Older Adults' Use of Health Maintenance Organizations

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The effects of Health Maintenance Organization membership on the use of physicians and hospitals by older adults was examined using data from the 1975 National Health Interview Survey. Comparison of the HMO and non-HMO groups revealed that the HMO members differed on several demographic variables. While the HMO members tended to have more frequent physicians' visits than the nonmembers, the two groups did not differ in their number of hospitalized days or hospital episodes. In both populations, use of physician's services was most strongly influenced by poor health, although the effects were stronger in the HMO than the non-HMO group, indicating the physicians' services were more accessible by older adults in HMOs than in fee-for-service systems. Hospital utilization was affected equally strongly by poor health in both groups.

The social and economic independence of older adults depends on their maintenance of good health. Access to necessary health care is an important part of health maintenance for the older adult, but accessibility is threatened by excessive costs which are beyond the financial reach of the individual and the society. Therefore, the containment of the soaring costs of health care services in the United States is an important focus of health policy for older adults in the United States today. A major legislative outcome of that concern in the 1970s was the enactment of the

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Health Maintenance Organization Act of 1973 (PL 03-22) in which the federal government encouraged the development of HMOs through grants and loan guarantees to new or expanding HMO operations. While there is a growing body of research on use of HMOs, this research has been focused almost exclusively on the population under 65 years of age, so that very little is known about older adults who belong to HMOs. This research was designed to address three questions about older adults who are HMO members. The first question to be addressed is which older people are most likely to join an HMO. The second question is whether, once enrolled in an HMO, older enrollees use health care services more or less than nonenrollees. The final question is what social factors affect the use of health care services among HMO members and nonmembers and how.

This research will use the health care services utilization framework developed by Andersen and Newman (1973) as the theoretical framework. The factors contained in the health care services utilization framework include (1) predisposing variables—such as demographic characteristics, social structure characteristics, and attitudes and beliefs—which exist prior to the onset of illness and are related to the probability of need for health care services, (2) enabling variables—such as family and community characteristics—which enable individuals to use the care they need, and (3) illness-morbidity variables which determine the need for services.

The research literature on HMO enrollment has recently been very thoroughly and critically reviewed by Luft (1980). Luft concluded that among adults less than 65 years of age, economic factors were not consistently related to enrollment in an HMO, while enrollment was positively related to health risk factors and to positive perceptions of the delivery characteristics of HMOs. Medicare recipients are underrepresented in the HMOs. In 1979, only 4.3% of the HMO enrollees were Medicare recipients, while

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approximately 10% of the American population were Medicare recipients. Most of these members had "aged in" the HMO and were not recruited after they became Medicare beneficiaries. Luft (1980) argued that Medicare clients are underrepresented in the HMO population because HMOs cannot use the savings resulting from lower hospital use to attract Medicare beneficiaries since Medicare already protects beneficiaries from large hospital bills and because complex Medicare reimbursement policies discourage HMOs from seeking Medicare beneficiaries. Older people who wish to join an HMO represent a high-risk category for utilization of services and, thus, may be discouraged from enrolling (Winn and McCaffree, 1979). In this research, older HMO members will be compared with older non-HMO members to determine if and how HMO members differ from nonmembers, especially on health and economic characteristics. Because most of the members of HMOs joined the HMO when they were under 65 and employed, it is hypothesized that they will be better off than older nonmembers in terms of both socioeconomic status and health.

The literature on the comparative use of physicians and hospitals by HMO enrollees and nonenrollees was reviewed by Wolinsky (1980), who concluded that HMO enrollees less than 65 years of age were likely to have higher physician utilization rate but lower hospitalization rates than people who did not belong to HMOs. Furthermore, the total cost of delivery of health care in HMO patient populations was lower than in patient populations with conventional insurance coverage. Wolinsky concluded that the major factor contributing to lower costs was the lower levels of hospitalization in HMOs. However, in a study of Medicare users in the Health Insurance Plan (HIP), Greenfield et al. (1978) found that enrollment in an HMO increased the overall Medicare costs for Medicare beneficiaries, primarily because one-third of the Medicare beneficiaries continued to use out-of-plan services. These results may not be generalizable because neither Medicare nor the HIP provided any incentives to patients to use only in-plan services. In this research the physician and hospital utilization rates of HMO enrollees and nonenrollees will be compared to determine if the rates are different. It is expected, based on

previous literature, that the use of ambulatory services may be greater, but no concomitant decrease in hospitalization rates is expected.

Finally, while there are a growing number of studies which have attempted to identify the predisposing, enabling, and illness-morbidity factors which affect the use of physicians and hospitals among the population in general (Aday et al., 1980; Andersen and Anderson, 1967, 1976; Wolinsky, 1978), and among older adults specifically (Eve and Friedsam, 1980; Eve, 1981), there are no studies which have examined these factors among an older HMO population. Recent multivariate research on older adults since the implementation of Medicare and Medicaid has consistently found that illness-morbidity characteristics have the greatest effect on use of physicians and hospitals (Eve and Friedsam, 1980; Eve, 1981). It is hypothesized that the use of both physicians and hospitals will be most affected by the illness-morbidity characteristics, among both the HMO members and nonmembers, but that the effects will be strongest among the HMO members since the economic constraints to the use of these services which exist in the fee-for-service practice setting are not present in the HMO setting.

Methods of Procedure

DATASET

The dataset used in this research is the National Center for Health Statistics's 1975 Health Interview Survey (HIS), a continuous ongoing survey of the civilian, noninstitutionalized population of the United States. Approximately 42,000 households containing approximately 116,000 people are sampled each year using a multistage probability design. The sample is weighted by age, sex, race, and residence to accurately represent the U.S. population.

The 1975 HIS sampled 11,687 respondents who were 65 years of age or older, which represented a weighted average of 22,728,000 people over 65 years old living in the United States in

1975. Of the total older population, 226 older adults (1.9%) were members of Health Maintenance Organizations or Prepaid Group Plans representing approximately 408,000 older HMO members in the United States.

OPERATIONAL MEASURES OF VARIABLES

The Andersen and Newman framework guided the selection of variables for analysis. The variables selected for analysis are listed in Table 1 with their means, standard deviations, measures of skewness and kurtosis, and values. The variables measured include six predisposing demographic characteristics (age, sex, race, married with spouse present, region of residence, and SMSA/non-SMSA residence); two predisposing social structure variables (education of the respondent and ethnicity); two enabling family variables (income of family or unrelated individual and private health insurance coverage); one objective illness-morbidity variable (total number of chronic conditions); and one subjective measure of illness-morbidity (self-reported health status).

Four measures of health care services utilization are included in the dataset. The two measures of physician utilization include the number of physician visits in the past 12 months and the interval since the last physician visit. The two measures of hospital utilization include hospitalized days in the past 12 months and the total number of hospital episodes in the past 12 months. A copy of the original research instrument is available in Drury (1977).

The reliability of the survey instrument and interview procedures and the validity of the questionnaire items and the sampling design have been established in a series of studies that have been summarized in a recent review by Cannell et al. (1977).

DATA ANALYSIS

Statistical Techniques. Student's *t* test was used in comparisons of the HMO and non-HMO populations to test for the significance of differences between the two populations. *Regress-*

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TABLE 1
Measurement of All Variables Included in the Final Model for the HMO*
and Non-HMO Populations 65 Years and Older**

Variable	Mean	SD	Skewness	Kurtosis	Values	*
<u>Predisposing Characteristics</u>						
Demographic						
Age						
HMO	71.181	5.464	1.026	0.606	65-99 years	
Non-HMO	73.212	6.441	0.789	0.034		
Sex						
HMO	0.520		-0.082	-2.003	0 = Female	
Non-HMO	0.410		0.364	-1.867	1 = Male	
Married, spouse present						
HMO	0.673		-0.741	-1.459	0 = No	
Non-HMO	0.533		0.132	-1.983	1 = Yes	
Region						
HMO	0.476		0.095	-2.001	0 = Southeast, Southwest	
Non-HMO	0.530		0.119	-1.986	1 = Northeast, North Central	
SMSA/non-SMSA residence						
HMO	0.835		-1.813	1.294	0 = Non-SMSA	
Non-HMO	0.630		0.538	-1.711	1 = SMSA	

TABLE 1 (Continued)

Variable	Mean	SD	Skewness	Kurtosis	Values
Social Structure					
Education of respondent					
HMO	4.682	2.010	0.421	-0.159	0 = None
Non-HMO	3.760	1.992	0.605	0.197	1 = 1-4 years completed 2 = 5-7 years completed 3 = 8 years completed 4 = 9-11 years completed 5 = 12 years completed (high school graduate) 6 = 13-14 years completed 7 = 15 years completed 8 = 16 years completed (college graduate) 9 = 17 years completed
Ethnicity					
HMO	0.954		-4.337	16.888	0 = Other
Non-HMO	0.908		-2.813	5.916	1 = Anglo
Enabling Characteristics					
Family					
Income of family or unrelated individual					
HMO	7.290	2.287	-0.306	-0.892	1 = Under \$1,000 2 = \$1,000-1,999 3 = \$2,000-2,999 4 = \$3,000-3,999 5 = \$4,000-4,999 6 = \$5,000-5,999 7 = \$6,000-6,999 8 = \$7,000-9,999 9 = \$10,000-14,999 10 = \$15,000-24,999 11 = \$25,000 or more
Non-HMO	6.167	2.675	0.074	-1.165	

(continued)

TABLE 1 (Continued)

Variable	Mean	SD	Skew	Kurtosis	Values
<u>Private health insurance</u>					
coverage					
HMO	0.793		-1.455	0.116	0 = No
Non-HMO	0.614		-0.467	-1.782	1 = Yes
<u>Illness-Morbidity Characteristics</u>					
<u>Objective</u>					
Total number of chronic conditions					
HMO	0.990	1.232	1.775	4.714	0-12 conditions
Non-HMO	1.094	1.335	1.608	3.492	
<u>Subjective</u>					
Health status					
HMO	2.008	0.884	-0.591	-0.390	0 = Poor
Non-HMO	1.895	0.919	-0.467	-0.621	1 = Fair
					2 = Good
					3 = Excellent
<u>Health Care Services Utilization</u>					
<u>Physician</u>					
Physician visits in past twelve months					
HMO	6.233	15.582	9.805	112.046	0-994 visits
Non-HMO	5.336	12.911	42.748	3071.230	

TABLE 1 (Continued)

Variable	Mean	SD	Skewness	Kurtosis	Values
Interval since last physician visit					
HMO	2.355	1.318	1.371	1.145	0 = Never
Non-HMO	2.535	1.445	1.148	0.322	1 = Visit in past 2 weeks
					2 = 2 weeks to less than 6 months
					3 = 6 months to less than 12 months
					4 = 1 year
					5 = 2-4 years
					6 = 5+ years
Hospital					
Hospitalized days in past twelve months					
HMO	2.795	10.065	6.962	62.564	0-365 days
Non-HMO	2.708	10.072	9.251	169.684	
Total number of hospital episodes in past twelve months					
HMO	0.229	0.574	2.974	9.558	0-8 stays
Non-HMO	0.230	0.583	3.547	18.937	

*N = 408 for weighted sample in thousands.

**N = 20,877 for weighted sample in thousands.

sion analysis was used to examine the relative effects of the predisposing, enabling, and need variables on the use of physicians and hospitals between HMO and non-HMO members. Regression analysis was used because it is a relatively powerful technique for examining the relationships among a large number of variables. The technique allows one to select variables that are potential determinants of the phenomena of interest (i.e., the effects) and to isolate the separate contributions to the effects made by each predictor variable (Heise, 1975). As the effects of the predictor variables are being compared for two different populations (HMO members and non-HMO members), metric regression coefficients are used rather than standardized beta coefficients (Kim and Kohout, 1975b).

Regression analysis required a number of assumptions about the model being tested. The assumptions required are the assumptions of interval measurement, linearity, additivity, non-collinearity or multicollinearity, normality, and homoscedasticity. The assumptions were tested and found to be adequately well met to proceed with the analysis.

Results

In this section, each of the three research questions will be considered individually. The questions to be considered are: (1) who belongs to an HMO, (2) do HMO members and nonmembers differ in their use of physicians and hospitals, and (3) do factors which influence the use of physicians and hospitals differ between HMO members and nonmembers.

WHO BELONGS?

Comparisons of the HMO members and nonmembers on the predisposing, enabling, and illness level variables using t tests are presented in Table 2. Inspection of Table 2 reveals that the two groups are significantly different on all the predictors except total number of chronic conditions. The HMO members are younger

TABLE 2

Comparison of HMO Members and Nonmembers on the Predisposing, Enabling, and Illness Level Variables

Variable	N*	Mean	SD	Standard Error	T Value	Degrees of Freedom	Two-Tailed Probability
<u>Age</u>							
HMO	407	71.1814	5.464	0.271	-7.41 ^o	429.35	0.000
Non-HMO	20,877	73.2121	6.441	0.045			
<u>Sex</u>							
HMO	407	0.5205	0.500	0.025	4.48+	21,283	0.000
Non-HMO	20,877	0.4104	0.492	0.003			
<u>Marital Status</u>							
HMO	407	0.6731	0.470	0.023	5.62+	21,283	0.000
Non-HMO	20,877	0.5330	0.499	0.003			
<u>Region</u>							
HMO	407	0.4764	0.500	0.025	-2.14+	21,283	0.033
Non-HMO	20,877	0.5297	0.499	0.003			
<u>SMSA/Non-SMSA Residence</u>							
HMO	407	0.8352	0.371	0.018	10.98 ^o	434.25	0.000
Non-HMO	20,877	0.6299	0.483	0.003			
<u>Education of Respondent</u>							
HMO	399	4.6816	2.010	0.101	9.15+	20,554	0.000
Non-HMO	20,156	3.7603	1.992	0.014			
<u>Ethnicity</u>							
HMO	407	0.9537	0.210	0.010	4.35 ^o	437.66	0.000
Non-HMO	20,877	0.9076	0.290	0.002			
<u>Family Income</u>							
HMO	169	7.2901	2.287	0.119	9.32 ^o	389.20	0.000
Non-HMO	14,491	6.1610	2.675	0.020			

(continued)

TABLE 2 (Continued)

Variable	N*	Mean	SD	Standard Error	T Value	Degrees of Freedom	Two-Tailed Probability
<u>Private health insurance coverage</u>							
HMO	407	0.7914	0.405	0.020			
Non-HMO	20,877	0.6137	0.487	0.003	8.83 ^o	430.21	0.000
<u>Total number of chronic conditions</u>							
HMO	407	0.9899	1.232	0.061			
Non-HMO	20,877	1.0936	1.335	0.009	-1.68 ^o	425.82	0.094
<u>Health status</u>							
HMO	407	2.0085	0.884	0.044			
Non-HMO	20,686	1.8952	0.919	0.006	2.47 ⁺	21,092	0.014

*Weighted sample in thousands.

^oSeparate variance estimate.⁺Pooled variance estimate.

than the non-HMO group. They are more likely to be female, to be married and living with their spouse, to live in the Southeast or Southwest, to live in an SMSA, and to be Anglo. The HMO members have higher levels of education and higher average family incomes. The HMO members are also more likely to have private health insurance coverage. While the HMO members subjectively rate their health slightly better than the non-HMO members, they do not differ significantly from the nonmembers on the total number of reported chronic conditions.

DIFFERENCES IN THE USE OF PHYSICIANS AND HOSPITALS

Data on the differences in the use of physicians and hospitals between HMO members and nonmembers are presented in Table 3. The t test is used to test for significance of differences between these two groups. The data indicate that, among older adults, HMO enrollees have a higher average number of visits to the physician in the past year (6.2 for HMO members versus 5.3 for nonmembers), although this difference is not statistically significant. The HMO members report a slightly smaller interval since their last physician visit than the non-HMO group, a difference which is statistically significant. However, in contrast to the previous research literature on the population less than 65 years old, the HMO members did not use hospital services significantly less than non-HMO members.

Given that the HMO members were younger and more affluent and rated themselves subjectively as healthier than the nonmembers, they would be expected to use fewer physicians' services, not more. Perhaps the better coverage of physician visits by the HMO plans as compared to Medicare coverage allows older people to seek care earlier in symptom stages and to have more preventive visits than older people who are not members of HMOs.

The similarity of the HMO and non-HMO groups in terms of their financial access to hospital services probably explains the similarity of their use of these services. Medicare provides better coverage of hospital benefits than of physician benefits. Further-

TABLE 3
Comparison of Use of Physicians and Hospitals by HMO Members and Nonmembers

Variable	N*	Mean	SD	Standard Error	T Value	Degrees of Freedom	Two-Tailed Probability
<u>Physician visits in past 12 months</u>							
HMO	400	6.2331	15.582	0.778			
Non-HMO	20,524	5.3355	12.911	0.090	1.15 ^o	410.72	0.253
<u>Interval since last physician visit</u>							
HMO	407	2.3549	1.318	0.065			
Non-HMO	20,800	2.5353	1.445	0.010	-2.73 ^o	426.34	0.007
<u>Number of short-stay hospital days in past 12 months</u>							
HMO	407	2.7946	10.065	0.498			
Non-HMO	20,877	2.7066	10.069	0.070	0.17+	21,283	0.861
<u>Number of short-stay hospital episodes in past 12 months</u>							
HMO	407	0.2291	0.574	0.028			
Non-HMO	20,877	0.2303	0.583	0.004	-0.04+	21,283	0.967

*Weighted sample in thousands.

^oSeparate variance estimate.

+Pooled variance estimate.

more, Medicare beneficiaries who belong to HMOs are free to seek hospital care outside of the HMO using their Medicare benefits. HMOs typically are reimbursed for actual use of hospital services by Medicare beneficiaries and, thus, do not have the same incentive to limit use of hospital services among the 65-and-over population as among the under-65 population.

Of the HMO enrollees, 34% report that they have seen a non-HMO physician in the past year. The two most frequently given reasons for using a non-HMO physician are that they preferred an outside physician (36%) and that they were referred to a non-HMO physician (32%) while the third most frequently given reason is that they needed health care while they were away from home (23%). Dissatisfaction with HMO care is the least frequently cited reason for seeing an outside physician.

These results are consistent with Greenfield's research discussed above. These results indicate (1) that use of physicians may increase with HMO enrollment, although the reason for that increase is not clear; (2) that older people who belong to HMOs continue to use non-HMO physicians; and (3) that the use of hospital services is not lower for HMO enrollees than nonenrollees. This finding may also indicate that older adults who are not HMO members are not able to see a physician as often as they feel is necessary or desirable. More research is needed on differences in the use of physicians services by HMO and non-HMO older adults to determine how and why their patterns of use differ.

FACTORS INFLUENCING UTILIZATION OF PHYSICIANS AND HOSPITALS

The ordinary least-squares regression coefficients showing the effects of the predictor variables on the four utilization variables are presented in Table 4. The older HMO and non-HMO population will be compared in terms of the predictiveness of the independent variables.

Use of Physicians. The major predictor variables affecting the number of physicians visits in the past year are the illness

TABLE 4
Metric Regression Coefficients and Multiple R² for the Effects
of the Predisposing, Enabling, and Illness/Morbidity Variables
on the Use of Health Care Services

Independent Variables	Physicians Visits in Past 12 Months		Interval Since Last Physician Visit		Hospitalized Days in Past 12 Months		Hospital Episodes in Past 12 Months	
	HMO	Non-HMO	HMO	Non-HMO	HMO	Non-HMO	HMO	Non-HMO
<u>Predisposing Demographic</u>								
Age	-.19	-.01	.00	-.01*	-.08	.06*	.00	.00*
Sex	1.95	-.62*	-.20	.18*	-1.96	.43*	-.07	.04*
Marital Status	.27	-.75*	.32*	-.17	2.04	-.54*	.11	-.01
Region	-1.56	-.15	-.24	.07*	1.96	.36*	.00	.02*
SMSA/non-SMSA	1.11	.95*	-.61*	.04	-1.24	.34*	-.16*	-.01
<u>Social Structure</u>								
Ethnicity	-.95	.36	.41	.03	.33	-.25	.07	.03*
Education	1.19*	-.21*	-.07*	-.02*	.31	.09*	.00	.00
<u>Enabling Family Level</u>								
Family income	.47	.24*	.04	-.02*	-.21	.09*	.02	.01*
Private insurance	.93	.66*	.67*	-.31*	.47	.34*	.00	.05*
<u>Illness/Morbidity Objective</u>								
Total chronic conditions	3.14*	1.55*	-.16*	-.22*	1.42*	.91*	.06*	.08*
<u>Subjective</u>								
Health Status	-1.20	-1.37*	.36*	.24*	-2.14*	-1.46*	-.14*	-.09*
R ²	.11	.05	.17	.10	.13	.05	.13	.07

*p ≤ .05

morbidity variables, especially the objective measure of total number of chronic conditions. Among the non-HMO group, family income and private insurance coverage have significant positive effects on the use of services but have no effects among the HMO group. Education, a predisposing, social structure

variable, has a significant effect on physician utilization in both groups, although the effects are in opposite directions—positive among HMO members and negative among nonmembers—indicating that in the HMO population, those older people with the most education are using physicians' services the most, while in the non-HMO population, the less educated older people are using the most services. None of the predisposing demographic variables has a significant effect among HMO members, but in the non-HMO groups, three of these variables—sex, marital status, and SMSA/non-SMSA residence—have significant effects. In the non-HMO group, women use more services than men, unmarried older people use more services than the married, and SMSA residents use more services than non-SMSA residents.

The interval since the last physician visit is also affected significantly by the illness/morbidity variables. Generally, the poorer the health, the shorter the interval since the last visit for both populations. Private insurance coverage significantly affects the interval since last visit for both groups, but in opposite directions. Among the HMO population, private insurance coverage is associated with longer intervals since the last visit, while in the non-HMO group it is associated with a shorter interval since the last visit. In both populations, education has significant but miniscule negative effects on the interval since last visit. Among the HMO population, married older people have a significantly shorter interval since last visit than do the unmarried, and SMSA residents have a significantly shorter interval than do non-SMSA residents. Among the non-HMO residents, men have shorter intervals on the average than women.

Use of Hospitals. The number of days hospitalized in the past year is strongly influenced by the illness/morbidity variables in both groups, although the effects are the strongest among HMO members. In both populations, the least healthy people use services the most. In the non-HMO group, but not in the HMO group, private insurance coverage, family income, and education have significant positive effects in the use of hospital services, although the effects are small, especially for income and education. In the non-HMO population, men have significantly more

hospitalized days than women, the unmarried have more hospitalized days than the married, residents of Frostbelt states have more hospitalized days than those in the Sunbelt, and SMSA residents have more hospitalized days than non-SMSA residents.

Hospital episodes in the past year are also affected by illness/morbidity. In the non-HMO population, there are also some positive statistically significant effects from income, private insurance coverage, education, ethnicity, sex, and region, but as the effects are very small, they will not be discussed further. In the HMO groups, residents of non-SMSAs have significantly fewer visits than residents of SMSAs.

Discussion

Comparison of the effects of the predisposing, enabling, and illness/morbidity variables on use of physicians and hospitals in the HMO population and in the non-HMO population has revealed some interesting patterns of relationships which have implications for the two major issues raised by HMOs, namely, (1) accessibility of health care and (2) cost of health care.

First, these data provide support for the argument that HMOs can make health care more accessible to the older adult. Overall, among both the HMO members and nonmembers, the illness/morbidity variables have the greatest effects on use of physicians and of hospitals. Thus, both systems are accessible to those who need services. However, the HMO system appears to be more accessible, especially for physicians' care. The greater strength of the illness/morbidity variables in predicting use of physicians and hospitals in the HMO population than the non-HMO population indicates that the HMO member uses more service per unit of illness than does the nonmember. In the non-HMO population, private insurance coverage and family income continue to influence accessibility of health care while in the HMO population these variables do not influence access to care. The fact that private insurance coverage is associated with a lengthening rather

than a shortening of the interval since last physician visit is probably a spurious association. Older people who belong to HMOs already have good coverage of hospital and physicians' services, so that those who choose additional private insurance coverage are likely to be those older people who have extra money to spend on a private insurance policy and who, as a relatively affluent group, tend to be healthy and therefore need fewer services. The substantial positive effect of education in the use of physicians among the HMO population may indicate that when the barriers to the use of health care services are removed, variables for which education is a proxy—such as health knowledge and beliefs, but which are not measured in this survey—become more important in influencing patterns of use of care than they would otherwise.

The one group for which care is not more accessible is the rural residents. Rural residents, who also tend to have lower incomes and poorer health than their urban counterparts, use fewer physicians' services than urban residents in both the HMO and non-HMO populations and use more hospital services in the HMO population but not in the non-HMO population. Thus, hospital care is more accessible in the HMO population than the non-HMO population, but physicians' care is not more accessible. These data suggest that HMOs which tend to be located in urban areas are no more accessible to rural residents than are the fee-for-service services and that older adults may use more hospital services especially in an HMO because outpatient services are not convenient to use.

The failure of other predisposing demographic variables—including age, sex, marital status, and region—to have statistically significant effects on use of services in the HMO population, as they do in the non-HMO population, may be a further indication that the more accessible health care becomes based on need, the less important these other variables become.

This analysis does not provide data to indicate that use of services, and therefore that the cost of health care services, will necessarily be contained by providing services to older people

through HMOs rather than the fee-for-service system. The increased use of health care services based on need discussed above may cause an increase in costs. It should be emphasized, however, that this dataset was not designed to address cost directly and cannot take into account variables such as greater efficiency of HMOs or economies of scale which could result from increased enrollments of older adults in HMOs.

Summary and Implications

Comparison of the HMO and non-HMO populations on the predisposing, enabling, and need variables indicate that the HMO members are younger, are more likely to be married, have higher levels of education and income, are more likely to have private health insurance, and subjectively rate their health as better. The two groups do not differ on the objective measure of health, the total number of chronic conditions. Analysis of data on the older HMO population indicates that, compared to nonmembers, HMO members have slightly more physicians' visits per year on the average and see a physician more frequently, but the HMO members do not differ from nonmembers in their use of hospital services.

Among both HMO members and nonmembers, physician utilization is most strongly affected by illness and morbidity as previous research has found both in the total population (Wolinsky, 1978) and among older people specifically (Eve and Friedsam, 1980; Eve, 1981), but the effects of the illness/morbidity variables are strongest among the older HMO population, indicating that physicians' services are more accessible to older adults in the HMO system than in the fee-for-service system. The emergence of the positive influence of education among the HMO population might be an indication that factors associated with education such as health values and beliefs may affect use of physicians when economic barriers to use are removed. The data also indicate that among the HMO population, SMSA residents

use more services than non-SMSA residents, possibly because of more convenient geographic access. The use of hospitals by HMO members and nonmembers is also most strongly affected by the illness-morbidity variables, as in the total older population (Eve and Friedsam, 1980; Eve, 1981) and among the general population (Wolinsky, 1978).

The data on older HMO members, while ambiguous on the effects of HMO membership on use of physicians, do tentatively suggest that use of physicians may be greater among the HMO population than the non-HMO population, which is all the more remarkable since the HMO population is younger, more affluent, and perhaps healthier than the non-HMO population. The fact that, when economic constraints are minimized, the HMO population chooses a greater number of and more frequent physician visits suggests that older adults may not be getting all the care they want or need in the fee-for-service system. The possible increase in use of physicians' visits, as well as the lack of difference between the HMO and non-HMO populations on use of hospital services, does suggest that the HMOs may not result in cost containment of medical expenses among older adults although it may result in more adequate coverage of physicians' services. The fact that non-SMSA HMO members have fewer and less frequent physician visits suggests further that HMOs, which tend to be located in SMSAs, are less geographically accessible to the elderly for whom transportation is problematic and therefore may be less effective in delivering health care services to rural elderly than to the urban elderly.

Given the importance of access to necessary health care for maintenance of health of older adults, more research should be conducted to determine the ability of HMOs to render health care more accessible and more economical. This research has raised a number of issues which need further research attention. First, more in-depth research is needed to determine why some older people choose to belong to HMOs. What percentage do in fact "age in" and why do they choose to remain members? How many adults join HMOs for the first time in their old age and why? How

receptive to HMO membership would older adults be if HMOs were to be made more available to them? How do Medicare and Medicaid policies affect HMO membership among older adults? Second, it is important to determine why older HMO members use more physicians' services than nonmembers but use the same amount of hospital services. Do older HMO members use more preventive services and, if so, is the prevention health and cost effective? Do they seek treatment earlier? Finally, with the economic barrier to health care services removed, what effects do health knowledge, values, and attitudes have on the use of services and how can these variables be manipulated to produce more effective and efficient use of services? Research on these questions will provide information which can be used to improve the current system of care available to older adults in the United States.

NOTE

1. As can be seen by inspection of Table 1, most of the predictor variables were measured at the nominal and ordinal level. The assumption of interval measurement was relaxed in order to use regression analysis, which is consistent with current accepted practice in social science (Asher, 1976; Boyle, 1970; Labovitz, 1970). The assumption of linearity was tested using polynomial stepwise regression. None of the polynomial variables in the analysis added an increment of .05 or more to the squared multiple correlation coefficient as required for acceptance of a nonlinear trend (Kim and Kohout, 1975b). The assumption of additivity was tested by calculating all possible first-order interaction terms among the independent variables and entering each interaction term separately in the last step of the stepwise regression equations. None of the interaction terms added the criterion amount of 5% to the variance explained (Kim and Kohout, 1975b). Collinearity and multicollinearity involve problems of highly intercorrelated independent variables. Harmful collinearity is present when a zero-order correlation of .80 or more exists between pairs of independent variables, while harmful multicollinearity exists when a multiple correlation coefficient of .80 or more is found when an independent variable is regressed on other independent variables (Farrar and Glauber, 1967; Hanushek and Jackson, 1977). Variables originally included in research which created problems of collinearity and multicollinearity were eliminated from the analysis. These variables eliminated included 11 predisposing variables (widowed, never married, education of household head, retired/nonretired, living alone, living with spouse, living with other relatives, actual family size, type of living quarters, total rooms, total number of bed-

rooms), 6 enabling variables (income of head, veteran, telephone, regular physician, private/public clinic, number of regular sources of care), and 5 illness/morbidity variables (total numbers of chronic and acute conditions combined, total number of chronic and acute conditions causing a limitation of activity, restricted activity days in the past two weeks, bed disability days in the past two weeks, and limitation of activity due to chronic conditions).

The assumption of a normal population was tested by examining the measures of skewness and kurtosis in Table 1. A positive skewness value indicates that the distribution is skewed to the right while a negative value indicates that the distribution is skewed to the left. A positive kurtosis value indicates that the curve is more peaked than a normal distribution while a negative value indicates that it is flatter than a normal distribution. Inspection of Table 1 reveals that the normality assumption was not met. Violation of this assumption will produce conservative estimates of the regression and squared multiple regression coefficients. Kobashigawa and Berki (1977) found that use of more expensive and time-consuming alternatives to ordinary least-squares regression produced only marginal gains in prediction and, thus, recommended the use of ordinary least squares.

It is also necessary to assume that the standard deviations of the Y's for each X are the same regardless of the value of X (Asher, 1976; Blalock, 1979; Kim and Kohout, 1975a). This assumption was tested through direct examination of residuals. Inspection of plots of the standardized residuals against the standardized predicted values of the dependent variables indicated that the assumption of homoscedasticity was not met for the multiple regressions in this analysis, primarily because the variables used in the data analysis, especially the dummy variables, were not normally distributed, as indicated in Table 1. However, as the sample size is large, so that efficiency of estimates is not of great concern, ordinary least-squares estimates will be used, as recommended by Blalock (1979). The effects of a lack of homoscedasticity is to produce conservative estimates of the regression coefficients.

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