenditures. Our estimated observed risk selection effect (US\$22) is also small. Given the evidence that few firms risk adjust premiums, our findings suggest that risk selection should not be a large concern among employers offering a choice among health plans.

Our small risk selection estimate is consistent with the results of the RAND randomized controlled trial involving one Seattle HMO in the late 1970s (Manning, Newhouse, and Duan, 1987).¹⁶ Schaefer and Reschovsky (2002), using the same CTSHS data set that the present authors use, also find no evidence that HMOs are experiencing favorable risk selection based on observed enrollee characteristics; in fact, HMO enrollees were slightly more likely than non-HMO enrollees to be in poor mental health and to have an expensive chronic health condition. Cutler and Zeckhauser (1998), on the other hand, estimate a risk selection effect of 32 percent for nonelderly persons using a “switcher” methodology, and Altman, Cutler, and Zeckhauser (2000) find that HMO enrollees are less likely than non-HMO enrollees to have an expensive medical condition, even after controlling for enrollee demographic characteristics.

Several factors may explain why we detect less risk selection than two of the studies mentioned above. First, switcher studies measure a marginal risk selection effect—expenditures of persons who switch to an HMO plan in a particular year relative to the expenditures of those who do not switch—whereas an average risk selection effect for all enrollees was estimated. Some individuals who expect to receive a substantial amount of medical services might be attracted to the relatively light cost sharing of HMO plans (Schaefer and Reschovsky, 2002). If these high-risk individuals joined HMOs early (before the switcher studies were conducted), the marginal risk selection effect estimated by switcher studies might exceed our estimated average risk selection effect. Second, we compare expenditures of HMO enrollees with those of PPO and indemnity enrollees; the Cutler and Zeckhauser (1998) study compared expenditures of HMO enrollees with indemnity enrollees only. If PPOs experience favorable risk selection relative to indemnity plans, our risk selection estimate would be smaller than the estimate from switcher studies. Third, we use more recent data (1996-1997) than the studies cited above. If risk selection diminishes as HMO enrollment grows, our risk selection estimate would be expected to be smaller than previous studies. Fourth, employers may be providing a larger contribution to indemnity and PPO plans than HMO plans in an attempt to risk adjust the premiums and mitigate selection. Fifth, the Altman, Cutler, and Zeckhauser (2000) study examined conditions that account for about 15 percent of total medical expenses, so if HMO patients with less severe health conditions use more services than their counterparts in indemnity plans, HMOs may not experience favorable risk selection overall.

¹⁶ The risk selection effect was the expenditure difference between individuals who were randomly assigned to the HMO and those who had previously *chosen* to enroll in the HMO. The two groups of people were enrolled in the same health plan, so the entire expenditure difference should be due to differences in enrollee characteristics.

The finding that HMO and non-HMO enrollees of similar characteristics receive the same amount of medical services differs from the results of early studies. These studies generally conclude that HMO enrollees spend fewer days in the hospital, but receive more physician visits and more preventive care than their fee-for-service counterparts (summarized by Miller and Luft, 1994), which would probably result in lower utilization for HMOs. A more recent study by Tu et al. (1999) is consistent with our findings of no utilization differences. They conclude, based on an analysis of the CTSHS, that HMO enrollees receive more primary and preventive care than non-HMO enrollees, while many of the more costly services are used in equal amounts in both plan types. Likewise, Altman, Cutler, and Zeckhauser (2000) and Cutler, McClellan, and Newhouse (2000) find little difference in the amount of medical resources used to treat HMO and indemnity patients. The differences between earlier studies and studies using the CTSHS may be due, in part, to the possibility that some CTSHS respondents miscategorized their insurance type. If some of those reporting that they are in an HMO are really in a non-HMO group and *vice versa*, the utilization effect could be less precisely estimated than in studies with a more accurate measure of insurance type.

The conclusion that differences in provider reimbursement rates account for most of the expenditure difference between HMOs and non-HMOs is consistent with the results of Cutler, McClellan, and Newhouse (2000) and Altman, Cutler, and Zeckhauser (2000). These studies conclude that patients with eight different medical conditions generally received the same type and amount of medical care whether they were enrolled in an HMO or indemnity plan. Massachusetts HMOs, however, paid physicians and hospitals about 40 percent less than indemnity plans conditional on the type of treatment rendered.

Could the strong assumption we use to estimate our utilization effect bias our results? The key assumption—random assignment of individuals to jobs that offer only an HMO plan and jobs that offer only a non-HMO plan, conditional on observed characteristics—could bias the results if individuals choose their job because of an unmeasured health concern or if employers choose the plan type on the basis of the unmeasured health of their employees. A fairly common hypothesis is that individuals who are relatively unhealthy (in unobserved ways) dislike HMO plans and will therefore choose jobs that offer a non-HMO plan. If such a scenario were true, our estimated utilization effect would be biased downward and, from Equation (4), our unobserved risk selection estimate would be biased upward. In fact, among individuals with no choice of plan type, HMO enrollees are less likely to report that their health is excellent or very good than non-HMO enrollees. The fact that HMO and non-HMO enrollees have similar observed characteristics lends some credence to our assumption that unobserved enrollee characteristics that affect the use of medical services are also similar.

To summarize, we find no evidence that HMO plans attract a disproportionate share of low-risk enrollees; the US\$188 difference between HMO and non-HMO medical expenditures per enrollee can be explained entirely by the relatively low provider reimbursement rates paid by HMO plans. This indicates there may be little need for employers to further risk adjust insurance premiums or otherwise restrict employee choice of plan types.

REFERENCES

- Altman, D., D. M. Cutler, and R. J. Zeckhauser, 2000, Enrollee Mix, Treatment Intensity, and Cost in Competing Indemnity and HMO Plans, National Bureau of Economic Research Working Paper No. 7832, Cambridge, MA.
- Chernew, M. E., and K. D. Frick, 1999, The Impact of Managed Care on the Existence of Equilibrium in Health Insurance Markets, *Journal of Health Economics*, 18: 573-592.
- Cox, D. F., and C. Hogan, 1997, Biased Selection and Medicare HMOs: Analysis of the 1989-1994 Experience, *Medical Care Research and Review*, 54: 259-274.
- Cunningham, P. J., C. Denk, and M. Sinclair, 2001, Do Consumers Know How Their Health Plan Works? *Health Affairs*, 20: 159-166.
- Cutler, D. M., and R. J. Zeckhauser, 1998, Adverse Selection in Health Insurance, in: A. M. Garber, ed., *Frontiers in Health Policy Research*, Vol. 1 (Cambridge, MA: MIT Press).
- Cutler, D. M., M. McClellan, and J. P. Newhouse, 2000, How Does Managed Care do it? *RAND Journal of Economics*, 31(3): 526-548.
- Goldman, D. P., A. Leibowitz, and J. L. Buchanan, 1998, Cost-containment and adverse selection in Medicaid HMOs, *Journal of the American Statistical Association*, 93: 54-62.
- Hill, J. W., and R. S. Brown, 1990, *Biased Selection in the TEFRA HMO/CMP Program* (Princeton, NJ: Mathematica Policy Research, Inc).
- InterStudy, 2000, *National Policy and Employer-Based Health Plans: An Analysis and Response From InterStudy Publications*. Available at http://www.hmodata.com/pdf/natpol_emp_hlthpln.pdf.
- Keenan, P. S., M. J. B. Buntin, T. G. McGuire, and J. P. Newhouse, 2001, The Prevalence of Formal Risk Adjustment in Health Plan Purchasing, *Inquiry*, 38: 245-259.
- Kemper, P., D. Blumenthal, J. M. Corrigan, P. J. Cunningham, S. M. Felt, J. M. Grossman, K. T. Kohn, C. E. Metcalf, R. F. St. Peter, R. C. Strouse, and P. B. Ginsburg, 1996, The design of the Community Tacking Study: A Longitudinal Study of Health System Change and Its Effects on People, *Inquiry*, 33: 195-206.
- Manning, W. G., J. P. Newhouse, and J.P. Duan, 1987, Health Insurance and the Demand for Medical Care: Evidence from a Randomized Experiment, *American Economic Review*, 77: 251-277.
- Manning, W. G., A. Leibowitz, G. A. Rogers, and J. P. Newhouse, 1985, A Controlled Trial of the Effect of a Prepaid Group Practice on the Utilization of Medical Services, *New England Journal of Medicine*, 310: 1505-1510.
- Marquis, M. S., and S. Long, 1999, Trends in Managed Care and Managed Competition, 1993-1997, *Health Affairs*, 18(6): 75-88.
- McCall, N., and H. S. Wai, 1983, An Analysis of the Use of Medicare Services by the Continuously Enrolled Aged, *Medical Care* 21(6): 567-585.
- McDonnell, K., and P. Fronstin, 1999, *EBRI Health Benefits Databook*, 1st edition (Washington, D.C.: Employee Benefit Research Institute).
- Miller, R. H., and H. S. Luft, 1994, Managed Care Plan Performance, *Journal of the American Medical Association*, 271: 1512-1519.

- Newhouse, J. P., 1996, Reimbursing Health Plans and Health Providers: Efficiency in Production versus Selection, *Journal of Economic Literature*, 34(3): 1236-1263.
- Newhouse, Joseph P., W. G. Manning, E. B. Keeler, and E. M. Sloss, 1989, Adjusting Capitation Rates Using Objective Health Measures and Prior Utilization, *Health Care Financing Review*, 15(1): 39-54.
- Reschovsky, J. D., 1999, Do HMOs Make a Difference? Data and Methods, *Inquiry*, 36: 419-425.
- Schaefer, E., and J. D. Reschovsky, 2002, Are HMO Enrollees Healthier Than Others? Results from the Community Tracking Study, *Health Affairs*, 21(3): 249-258.
- Tu, H. T., P. Kemper, and H. J. Wong, 1999, Do HMOs Make a Difference? Use of Health Services, *Inquiry*, 36:400-410.

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