Difference in the Use of Preventive Services Between Fee-for-Service Plans and HMOs: Is More Better?

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Objective: Based on the US Preventive Services Task Force recommendations, we studied how health insurance type, ie, fee-for-service (FFS) or health maintenance organization (HMO), affects the utilization of preventive services of differing effectiveness.

Study Design: Household survey data from the 1993 and 1994 National Health Interview Surveys.

Methods: We compared the use of mammograms, Pap smears, blood pressure measurements, counseling about hormone replacement therapy (HRT), and general physical examinations in FFS plans and HMOs. We used the bivariate probit model to control for selection bias caused by the unobservable factors in the choice of health insurance type.

Results: Enrollees in HMOs obtained more Pap smears, blood pressure measurements, mammograms (women 40 to 49 years old), and general physical examinations than enrollees in FFS plans. No significant difference was found between FFS plans and HMOs for the use of mammograms (women aged 30 to 39 years and 50 to 64 years) or HRT counseling. The correlation ratios from bivariate probit estimations indicated no selection bias favoring HMOs; for some preventive services, selection bias favored FFS plans.

Conclusions: Compared with enrollees in FFS plans, persons in HMOs used more preventive services, including less effective ones. Not controlling for selection bias underestimated the HMO effect.

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Many highly recommended preventive services are underused in the United States. For example, self-reported use of mammograms and Pap smears within the past 2 years remained well below 90% in 1997 and appeared to stop increasing since 1995.[1] One reason is that coverage of preventive care used to be less generous than coverage of acute care in traditional fee-for-service (FFS) health insurance. State governments tried to address this problem with legislative coverage mandates, mostly for cancer screening. By November 1996, 50 states and 16 states had adopted mandates to cover screening services for breast and cervical cancer, respectively, with most state mandates legislated between 1988 and 1992. One study examined the effect of a Maryland mandate on mammography screening in 1991 and found a modest increase in use.[2] Health maintenance organizations (HMOs) have achieved a dominant market share in recent years. Compared with FFS health insurance, HMOs promote use of preventive services through more generous coverage and use of physician incentives. Their vertically integrated structure is thought to allow the management of physician behavior through both clinical rules (or practice guidelines) and financial incentives.[3,4] Previous literature generally found that HMO enrollees use more preventive services than FFS enrollees.[5-9]

Preventive services differ widely in effectiveness. A preventive service effective for one demographic group may not be effective for others. For example, the United States Preventive Services Task Force (USPSTF) found good evidence to recommend mammograms for women aged 50 to 69 years but insufficient evidence (in 1989 and 1996) or fair evidence (in 2002) to recommend mammograms for women aged 40 to 49 years.[10-12] Use of less effective preven-

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tive services not only is economically inefficient, but also may generate unnecessary false-positive results. For example, Elmore et al[13] found that, over a period of 10 years, nearly one third of women aged 40 to 49 years screened for breast cancer had at least one false-positive result from either mammograms or clinical breast examinations, which presumably led to increased consumption of medical services such as follow-up physician visits, x-ray tests, etc. Few studies have compared the use of less effective preventive services in FFS plans and HMOs.

Our goal was to answer this question through a comparison of the use of preventive services differing in effectiveness in a nationally representative sample of FFS and HMO populations. To test and control for potential selection bias from the choice of health insurance type, ie, FFS or HMO, we used the bivariate probit model to simultaneously estimate the choice of health insurance type and the utilization of a preventive service.

METHODS

Data Sources

The primary data sources for this study were the 1993 and 1994 National Health Interview Surveys (NHIS). The NHIS is an annual national survey of the civilian, noninstitutionalized population in the United States. The survey provides detailed information on household demographics, health conditions, and insurance coverage. The 1993 and 1994 NHISs categorized health insurance plans into 9 types: Blue Cross and/or Blue Shield, other major FFS plan, group HMO, staff HMO, independent practice association (IPA), network, mixed HMO, other HMO, and preferred provider organization (PPO). None of the households were surveyed twice during the 1993 and 1994 periods. For the study population, we excluded individuals older than 64 years (Medicare eligible population) or younger than 23 years (school age population), or those who were uninsured, covered under public or military insurance, or covered under more than 1 private insurance policy.

Dependent Variables

Approximately 1 adult person per household in half of the households surveyed in 1993 and 1994 was also questioned about his or her use of preventive services. Time period since the last use of mammograms, Pap smears, blood pressure measurements, and general physical examinations was surveyed in both the 1993 and 1994 NHISs. We defined "general physical examination" based on the following survey question: "About how long has it been since your last general physical exam or routine checkup by a medical doctor or other health professional? Do not include a visit about a specific problem." The 1994 NHIS also surveyed women aged 40 to 60 years on whether they had ever had a discussion with healthcare professionals about postmenopausal hormone replacement therapy (HRT). As the 1993 and 1994 NHISs used different household panels and shared the same set of questions on health insurance type and preventive care (except for HRT counseling),

Table 1. The US Preventive Services Task Force Recommendations on Selected Preventive Services

Preventive Service	Population	Recommendations: Grade* and Frequency
Mammograms	Women 50-69 years	A, once every 1-2 years
Pap smears	All women	A, once every 3 years
Hypertension	All adults	A, once every 2 years
HRT counseling	Perimenopausal women	B, routine counseling
Mammograms†	Women 40-49 years	C (1989 and 1996), B (2002), once every 1-2 years
Mammograms	Women 30-39 years	Not rated
General physical examination	All adults	Not rated

*Grade indicates the strength of recommendations by the US Preventive Services Task Force: A, good evidence to recommend the procedure; B, fair evidence; and C, insufficient evidence.
†Insufficient evidence (C) in 1989 and 1996; fair evidence (B) in 2002.
HRT indicates hormone replacement therapy.

we combined the 2 years' data to form the study population.

For patients with certain diagnoses or diseases in medical history, use of preventive services is likely for diagnosis or treatment rather than screening purpose. For example, patients ever diagnosed with hypertension or with any chronic conditions may have blood pressure measured during their routine checkups. Symptomatic patients were excluded from the study population for the relevant preventive services. Such patients included the following: for mammograms, patients who had ever had breast cancer; for Pap smears, patients who had ever had a hysterectomy; for blood pressure measurements, patients who had ever been told they had hypertension or 1 or more chronic health condition; and for general physical examinations, patients who had 1 or more chronic health condition.

We used the *Guide to Clinical Preventive Services*[10-12] by the USPSTF to define the effectiveness of preventive services. The USPSTF rated periodic use of mammograms by women aged 50 to 69 years, Pap smears, blood pressure measurements, and HRT counseling as definitely effective and determined that evidence was insufficient (in 1989 and 1996) or fair (in 2002) to recommend mammograms for women aged 40 to 49 years. The other 2 preventive services, mammograms by women 30 to 39 years old and general physical examinations, were not rated. **Table 1** describes the USPSTF recommendations.

Health Insurance Type: Fee-for-Service Versus Health Maintenance Organization

We initially separated the population into 4 insurance groups: FFS plans, PPOs, group or staff HMOs, and other HMOs (including IPA, network, mixed HMO, and other HMO). We find that FFS plans are similar to PPOs and that group or staff HMOs are similar to other HMOs in use of the targeted preventive services. Therefore, we combined group or staff HMOs with other HMOs to form the HMO population and compared it with the FFS population. This simple dichotomy compared the average effect of FFS plans versus HMOs and allowed us to use the bivariate probit model (to be discussed in the Statistical Analysis section below) that simultaneously models the choice of health insurance type and its effect on the use of a preventive service. We carried out separate statistical analyses with or without PPOs in the FFS population and derived similar results. As PPOs account for approximately 8% of the study population, we chose to report the results without PPOs (therefore a smaller FFS population) for this study.

Other Independent Variables

Beyond health insurance type, factors influencing the utilization of preventive services include age, sex, race, education, family income, health status, region, and year (1993 vs 1994). Three health status measures were evaluated in our study: self-assessed fair or poor health status, presence of any chronic health conditions, and expected insurable medical expense. We used Manning's 2-part square root method[14] and the 1987 National Medical Expenditure Survey (NMES) data to predict an individual's expected insurable medical expense. (At the time of this project, data from the Medical Expenditure Panel Surveys from 1996 and later were not yet released and the 1987 NMES was the best source of data to estimate an insured individual's expected medical expense.) This method was used by Pauly and Herring[15]—its first stage is a probit model estimating the probability of incurring any insurable medical expense; its second stage is a linear regression estimating the amount of insurable medical expense conditional on any use, with the square root of insurable medical expense as the dependent variable. Both stages share the same set of explanatory variables—age, sex, race, self-reported health status, HMO (vs FFS), region, medical savings account (vs no medical savings account), and presence of 10 common chronic health conditions. An individual's expected insurable medical expense is the product of his or her predicted probability of any use from the first stage and his or her predicted expense from the second stage.

Table 2 presents the characteristics of the HMO and FFS populations. The 2 populations were similar in the distribution of sex, education, family income, self-reported fair or poor health status, expected insurable medical expense, and presence of any chronic conditions, although the HMO population had significantly younger enrollees, more minorities, and more rural enrollees. Significant regional and year variations were also noted. The differences between the HMO and FFS populations for each preventive service were similar to those between the overall HMO and FFS populations.

Statistical Analysis

To estimate the effect of health insurance type on the utilization of a preventive service, the ith individual's propensity to use a preventive service dur-

ing a certain period is specified in a univariate probit model:

$$Ui = \alpha Ii + \beta_U \mathbf{Y}_{Ui} + \varepsilon_{Ui}, \quad (1)$$

where I stands for insurance type (equal to 1 if an individual is enrolled in HMOs and equal to 0 otherwise); $\mathbf{Y}_{Ui}$ is a vector of independent variables that include age, sex (if both men and women are present), menopausal status (for HRT counseling), race, education, income, self-assessed fair or poor health status, region, rural area, and year 1993 (vs 1994); and the disturbance term ε_{Ui} captures any unobserved factors' influences on utilization. Hereafter, Equation (1) is also called the *utilization equation.* This univariate probit model is similar to the usual logit model and both are subject to selection bias from the choice of insurance type. In this observational study, selection bias occurred when an individual chose HMOs over FFS plans or vice versa based on his or her own (or, in the case of a family policy, his or her family's) unobserved but anticipated use of a preventive service. Consequently, the univariate probit or logit model may over- or underestimate the "true" HMO effect.

To test and control for selection bias, an individual's propensity to choose an HMO over a FFS plan is specified in a second probit model:

$$Ii^* = \beta_I \mathbf{X}_{Ii} + \varepsilon_{Ii}, \quad (2)$$

where $\mathbf{X}_{Ii}$ is a vector of independent variables influencing the choice of insurance type and the disturbance term ε_{Ii} captures any unobserved factors' influences on the choice. Hereafter, Equation (2) is also called the *HMO choice equation.* In the bivariate probit model, the 2 disturbance terms in Equations (1) and (2) are assumed to be independent across individuals and to have a bivariate normal distribution conditional on the 2 sets of independent variables. The bivariate probit model is more general than the 2-stage instrumental variable method, as it allows for the disturbance terms to be correlated. The statistical evidence supporting the existence of selection bias is a significant correlation between the 2 disturbance terms, ie, when unobservable factors that influence the choice of insurance type are correlated with unobserved factors influencing the use of a preventive service. This approach was used by Kreider and Nicholson[16] and by Waters[17] to estimate the impact of health insurance (vs no health insurance) on the utilization of medical services.

The bivariate probit estimation requires that at least one "identifying" variable present in Equation (2) be absent in Equation (1). The criteria for proposing identifying variables are that the variable should have an impact, theoretically and conceptually, on the choice of insurance type but not be directly related to the utilization of a preventive service. In the United States, many households obtain insurance from the workplace, where employers or unions set health insurance options, such as insurance type and employee share of premium. Our first set of identifying variables included occupation and industry characteristics,

Table 2. Overall Population Characteristics by Insurance Type*

Variable	FFS (n = 6390)	HMO (n = 5064)
Demographics		
Age, y	41.4 (10.9)	39.7 (10.4)
Female	57%	58%
Non-white	12%	19%
Education, y	13.8 (2.5)	13.9 (2.5)
Family income, annual	$35 972 ($13 330)	$36 406 ($13 112)
Health indicators		
Fair or poor health status	5.8%	5.7%
Presence of any chronic conditions	15%	15%
Expected insurable medical expense	$797 ($267)	$791 ($256)
Region		
Midwest (vs Northeast)	29%	21%
South (vs Northeast)	32%	23%
West (vs Northeast)	17%	30%
Rural area (vs urban)	27%	10%
Year 1993 (vs 1994)	54%	50%

*Values are mean (standard deviation). Standard deviations for dummy variables are omitted.
FFS indicates fee for service; HMO, health maintenance organization.

employee share of premium (defined as employee sharing at least part of premium vs the entire premium paid by employers or unions), and insurance sponsorship (directly purchased, union-sponsored, or employer-sponsored policies). Beyond the individual in both the HMO choice equation and the utilization equation, the presence of 2 demographic groups in a family policy, ie, women aged 40 to 64 years or children younger than 3 years, indirectly increases the need for preventive care and may affect the choice of insurance type. Our second set of identifying variables included characteristics of a household and its health insurance policy, including family policy (vs single policy), presence of women aged 40 to 64 years or children younger than 3 years in a family policy, expected insurable medical expense of a covered life or covered lives in a policy, presence of 2 or more policies in a household, and whether a household had moved within 1 year. The dummy variable indicating the presence of women aged 40 to 64 years is not in the HMO choice equation of 2 preventive services—mammograms by women aged 50 to 64 years and mammograms by women aged 40 to 49 years—as its value is always equal to 1 in the 2 cases. We tested the bivariate probit analyses with or without the second set of identifying variables and found similar results. We report bivariate probit estimations with both sets of identifying variables.

Table 3. Utilization Rates of Preventive Services by Insurance Type*

Preventive Services (Study Population)	FFS	HMO
Mammograms within 2 years (women 50-64 y)	919 (72.6)†	538 (78.1)†
Pap smears within 3 years (women 23-64 y)	2923 (87.6)‡	2482 (90.2)‡
Blood pressure measurements within 2 years (adults 23-64 y)	4783 (86.3)§	3809 (90.2)§
Ever having HRT counseling (women 40-60 y)	646 (43.2)	480 (38.5)
Mammograms within 2 years (women 40-49 y)	996 (64.2)†	774 (69.0)†
Mammograms within 2 years (women 30-39 y)	1118 (23.3)	1040 (24.7)
General physical examinations within 3 years (adults 23-64 y)	5315 (77.8)§	4243 (84.6)§

*Values are sample size (percent utilization).
HMO versus FFS: †$P < .05$; ‡$P < .01$; §$P < .001$.
FFS indicates fee for service; HMO, health maintenance organization; HRT, hormone replacement therapy.

RESULTS

Table 3 shows the mean utilization rates of preventive services in FFS plans and HMOs, respectively. All utilization rates were higher in HMOs except for HRT counseling. Chi-square tests indicated significant differences between FFS and HMO enrollees in the use of mammograms by women aged 50 to 64 years, Pap smears, blood pressure measurements, mammograms by women aged 40 to 49 years, and general physical examinations. Noticeably, the use of HRT counseling was less than 45% and that of general physical examinations (or routine checkups) was higher than 75% in both insurance types. After controlling for observable characteristics in univariate probit estimations and controlling for both observable and unobservable characteristics in bivariate probit estimations (**Tables 4** and **5**), the HMO effect remained significantly positive for 4 preventive services: Pap smears, blood pressure measurements, mammograms among women aged 40 to 49 years, and general physical examinations, with a larger effect in bivariate probit estimations. In addition, the positive HMO effect on the use of blood pressure measurements remained significant after controlling for ever having a doctor visit within the past year. However, the HMO effect was insignificant for mammograms by women aged 50 to 64 years, HRT counseling, or mammograms by women aged 30 to 39 years.

The correlation ratios from bivariate probit estimations (last row in Tables 4 and 5) are either insignificant or significantly negative, indicating that unobserved factors contributing to the use of preventive services are either not correlated with or are negatively correlated with unobserved factors contributing to the choice of health insurance type. In other words, there was no selection bias favoring HMOs in the use of these preventive services. On the contrary, there appears to be selection bias favoring FFS plans in the use of blood pressure measurements, mammograms among women aged 40 to 49 years, and general physical examinations. Consequently, the "true" HMO effect was larger in bivariate probit estimations for these 3 preventive services plus Pap smears (which have a negative but insignificant correlation ratio).

Education and family income were strong predictors of utilization of all preventive services studied.

Table 4. Use of Effective Preventive Services in HMOs versus FFS Plans (Probit Model)

	Mammogram (Women 50-64 y)		Pap Smear (Women 23-64 y)		Blood Pressure Measurement	
	Univariate	Bivariate	Univariate	Bivariate	Univariate	Bivariate
Intercept	–2.2587†	–2.1143*	–1.1313†	–1.3571†	–1.5349‡	–1.9716‡
HMO	0.1217	–0.0609	0.1206*	0.4519*	0.2052‡	0.9538‡
Age	0.00327	0.00246	–0.0142‡	–0.0127‡	0.00284	0.0049†
Female					0.5208‡	0.4744‡
Non-white	0.00625	0.01368	0.072	0.032	0.0146	–0.062
Education	0.039†	0.0379*	0.0512‡	0.0532‡	0.0363‡	0.0377‡
Log (family income)	0.206‡	0.2054‡	0.1953‡	0.1900‡	0.162‡	0.1509‡
Fair or poor health	–0.0339	–0.0362	0.0587	0.0583	0.5857‡	0.5430‡
Region						
Midwest	0.0262	0.0027	0.1169	0.1436*	0.00981	0.0786
South	0.1136	0.101	0.1802†	0.2194†	0.0891	0.1648‡
West	0.2072	0.2403	0.1203	0.09	–0.0225	–0.0837
Rural area	–0.1351	–0.1651	0.0538	0.1348	–0.017	0.1700†
Year 1993	0.0726	0.0651	0.033	0.0433	0.0613	0.0840*
N	1457	1457	5405	5405	8592	8592
Log likelihood	–805	–1663	–1827	–5181	–2989	–8402
Correlation ratio		0.114		–0.212		–0.482‡

*$P < .05$; †$P < .01$; ‡$P < .001$.
FFS indicates fee for service; HMO, health maintenance organization; HRT, hormone replacement therapy.

Table 5. Use of Less Effective Preventive Services in HMOs versus FFS Plans (Probit Model)

	Counseling on HRT		Mammogram (Women 40-49)		Mammogram (Women 30-39)		General Physical Examination	
	Univariate	Bivariate	Univariate	Bivariate	Univariate	Bivariate	Univariate	Bivariate
Intercept	–8.092‡	–7.3597‡	–3.5671‡	–4.1030‡	–8.1169‡	–8.1323‡	–1.6893‡	–2.0341‡
HMO	–0.032	–0.4481	0.1507*	0.7034*	0.0279	0.414	0.2654‡	0.9039‡
Age	0.104‡	0.0998‡	0.0375‡	0.0392‡	0.1457‡	0.1438‡	0.00691‡	0.00856‡
Female							0.5481‡	0.5108‡
Menopause	0.613‡	0.6037‡						
Non-white	–0.294*	–0.2501*	–0.0298	–0.0805	0.1897*	0.1322	0.2819‡	0.1999‡
Education	0.046†	0.0418*	0.0604‡	0.0671‡	0.038†	0.0370†	0.0147*	0.0172†
Log (family income)	0.177*	0.149	0.1472*	0.1534*	0.1798*	0.1689*	0.1556‡	0.1443‡
Fair or poor health	–0.391	–0.3890*	0.0314	0.0247	0.0479	0.0416	0.2215*	0.2089*
Region								
Midwest	0.214	0.1647	–0.1647	–0.1209	–0.1506	–0.1169	–0.1986‡	–0.1278†
South	0.327†	0.2915*	–0.0962	–0.0418	–0.1235	–0.0722	–0.0758	0.0008
West	0.241*	0.3117*	–0.0798	–0.1253	–0.2511†	–0.2700†	–0.191‡	–0.2353‡
Rural area	0.208*	0.1095	–0.00322	0.1634	–0.0119	0.0887	–0.0503	0.1012
Year 1993			–0.0356	–0.0379	–0.02	–0.0074	0.3183‡	0.3265‡
N	1126	1126	1770	1770	2158	2158	9558	9558
Log likelihood	-615	-1298	–1105	–2191	–1087	–2426	–4365	–10381
Correlation ratio		0.264		-0.357*		–0.247		–0.415‡

*$P < .05$; †$P < .01$; ‡$P < .001$.
FFS indicates fee for service; HMO, health maintenance organization.

Women were more likely to use blood pressure measurements and general physical examinations than men. Significant regional variations were also noted. For women aged 40 to 60 years, experiencing menopausal symptoms was positively associated with HRT counseling. Except for use of general physical examinations and blood pressure measurements, no significant differences were noted between 1993 and 1994. The effects of age, race, and self-assessed fair or poor health status were mixed across preventive services.

For all preventive services studied, results from the HMO choice equation in bivariate probit estimations were similar. As an example, the coefficients from the HMO choice equation for the use of blood pressure measurements are presented in **Table 6.** Age, race, education, region, and year were significant predictors. Significant identifying variables included 3 industry variables (retail sale or wholesale industry, professional service industry, and public administration industry), employee share of premium, and directly purchased insurance (vs employer-sponsored policies). The effect of a family policy covering women aged 40 to 64 years or that of a family policy covering children younger than 3 years was not significant. The effect of a policy with higher expected insurable medical expenses was not significant.

Table 6. Coefficients on Variables in the HMO Choice Equation for the Bivariate Probit Estimation Studying the Use of Blood Pressure Measurements

Variable	Coefficient	Standard Error
Intercept	0.9876	0.6116
Independent Variables		
Age	–0.01063‡	0.00334
Non-white	0.2796‡	0.0539
Education	–0.0264†	0.00918
Log (family income)	–0.0377	0.0369
Midwest region	–0.2314‡	0.0500
South region	–0.3812‡	0.0501
West region	0.2704‡	0.0521
Rural area (vs urban)	–0.6779‡	0.0500
Year 1993	–0.0841*	0.0358
Identifying Variables		
Professional or management (vs other occupations)	–0.0388	0.0438
Industry variables (vs agriculture, fishing and forestry)		
Transportation and communication industry	0.0841	0.0756
Retail sale and wholesale industry	–0.1583*	0.0678
Financial and insurance industry	–0.0152	0.0722
Repair and personal service industry	0.00490	0.0841
Professional service industry	0.1767‡	0.0537
Public administration industry	0.2358†	0.0789
Not in the labor market	0.0362	0.0975
Insurance information		
Share of premium (vs zero contribution)	0.3358‡	0.0401
Directly purchased insurance (vs employer-sponsored)	–0.5277‡	0.0919
Union-sponsored insurance (vs employer-sponsored)	0.2514	0.1584
Family policy (vs single policy)	–0.0080	0.0721
Presence of women 40-64 y in a family policy	0.00394	0.0656
Presence of children <3 y in a family policy	–0.0023	0.0586
Log (expected insurable medical expense of a policy)	0.0089	0.0744
Moved within 1 year	–0.0908	0.1372
Presence of at least 2 policies in a household	0.0697	0.0390
Log likelihood	–8402	

*P <.05; †P <.01; ‡P <.001.
HMO indicates health maintenance organization.

Finally, we simulated the potential difference in utilization between FFS plans and HMOs for the entire study population (**Table 7**). According to bivariate probit estimations, enrollment in HMOs led to 25% more use of mammograms by women aged 40 and 49 years, 8% more use of Pap smears, 19% more use of blood pressure measurements, and 23% more use of general physical examinations. Noticeably, because of the negative bivariate probit correlation ratios, these marginal effects were larger than those from univariate probit estimations.

DISCUSSION

Simple comparisons of means indicated that, except for HRT counseling and mammograms by women aged 30 to 39 years, the utilization rates of the studied preventive services were significantly higher in HMOs than in FFS plans during 1993 and

Table 7. Simulated Marginal Effects of HMO (vs FFS) on Utilization Rates

Service	Univariate Probit (%)	Bivariate Probit (%)
Mammograms (50-64 y)	3.8	–1.9
Pap smears	2.2*	8.2*
Blood pressure measurements	3.8‡	18.7‡
HRT counseling	–1.2	–17.0
Mammograms (40-49 y)	5.5*	24.8*
Mammograms (30-39 y)	0.8	12.3
General physical examinations	6.8‡	23.2‡

*$P < .05$; †$P < .01$; ‡$P < .001$.
FFS indicates fee for service; HMO, health maintenance organization; HRT, hormone replacement therapy.

1994. When we controlled for observable characteristics and potential selection bias, the results were largely the same. Enrollees in HMOs not only used more preventive services proven effective, such as Pap smears and blood pressure measurements, but also use more preventive services proven less effective, ie, mammograms among women aged 40 to 49 years and general physical examinations. No difference was noted between FFS plans and HMOs for the use of 2 recommended services—mammograms among women aged 50 to 64 years and HRT counseling. It appears that both insurance types can provide more effective preventive care by decreasing the use of general physical examinations (higher than 75% for both insurance types) and increasing the use of HRT counseling (less than 45% for both insurance types).[18,19] Our definition of general physical examinations included routine checkups and therefore possibly overestimates its use.

Our results are consistent with previous findings that HMOs perform better than FFS plans in the utilization of preventive services,[5–9] which may lead to early diagnosis and treatment of the underlying diseases. For example, compared with Medicare FFS enrollees, Medicare HMO enrollees were diagnosed at earlier stages for cancers for which effective screening services are available.[20,21] One major limitation of our study is that there may be significant differences within HMOs (and possibly FFS plans) in preventive care. Compared with for-profit HMOs, not-for-profit HMOs have higher rates in 14 quality-of-care indicators including mammograms and Pap smears; the quality of care scores are highest for staff- and group-model HMOs.[22] The other major limitation of our study is potential switching between FFS plans and HMOs. For example, a woman might have had a Pap smear done through an FFS plan, switched to an HMO, and reported her recent use of a Pap smear as an HMO enrollee. We cannot control for the trend of increasing HMO enrollment in the early 1990s. However, we attempted to minimize this effect by using the shortest length of study possible, ie, use of a preventive service within 1 year, and obtained similar results; this adds further confidence to our findings.

Two main factors likely contribute to more use of preventive services in HMOs: coverage (or patient cost sharing) and physician behavior. Data limitations prevented us from separating the individual effects of these 2 factors. We speculate that the difference in coverage between HMOs and FFS plans has narrowed in recent years, especially with state legislative mandates on coverage. However, patient cost sharing in FFS or PPO plans, ie, deductibles or coinsurance, still has a greater negative impact on preventive care than that in HMOs, ie, copayments.[23] Increases in HMO market share are associated with reductions in the number of mammography providers, increases in the number of services produced by the remaining providers, and reductions in costs for mammography.[24] It is possible that the lower acquisition or production costs of preventive services in HMOs warrant lower cost sharing. Difference in physician behavior may be equally important. Primary care physicians employed by one HMO indicate that they favor practice guidelines for improving patient care.[25] HMO visits seem to include more preventive services and disease prevention than FFS visits.[26] The increasing use of quality-of-care measurements, many preventive services, in HMO physicians' compensation scheme may also contribute to increasing use of preventive services. For example, the HMO Employer Data and Information Set version 3.0 in 1998 includes 8 clinical measures for quality of care; of those, 5 are preventive services. Finally, the practice setting in staff or group HMOs may be more convenient for a patient to obtain multiple preventive services during a single visit.

The promotion of preventive care in HMOs could be more attractive to healthier individuals if they demand more preventive care than less healthy persons. Yet in this study, we found no evidence indi-

cating that the use of preventive services served as a risk selection instrument for HMOs. The correlation ratios from bivariate probit estimations indicated that there was no selection bias favoring HMOs and that, for 3 preventive services, there was selection bias favoring FFS plans. Consequently, the "true" HMO effect was larger in bivariate probit estimations for 4 preventive services that were used significantly more in HMOs. It should be noted that our statistical analyses focused on the correlations between the choice of health insurance type and the use of studied preventive services and cannot rule out other forms of risk selections unrelated to preventive care, such as restricted access to specialist care.

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