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PREFACE

This report represents the first major release of experimental results from the Rand Health Insurance Study, a large-scale, controlled trial in health care financing. Preliminary design work for the Study began in 1971; a pilot sample of participants was enrolled in late 1973; and the first regular sample was enrolled in the first site (of six) in late 1974. Most participants have now completed their period of participation, and all will complete it by January 1982. The design of the Study is described in Joseph P. Newhouse, "A Design for a Health Insurance Experiment," *Inquiry,* March 1974, also available from Rand as report R-965-1-OEO, and in R-1987/1-HEW, *Conceptualization and Measurement of Health for Adults in the Health Insurance Study: Vol. 1, Model of Health and Methodology.* The project was begun with a research grant from the Office of Economic Opportunity and has been carried on since 1973 with the support of a grant from the Office of the Assistant Secretary for Planning and Evaluation, U.S. Department of Health, Education, and Welfare (now Health and Human Services).

Earlier, nonexperimental work on the issues covered in this report is summarized in Joseph P. Newhouse and Rae W. Archibald, *Overview of Health Insurance Study Publications,* available from Rand as paper P-6221. A shorter version of this report (without the appendices) is published in the December 17, 1981 issue of *The New England Journal of Medicine.*

SUMMARY

A total of 7706 participants in six sites have taken part in a controlled experiment related to cost sharing in health insurance policies. Most participants received care from the physician of their choice. A small number received care at a Health Maintenance Organization; results relating to those participants are not reported here.

The families were assigned in an unbiased manner to insurance plans that covered a broad range of medical services but varied the coinsurance rate, i.e., the fraction of its medical bills that the family must pay. This out-of-pocket expenditure was subject to an upper limit of $1000 per year or 5, 10, or 15 percent of income, whichever was less. In general, the same coinsurance rate applied to all services, but in one plan, a 95-percent coinsurance rate applied only to outpatient services; inpatient services were free. Families participated for 3 or 5 years; the findings in this report are based on about 40 percent of the data that will ultimately be available.

The major findings to date include the following:

1. Expenditure per person responds to variation in cost sharing. It is about 50 percent greater in the plan with no cost sharing than in the one with 95-percent coinsurance up to a maximum of $1000 in any one year.

2. The variation in expenditure across plans comes from variations in the real quantity of services consumed; to date we have found little or no variation in price per unit of service as a function of plan.

3. As cost sharing declines, the percentage of individuals seeking care rises, as does the number of ambulatory visits per user. The number of adults hospitalized increases, but the number of children hospitalized shows no systematic relationship to plan. Cost per person hospitalized does not appear to be related to plan.

4. The response of the lowest third and highest third of the income distribution to the insurance plans was similar, but it would probably have been greater in the lower-income group had the cost sharing not been income-related.

5. Cost sharing for only ambulatory services (inpatient services free) decreases hospital admissions among adults relative to free care and does not appear to affect admission rates for children.

The implications of these findings are that:

1. Cost sharing unambiguously reduces expenditure; it is not

"penny-wise and pound-foolish" (with respect to expenditure) as some have argued.

2. If income-related, cost sharing causes approximately equiproportionate reductions in use among different income groups.

3. Cost per hospital stay, which has risen much faster than number of stays in recent years, is unlikely to be much affected by variation in cost sharing provided there is a ceiling on out-of-pocket expenditure of around $1000, as was the case in this experiment.

4. Whether the additional use of medical services that is induced by lower cost sharing is necessary or unnecessary is not yet known. In all likelihood, it represents a mix of high- and low-benefit services. Extensive measures of participants' health status have been made, and the sample size should ultimately be adequate to identify nontrivial differences in health status that the variation in cost sharing may have induced.

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I. INTRODUCTION

The controversy over the desirability of cost sharing in health insurance policies has simmered for decades and occasionally boiled over, in part because of the meager quantitative evidence about the effects of cost sharing on health status and on the demand for medical services. The limited information available prompted the federal government to sponsor a social experiment, or controlled trial, of the effects of cost sharing. The experiment, which was intended to be as definitive as possible, began in the first site in late 1974 and will end in the last site in early 1982. Results concerning the effects of cost sharing on health status are not yet available, and we have only interim results on the use of medical services. But in light of the ongoing debate over the appropriate role—if any—of cost sharing in health insurance plans, we consider it useful to release these preliminary results now.

II. PRIOR STUDIES

Even as late as 1971, a leading authority, testifying before the Senate Subcommittee on Health, could cite no evidence that cost sharing methods, such as deductibles and coinsurance, led to lower use of health services (Fein, 1971). Subsequently, a number of studies, each with its own limitations, suggested that the extent of cost sharing did affect use;* the quantitative sensitivity of use to cost sharing has, however, remained quite uncertain. The estimates in these studies differed by a factor of three or more in how much the use of health services would increase if an average uninsured person became fully insured. And some argued that fully insuring ambulatory services would *reduce* total expenditure by encouraging preventive care and more appropriate use of the hospital (Roemer et al., 1975), although other evidence suggested the contrary (Hill and Veney, 1970; Lewis and Keairnes, 1970).

The uncertainty about the effects of cost sharing on particular types of individuals exceeds the uncertainty about its effect, on average, on the population as a whole. For example, some believe that cost sharing affects primarily the poor and has very little, if any, effect on the middle class. Evidence from Canada suggests that the poor and those with larger families respond relatively more to cost sharing (Beck, 1974), but one study in the United States did not detect any marked difference in the response of different income groups (Newhouse and Phelps, 1976). In another instance, lower-income groups did respond more, percentagewise, to coinsurance, but absolute changes were similar (Phelps and Newhouse, 1972; Scitovsky and Snyder, 1972).

Still others believe that for children, the demand for health care is less sensitive to cost sharing than for adults, maintaining that much of children's demand for medical services is predictable (Marmor, 1977). They use this predictability to support the argument that cost sharing should be eliminated for children's medical services. At the same time, the rate at which children visit physicians has been notably more sensitive to income than has the rate for adults (NCHS, 1972), suggesting that children's use of medical services may, on average, be more discretionary than that by adults. (In more recent data, however, this trend is not nearly so apparent (NCHS, 1979).)

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*See Beck, 1974; Enterline et al., 1973; Feldstein, 1978; Newhouse, 1978a; Newhouse and Phelps, 1976; Newhouse, Phelps, and Schwartz, 1974; Phelps and Newhouse, 1972, 1974; Rosett and Huang, 1973; Scitovsky and McCall, 1977; Scitovsky and Snyder, 1972.

In sum, nonexperimental data suggest that use will vary with the amount of cost sharing, but are inconclusive about the magnitude of this effect and its possible variation among different types of people.

III. METHODS

SELECTION OF FAMILIES AND SITES

A total of 2756 families, consisting of 7706 persons, have been enrolled in one of several different health insurance plans, 70 percent of them for 3 years and the rest for 5 years. The details of the experimental design as of late 1973 are given in Newhouse (1974), but are briefly reviewed and updated here. The families come from six areas of the country (listed by size): Seattle, Washington; Dayton, Ohio; Charleston, South Carolina; Fitchburg-Leominster, Massachusetts; Franklin County, Massachusetts; and Georgetown County, South Carolina. Families who moved after enrollment were kept in the study as long as they remained within the United States.*

Within these six sites, families were selected at random, subject to the following restrictions: Families were excluded in which heads were eligible for Medicare at the beginning of the study (or who would become so by virtue of age before the end of the study). Hence, our results do not necessarily apply to the aged population. Families participating in the Supplemental Security Income (SSI) program, including those participating in the Disability Medicare program, were ineligible. So, too, were families eligible for the military medical care system, veterans with total disability that was service-connected, and persons residing in institutions that assumed responsibility for medical care (e.g., prisons, mental institutions). Families with incomes in excess of $25,000 (1973 dollars) were ineligible; this rule excluded so few people (approximately the upper 5 percent of the income distribution) that it should not materially affect our results. Persons over 62 at the time of enrollment in otherwise eligible families were excluded, but the remainder of the family was eligible. Finally, low-income families within each site were mildly oversampled.

The sites were selected as follows. First we calculated the optimal number of sites for a given budget. This implied balancing the effect of additional dollars spent to reduce between-site variance by adding more sites with that of additional dollars spent to reduce within-site variance by adding more families. Our estimates showed that the optimal number of sites for our budget was between four and nine. We settled on six.

It remained to determine the exact sites. The six sites were selected

*Except for families enrolled in the control group at the Health Maintenance Organization. These participants are not included in the analysis described in this report.

(a) to represent all four census regions and thus account for any regional variation in responsiveness of demand to cost sharing; (b) to obtain a spectrum of city sizes, because the complexity of the medical care delivery system (and hence the response to insurance) could vary with city size; (c) to achieve variation in waiting times for an appointment and the proportion of primary care physicians accepting new patients, since response to demand could vary according to the amount of excess demand for ambulatory services; (d) to include participants from both Northern and Southern rural areas, because these areas tend to differ in economic and racial characteristics; and (e) to ensure that one site had a well-established, prepaid group practice.

The actual sites chosen satisfied these criteria (Table 1). We have not yet reweighted the sample to represent a national probability sample, because any weights would change with each new increment of data. But the characteristics of the unweighted sample, when averaged across the sites, do not markedly differ from those of the nation, save for the intentional departures, such as the exclusion of the aged.

ASSIGNMENT OF FAMILIES TO EXPERIMENTAL INSURANCE PLANS

The families selected to enroll in the experiment were assigned to an insurance plan by an unbiased method, the Finite Selection Model (Morris, 1979). The model retains some randomization, but improves upon simple and stratified random assignments by making the distribution of the several family and individual characteristics represented in each insurance plan as similar as a limited number of families permit. The characteristics taken into account are described in Morris (1979).

Fifteen percent of the families contacted were not enrolled because they refused a screening or baseline interview (Table 2). There is no way of knowing whether these families would behave differently from those who ultimately enrolled. Another 20 percent of the families refused a subsequent enrollment interview or the offer of enrollment in the experimental plan. If they refused, they could not participate in the experiment at all. Because the characteristics and the prior use of medical services of families who ultimately enrolled in the experiment do not differ significantly from those of eligible families who completed baseline interviews, refusal of this 20 percent should not bias the results.

Table 1

CHARACTERISTICS OF SITES

Site	Census Region	Population of Urbanized Area or County (1970)	Primary Care Physicians per 100,000 Population (1972)[a]	Days Spent Waiting for an Appointment with a Primary Care Physician, New Patient[b] (1973, 1974)	Median Family Income (1969)	Percent Over Age 24 with Less Than 5 Years of Education (1970)	Percent Black (1970)	Number of Enrollees
Seattle, WA	West	1,200,000	59	4.1	11,800	1.8	3	1,220[c]
Dayton, OH	North Central	690,000	41	7.5	11,400	3.3	13	1,140
Charleston, SC	South	230,000	33	15.9	8,300	6.2	25	780
Fitchburg-Leominster, MA	North East	78,000	30	25.0	10,000	4.3	1	724
Franklin County, MA	North East	59,000	46	9.2	9,900	2.8	1	891
Georgetown County, SC	South	34,000	44	0	6,400	20.6	48	1,061
United States	—	—	46	7.1	9,600	5.5	11	—

[a]Includes general practitioners, family practitioners, internists, and pediatricians.

[b]Physicians who do not use appointment systems and take patients on a first-come, first-served basis are valued as having zero wait time. All physicians sampled in Georgetown County at the time of the survey accepted patients on this basis. For other sites, the values are negligibly changed if only physicians using appointment systems are included.

[c]An additional 1892 participants were enrolled in the Group Health Cooperative of Puget Sound.

Table 2

PROPORTION OF SAMPLE REMAINING AFTER ACCOUNTING FOR REFUSALS AT VARIOUS STAGES

(Percentage/100)

Enrollment Criteria	Dayton	Seattle[a]	Massachusetts	South Carolina	Total
Initial sample	1.0	1.0	1.0	1.0	1.0
Did not refuse screening interview	.88	.85	1.0[b]	1.0[b]	.94
Did not refuse baseline interview	.74	.78	.88	.95	.85
Did not refuse enrollment interview	.73	.70	.76	.84	.76
Did not refuse offer of enrollment	.68	.59	.62	.71	.65
Number of families enrolled	390	484	566	568	2008

NOTE: These numbers do not account for families who moved prior to enrollment, could not be located, were chronically not at home, or other losses from the sample not due to refusal.

[a]Excludes 752 families enrolled in the Group Health Cooperative of Puget Sound.

[b]There was no screening interview in Massachusetts or South Carolina.

DESCRIPTION OF INSURANCE PLANS

The insurance plans that were offered to the families varied along two dimensions: the coinsurance rate (fraction of the bill paid by the family) and the Maximum Dollar Expenditure (an upper limit on annual family out-of-pocket expenditure). The coinsurance rates were 0 (free care), 25, 50, or 95 percent. The Maximum Dollar Expenditure varied as a fraction of family income, either 5, 10, or 15 percent, to a maximum of $1000.* The 95-percent coinsurance plan, together with the limit on the family's expenditure, approximates an income-related catastrophe plan.

The following example illustrates how the experimental plan operated. A family assigned to a plan with a 25-percent coinsurance rate and a $1000 Maximum Dollar Expenditure would pay 25 percent of all medical and dental bills in each year until the total of all of these bills reached $4000. At that point it would have spent $1000 out-of-pocket, after which all further expenditure during that year would be fully paid (or reimbursed) by the experimental plan. At the beginning of the next year, the family would again pay the 25-percent coinsurance until the $1000 limit was reached.

One plan differed somewhat from all the others in that its ceiling on out-of-pocket expenditure was not related to income. This plan had a 95-percent coinsurance rate, but the maximum out-of-pocket expenditure was limited to $150 for each person or, alternatively, to $450 for the family. Thus, this plan approximates one with a $150-per-person annual deductible, with a provision that no more than three people in the family must satisfy the "deductible." We refer to this plan as the Individual Deductible Plan.

Most enrolled families were permitted to seek care from any provider. Some families in Seattle, however, were assigned to a prepaid group practice, the Group Health Cooperative of Puget Sound in Seattle; their medical care was free as long as it was received at the Cooperative. In addition, some families were included who were already members of the Cooperative. Results on families enrolled in the Cooperative are not yet available.

A wide variety of services were covered in all plans, including hospital, physician, dental, mental health, visual, and auditory services, drugs (including over-the-counter drugs for certain chronic conditions), and supplies. Services of nonphysician providers, such as audiologists, chiropractors, clinical psychologists, optometrists, physical therapists, and speech therapists, were also covered. The only noteworthy exclusions from coverage were nonpreventive orthodontic ser-

*In the 25-percent coinsurance plans, the maximum was $750 in most site-years.

vices, cosmetic surgery for pre-existing conditions, and outpatient mental health visits exceeding 52 per year.

Each policy covered all services at a single coinsurance rate with two exceptions. First, three plans required 50-percent coinsurance for dental and outpatient mental health services, but only 25 percent for all other services. These plans are grouped with the 25-percent coinsurance plans below. Second, the Individual Deductible Plan applied cost sharing to *outpatient* services only; inpatient services were free to the family. The Individual Deductible Plan thus approximated the situation of many families who have complete or nearly complete insurance coverage for inpatient services but incomplete coverage for outpatient services. It was designed to test the hypothesis that failure to provide full coverage for outpatient services inflates total medical expenditures by inducing additional hospitalization (Roemer et al., 1975).

A number of minor changes in the insurance plans were made after the plans had been in operation for a year in the first site (Dayton). In the first year in Dayton, dental services for adults were not covered in plans with nonzero coinsurance rates, but were covered thereafter like any other service. Also during the first year in Dayton, expenditures for outpatient mental health services were covered at the coinsurance rate specified in the policy. Such expenditures did not count toward the Maximum Dollar Expenditure during the first year, but subsequently they did. Finally, in the first year in Dayton, there were plans with 100-percent coinsurance rather than 95 percent; at the beginning of the second year in Dayton, the plans with 100-percent coinsurance were changed to 95-percent coinsurance. The change from 100 to 95 percent is ignored for simplicity in the following analysis, but because of the different treatment in the first year in Dayton, we will omit dental and outpatient mental health services from the analysis.

Upon enrollment, families signed over (assigned) the benefits from any existing health insurance coverage to the experiment; such policies were kept in force so that the families could return to them at the end of the experiment. Any family whose existing coverage was such that participation in the experiment could make it potentially worse off financially was paid, over the course of the experiment, an amount at least equal to its maximum possible loss. (This payment was made irrespective of the family's actual use of medical services.) For example, if the family had been assigned to an experimental plan with a \$450 Maximum Dollar Expenditure and had an existing policy with a \$100 deductible and a 20-percent coinsurance above the deductible, it was paid at least \$280 per year ($280 = 450 - 100 - .2(450 - 100)$). Thus, a family always gained financially by enrolling.

ARTIFACTS OF THE EXPERIMENT

Our analyses are designed to control for several methodological artifacts of the experiment, including the "hold-harmless" payments just described, possible transitory effects from the limited duration of the experiment, the frequency of questionnaire administration, and the initial screening examination. The methods used to adjust for any effects that these artifacts may have had are described in Appendix A.

SAMPLE ANALYZED

The sample analyzed below includes individuals who participated in the experiment for the entire year in question and decedents who had participated during the year in which they died. (If, for example, a person withdrew sometime during the second year, data for that person are included in the analysis of the first year's experience only.) The inpatient expenditures for newborns are included with those of their mothers. The resulting sample includes roughly 95 percent of the individuals initially enrolled in the experiment. Attrition has been minimal—on the order of 2 or 3 percent per year—and no adjustment has been made for any bias that may have been introduced by attrition.

Our results include data from all sites except the two in South Carolina. The 3-year South Carolina sample was not enrolled until late 1978 and early 1979; consequently, the data now available are too few to merit analysis. The sample analyzed comprises data from the first 3 years of the Dayton site and the first 2 years of the Seattle and Massachusetts sites. Overall, these data constitute about 40 percent of the ultimate number of person-years.

METHOD OF ANALYSIS

One can, of course, analyze data from this experiment by computing means and standard deviations by plan (simple analysis of variance). Because plan was designed to be unrelated to any known covariates, differences in mean values by plan will yield unbiased estimates of differences among plans. Although such a procedure is satisfactory for ambulatory expenditure, the standard errors associated with per person total expenditure by plan are unacceptably large. The imprecision results from rare, very large claims that make the sample mean a relatively unreliable estimate of the population mean. For these reasons, we have augmented our analysis with more sophisticated methods. These methods consist of four estimated equations that predict expenditure. The equations are sketched in Appendix A and are described at greater length by Duan et al. (forthcoming).

In addition to its greater precision, the four-equation analysis permits a more reliable estimate of standard errors. When one is computing standard errors of differences among plan means (i.e., using analysis of variance), it is difficult to account for intrafamily and intertemporal correlation. We have made two different estimates of these correlations: a maximum likelihood estimate and a method of moments estimate. Unfortunately these methods yield different results for the estimated standard errors of the plan means. When the maximum likelihood method is used, the estimated correlations are sufficiently small that their effect on the standard errors is negligible (relative to assuming the correlation to be zero). When the method of moments is used, the correlation is such that the estimated standard errors are increased about 25 percent (above what they would have been had the correlation been zero). Because of the uncertainty about the magnitude of this correlation, we have not corrected the standard errors of the simple means for intrafamily and intertemporal correlation (i.e., standard errors for simple means assume no intrafamily or intertemporal correlation). The standard errors for values predicted by the four equations are corrected for intrafamily correlation, but are not corrected for intertemporal correlation. If intertemporal correlation were accounted for, the standard errors would increase by at most 7 percent (Duan et al., forthcoming).

IV. RESULTS

OVERALL EXPENDITURE

Per capita total expenditure (inpatient plus ambulatory, excluding dental and outpatient mental health services) rises steadily as coinsurance falls (Table 3). Expenditure per person in the plan with no coinsurance (the most generous plan) is about 60-percent greater than in the plan with 95-percent coinsurance, which approximates income-related catastrophe coverage (0.6 = (401 − 254)/(254)). Expenditure in the other plans falls between these two extremes. Differences among plans with different Maximum Dollar Expenditures were small; therefore, for clarity, all plans with the same coinsurance rate have been combined.

It is difficult to compare the figures in Table 3 with national data. Appendix B shows that the average expenditure in the country, adjusted for comparability, is around $350. As it should, this value lies within the range of our plans.

Precision for ambulatory expenditure is sufficiently good to permit disaggregation by site and year. In each site and year analyzed to date, per person expenditure on ambulatory services rises as coinsurance falls, save for a few insignificant exceptions (Table 4).

Although the simple arithmetic mean provides acceptable precision for analyzing ambulatory expenditure, it does not do so for plan-related differences in total expenditure (given the sample size available to date in this experiment). Even ignoring intrafamily and intertemporal correlation, the differences in total expenditure between any two plans shown in Table 3 are mostly insignificant at the 5-percent level (although the differences between the free care plan and the family deductible plan and between the 25-percent coinsurance plan and the 95-percent (family deductible) plan are significant at the 1-percent level). This lack of precision occurs because a few large medical expenditures account for a substantial portion of all expenditures on a given plan and can therefore affect the average quite dramatically; e.g., over the 9 site-years, 1 percent of the individuals in the sample accounted for 28 percent of the total expenditure.

Application of techniques better suited to such data yields a somewhat different, but probably more reliable, estimate of what per person expenditure would be if a larger number of families had been enrolled. The resulting estimates show narrower but more significant differences among plans than the actual per person expenditure presented in Table 3. Averaged across all sites, predicted expenditure

TABLE 3

ACTUAL ANNUAL TOTAL AND AMBULATORY EXPENDITURE PER PERSON, BY PLAN: NINE SITE-YEARS

Plan	Total Expenditure	Ambulatory Expenditure	Number of Person-Years for Total Expenditure	Number of Person-Years for Ambulatory Expenditure[a]
Free care	\$401 (±52)	\$186 (±9)	2825	2834
25-percent coinsurance	346 (±58)	149 (±10)	1787	1792
50-percent coinsurance	328 (±149)	120 (±12)	766	766
Family Deductible, 95-percent coinsurance	254 (±37)	114 (±10)	1763	1764
Individual Deductible, 95-percent coinsurance[b]	333 (±74)	140 (±11)	1605	1609

NOTE: 95-percent confidence intervals are shown in parentheses. Dollars are current dollars, beginning in late 1974 and extending through late 1978. The figures are uncorrected for site price-level differences or for small differences in allocation to plan by site. Confidence intervals are uncorrected for intertemporal and intrafamily correlation; such a correction cannot be made without imposing strong assumptions about the nature of the correlation. Ignoring intertemporal and intrafamily correlation, the F-value to test the null hypothesis of no differences among the plans in total expenditure with 4,8741 degrees of freedom is 3.14, significant at the 5-percent level. The F-value to test the null hypothesis of no differences among the plans in ambulatory expenditure is 33.4, significant at well under the 1-percent level.

[a]The sample for ambulatory expenditure includes 19 individuals with a known hospital admission for whom the amount of inpatient expenditure is missing.

[b]Coinsurance in this plan applies to outpatient care only; inpatient care is free.

TABLE 4

EXPENDITURE ON AMBULATORY CARE PER PERSON, BY PLAN, SITE, AND YEAR

Plan	Dayton			Seattle		Fitchburg		Franklin County	
	Year 1	Year 2	Year 3	Year 1	Year 2	Year 1	Year 2	Year 1	Year 2
Free care	$180 (±25)	$188 (±25)	$235 (±37)	$192 (±21)	$192 (±24)	$168 (±27)	$205 (±46)	$153 (±21)	$159 (±30)
25-percent coinsurance	84%†	78%*	68%	77%	88%†	96%†	63%	79%*	83%†
50-percent coinsurance	69	59	58	—	—	72*	51	72*	75†
95-percent coinsurance	55	68	51	60	72*	80†	56	51	59
Individual Deductible, 95-percent coinsurance	83†	67	60	86†	78*	64	68*	86†	82†
Total number of persons	1110	1103	1092	1171	1146	704	693	875	871

NOTE: 95-percent confidence intervals for the free plan are shown in parentheses. If no symbol appears to the right of the number, the difference from the free plan is significant at the 1-percent level. An asterisk (*) to the right of the number indicates that the difference from the free plan is significant at the 5-percent level; a dagger (†) indicates that the difference is not significant at the 5-percent level. (All tests are one-tail tests.) No persons were assigned to the 50-percent coinsurance plan in Seattle. The 19 individuals with a known hospital admission but missing hospital expenditures have been included in the sample for this table (see note *a* in Table 1). Standard errors are not corrected for intrafamily correlation.

per person in the 95-percent coinsurance plan is 69 percent of that in the free care plan; in other words, free care causes expenditure to increase by nearly 50 percent (Table 5). The predicted difference in dollars for the two plans is $132; a 95-percent confidence interval around this difference is ±$44. In some site-years, the predicted expenditure for the 50-percent coinsurance plan was smaller than that for the 95-percent coinsurance plan, but the difference is statistically insignificant. This misordering appears to be attributable to the sampling error, given the relatively few participants enrolled in the 50-percent coinsurance plan.

The estimated effects of experimental artifacts are uniformly small and insignificant at the 5-percent level. Any transitory effects associated with the limited duration of the experiment appear negligible. Responsiveness in Dayton was relatively constant across 3 years (Table 5). Failure of the response to decline over time suggests that any initial surge in the free care plan was unimportant. End-of-experiment effects also appear minimal. There is only an insignificant difference in the predicted per person expenditure between the 3- and 5-year groups during the third year in Dayton (data not shown).

The estimated effect of the hold-harmless payment is also negligible. That its effect should be negligible is plausible—it is as if an employer increased the cost sharing in the health insurance plan, passed on the savings in premiums to employees, and added a general wage increase that averaged less than 10 percent. It does not seem likely that the use of medical services would be much affected by a wage increase of this magnitude. This matter is discussed further in Appendix A.

DIFFERENCES IN USE AMONG PLANS

Expressing differences among plans in dollars is a natural method of aggregating various services. But it does not indicate whether observed differences in expenditure reflect differences in the actual amount of services consumed or in the price per unit of service. Which of these two factors predominates clearly affects one's interpretation of expenditure differences.

In fact, variation in the quantities of services consumed appears to account for most of the differences among plans. Using plan means from the four site-years for which both expenditure and visit data are now available (Year 2 in each site), we find that the correlation between visits per person and ambulatory expenditure per person is 0.94. As an example, in the second year in Dayton, physician visit

TABLE 5

PREDICTED TOTAL EXPENDITURE PER PERSON, BY PLAN, SITE, AND YEAR
(Dollars for free plan; percentage of free plan elsewhere)

Plan	Dayton			Seattle		Fitchburg		Franklin County		All Site-Years
	Year 1	Year 2	Year 3	Year 1	Year 2	Year 1	Year 2	Year 1	Year 2	
Free care	$414 (±65)	$472 (±77)	$514 (±83)	$382 (±56)	$442 (±70)	$376 (±65)	$477 (±91)	$374 (±63)	$399 (±73)	$430 (±50)
25-percent coinsurance	75%	79%	72%	85%*	81%	90%†	81%*	83%*	91%†	81%
50-percent coinsurance	64	61	63	—	—	71	59	78*	71	67
95-percent coinsurance	69	73	62	73	72	76	67	66	66	69
Individual Deductible, 95-percent coinsurance[a]	76	70	67	86*	81	81*	75	82*	80	77

NOTE: 95-percent confidence intervals for the free plan are shown in parentheses. If no symbol appears to the right of the number, the value is significantly different from the free plan value for that site-year at the 1-percent level (one-tail test). An asterisk (*) indicates that the value is significantly different at the 5-percent level. A dagger (†) indicates that the value is not significantly different at the 5-percent level; in the two instances in which this occurs, the t-statistic exceeds one. The dollars are current dollars, beginning in late 1974 and extending through late 1978; they are uncorrected for site price-level differences. The sample is the same as that in Table 2 except that the 19 individuals with missing inpatient expenditures, who were excluded from Table 1, are also excluded here. Standard errors are corrected for intrafamily correlation.

[a]Coinsurance applies to outpatient care only; inpatient care is free.

rates varied across plans by almost the same percentage as ambulatory expenditure rates, suggesting that price per visit varied little (Table 6). The misordering between the 50- and 95-percent coinsurance plans is insignificant and appears to reflect random fluctuation.

TABLE 6

AMBULATORY EXPENDITURE RATES AND OFFICE VISIT RATES PER PERSON, BY PLAN: DAYTON, YEAR 2

Plan	Ambulatory Expenditure Rates (Free plan = 100)	Office Visit Rates[a] (Free plan = 100)
Free care	$188 (100)	5.4 visits (100)
25-percent coinsurance	(78)	4.4 visits (81)
50-percent coinsurance	(59)	3.2 visits (59)
95-percent coinsurance	(68)	3.7 visits (69)
Individual Deductible, 95-percent coinsurance	(67)	3.7 visits (68)

NOTE: All differences in expenditure and visits between the free plan and other plans are significant at the 1-percent level except the differences between the free and 25-percent coinsurance plans for ambulatory expenditures, which are significant at the 5-percent level using a one-tail test. Standard errors are corrected for intrafamily correlation.

[a]Visits are defined from claims. A visit is any outpatient service performed by an M.D. or D.O. or his staff for a given patient on a single day. Nonbilled services such as telephone visits or visits to industrial clinics are not counted as visits by this definition.

The likelihood of a physician visit or a hospital admission during a year also differs markedly across plans (Table 7), further demonstrating that differences in expenditure result from variation in actual amounts of services consumed. The admission likelihood in the zero coinsurance plan is 13 to 42 percent above the rates in other plans. The admission likelihood in the Individual Deductible Plan, in which inpatient services are fully covered, lies between the likelihood in the zero coinsurance plan and that in the 25-, 50-, and 95-percent coinsurance plans, suggesting that both the price of outpatient services and the price of inpatient services determine hospital admissions. By contrast with the likelihood of admission, annual expenditure per hospital stay shows no consistent pattern with respect to plan, and we cannot reject the null hypothesis of no relationship between plan and

TABLE 7

ANNUAL PROBABILITY OF ONE OR MORE PHYSICIAN VISITS OR HOSPITAL ADMISSIONS, NINE SITE-YEARS

Plan	Physician Visits	Hospital Admissions
Free care	.84 (±.02)	.102 (±.013)
25-percent coinsurance	.78 (±.03)	.081 (±.014)
50-percent coinsurance	.75 (±.05)	.072 (±.021)
95-percent coinsurance	.69 (±.04)	.076 (±.014)
Individual Deductible, 95-percent coinsurance[a]	.73 (±.04)	.090 (±.016)

NOTE: 95-percent confidence intervals are shown in parentheses. The differences in the likelihood of a physician visit between the free plan and the other plans are significant at well under the 1-percent level; the differences in hospital admissions between the free care plan and the other plans are also significant at the 1-percent level, except for the free-care 25-percent coinsurance difference, which is significant at the 5-percent level, and the free-care individual-deductible difference, which is not significant at the 5-percent level. All tests are one-tail tests. Standard errors are corrected for intrafamily and intertemporal correlations.

[a]This plan has zero coinsurance (free care) for inpatient services.

expenditure per stay at the 5-percent level of significance (F with 4,735 d.f. = 2.03, P-value approximately 0.1).

Differences in expenditure among plans can be disaggregated into differences in the number of participants in each plan who use any medical services during a year and differences in the amount of expenditure among those who use any services. The number of participants who use any service rises from 75 percent or somewhat more in the family deductible plan to 90 percent in the plan in which all services are free (Table 8). This difference in the number of users accounts for approximately one-third to one-half of the difference in overall expenditure among plans, depending on the site and year.

Although price per unit of service does not differ much across the plans, one should not infer that treatment intensity does not respond to coinsurance. Because the fraction of users increases as coinsurance falls, users in the plan with lower coinsurance may be, on average,

Table 8

Predicted Expenditure, by Plan and Age Group: Year 1

(Dollars for free plan; percentage of free plan elsewhere)

Plan	Dayton		Seattle		Fitchburg		Franklin County	
	Adult	Child	Adult	Child	Adult	Child	Adult	Child
Free care	$555 (±91)	$196 (±32)	$500 (±76)	$174 (±27)	$521 (±95)	$185 (±34)	$507 (±92)	$186 (±32)
25-percent coinsurance	75%	77%	84%*	91%†	88%†	98%†	81%*	89%†
50-percent coinsurance	62	71	—	—	68	82†	74*	93†
95-percent coinsurance	69	69	72	75	75	78*	66	69
Individual Deductible, 95-percent coinsurance[a]	76	75	85*	89†	81*	83†	81*	86*

NOTE: 95-percent confidence intervals are shown in parentheses. If no symbol appears to the right of the number, the difference from the free plan is significant at the 1-percent level (one-tail test). An asterisk (*) indicates that the value is significant at the 5-percent level; a dagger (†) indicates that the value is not significant at the 5-percent level.

[a]Coinsurance applies to outpatient care only; inpatient care is free.

less sick, thereby offsetting the possible tendency for persons with a given illness to be treated more intensively as the coinsurance rate falls.

The values in Tables 6 and 7 are consistent with national data, implying that the choice of sites, the package of covered services, the administrative procedures used, and the transitory nature of the experiment do not distort the results. Because coverage of hospital services in the nation is quite high, the national likelihood of admission should lie between that found in the free plan and those found in the other plans. In fact, it does; the national rate in 1977 for the under-65 population was 0.095 (NCHS, 1977). This value is also close to that found in the Individual Deductible Plan, as it should be. The national likelihood of visiting a physician, 0.75 in 1977, lies at the value for the 50-percent coinsurance plan, consistent with the partial existing coverage of ambulatory services (Newhouse, Phelps, and Schwartz, 1974; NCHS, 1977). Finally, the visit rates appear consistent with the national rate of 3.9 office, home, and clinic visits per person (NCHS, 1979). Across the four sites in the second year for which data are available, the visit rate in the free plan was above this value, in the 25-percent plan it equalled it, and in the other plans it was below it.

USE BY SUBGROUPS

An important objective of the experiment is to judge the effect of cost sharing on various subgroups of the population. Of special interest is whether cost sharing has a different effect on adults and children, poor and nonpoor, and blacks and whites. Expenditure by adults shows greater responsiveness to variation in cost sharing than does expenditure by children (Table 8), largely because the likelihood of at least one hospital admission for children shows no significant response to plan (observed differences for children are insignificant), whereas the likelihood for adults is markedly higher in the free care plan (Table 9).

Different income groups have relatively similar responses (Table 10). In Dayton, families in the lower third of the income distribution show somewhat more responsiveness to coinsurance than those in the upper third, but in the other three sites the two groups respond almost identically. Even in Dayton the apparent greater responsiveness admits of a different interpretation; the absolute decline in actual dollars as coinsurance rises is very similar between the two income groups. (This is also true in the two subsequent years in Dayton, which are not shown.) In all cases, the income measure is average

TABLE 9

ANNUAL PROBABILITY OF ONE OR MORE HOSPITAL ADMISSIONS, BY PLAN AND AGE GROUP

Plan	Child (17 years or under)[a]	Adult (Over 17 years)
Free care	.056 (±.015)	.133 (±.018)
25-percent coinsurance	.047 (±.017)	.104 (±.020)
50-percent coinsurance	.057 (±.029)	.082 (±.028)
95-percent coinsurance	.045 (±.017)	.095 (±.020)
Individual Deductible, 95-percent coinsurance[b]	.065 (±.023)	.104 (±.019)

NOTE: 95-percent confidence intervals are shown in parentheses. For adults, 50- and 95-percent coinsurance values are significantly different from the free plan value at the 1-percent level, and the 25-percent and Individual Deductible values are significantly different at the 5-percent level. For children, no plan difference is significant at conventional levels. All tests are one-tail tests. Standard errors are corrected for intrafamily and intertemporal correlations.

[a]The mean for children in our plans is .054 (±.008); the national mean is .050 (±.004) (Newhouse, 1974).

[b]This plan has zero coinsurance (free care) for inpatient services.

family income for the 2 years before enrollment; more current income data now being processed should yield more precise estimates.

Blacks in Dayton spend about 20 percent less than whites, holding a variety of characteristics constant, including plan, pre-enrollment self-assessed health status, and income; the difference is significant at the 1-percent level. Values for blacks in other sites and for other minorities are not presented because of insufficient representation in our sample (Table 1). Why blacks in Dayton spent less is not clear. Whether this result will continue to hold in the two South Carolina sites, where the proportion of blacks is markedly higher, is not known.

TABLE 10

PREDICTED EXPENDITURE, BY INCOME TERTILE AND PLAN: YEAR 1
(Dollars for free plan; percentage of free plan elsewhere)

Plan	Dayton		Seattle		Fitchburg		Franklin County	
	Low	High	Low	High	Low	High	Low	High
Free care	$395 (±67)	$446 (±69)	$384 (±59)	$381 (±57)	$403 (±73)	$367 (±65)	$391 (±69)	$368 (±64)
25-percent coinsurance	71%	78%	85%*	85%*	89%†	90%†	82%*	83%*
50-percent coinsurance	60	67	—	—	71	71	77*	78*
95-percent coinsurance	65	72	72	73	75	76	65	67
Individual Deductible, 95-percent coinsurance[a]	73	78	86*	86*	81*	82*	81	82*

NOTE: 95-percent confidence intervals are shown in parentheses. Comparisons do not hold factors constant other than income; they simply compare predictions for actual families with incomes below $9548 and above $15,264 (1972 dollars) in Dayton; below $8222 and above $13,882 (1973 dollars) in Seattle; below $8884 and above $13,033 (1973 dollars) in Fitchburg; and below $9374 and above $13,155 (1973 dollars) in Franklin County. These values define the lower third and upper third of the income distribution for the site. If no symbol appears to the right of the number, the difference from the free plan is significant at the 1-percent level. An asterisk (*) indicates that the difference is significant at the 5-percent level; a dagger (†) indicates that the difference is not significant at the 5-percent level. All tests are one-tail tests. Standard errors are corrected for intrafamily correlations.

[a]Coinsurance applies to outpatient care only; inpatient care is free.

V. DISCUSSION

Our results clearly show that the use of medical services responds to cost sharing; demand in an insurance plan with full coverage appears to be about 50 percent above that in an income-related catastrophe insurance plan. The fragmentary evidence now in the literature is roughly consistent with this value; e.g., the 25-percent decline in visits observed in a natural experiment among Stanford University employees when their coinsurance rate was changed from zero to 25 percent (Scitovsky and McCall, 1977; Scitovsky and Snyder, 1972) is similar to the 20-percent decline in ambulatory expenditure observed between the zero and 25-percent coinsurance plans (Table 3). And the magnitude of differences in insurance premiums for policies with 10-, 15-, 20-, and 25-percent coinsurance is consistent with the differences in total use between the zero and 25-percent coinsurance plans (Phelps and Newhouse, 1974).

The response to the experimental plans by families at different income levels was similar. In Dayton, the response among the lower third of the income distribution somewhat exceeded that among the upper third in percentage terms (although not in absolute terms); but in Seattle and the two Massachusetts sites, responsiveness was virtually identical between the lower third and upper third of the income distribution.

As others have conjectured, expenditure for children depends less on coinsurance than does expenditure for adults.

THE POLICY DEBATE OVER COST SHARING

Many arguments have been advanced about the desirability and shortcomings of cost sharing. One alleged shortcoming is that cost sharing, especially for ambulatory services, raises overall costs by inducing individuals to delay seeking care and physicians to hospitalize patients who could be treated as outpatients (Roemer et al., 1975). The results from the Individual Deductible Plan tend to refute this argument. Under that plan the incentives for inappropriate use of the hospital are stronger than in other plans because inpatient services are free. Physicians thus have a greater incentive to perform procedures in the hospital that could be performed in the office. But the probability of hospitalization in the Individual Deductible Plan is lower than in the free care plan, significantly so for adults (Table 9).

Evidently, given the reduced use of outpatient services under the Individual Deductible Plan, physicians less frequently see illness that leads to hospitalization. The medical consequences of the decreased hospital use in the Individual Deductible Plan are not clear.

Any increase in total expenditure resulting from delay in seeking care because of cost sharing is outweighed by other forces. The 95-percent coinsurance and free care plans probably differ most in the incentive to delay, yet total expenditure in the free care plan is well above that in the 95-percent coinsurance plan, and the difference is significant at the 1-percent level in each site and year studied (Table 5).

Another negative argument about cost sharing is its alleged promotion of an inequitable distribution of services. This argument is difficult to address because no consensus exists on an operational measure of equity. If, in fact, the poor responded more to cost sharing than did middle-income groups, some might argue that the proportion of services going to the poor when care is free is the equitable amount —and that the proportion going to the poor when services are not free is, by implication, too low.

Our interim results indicate that the poor are not more responsive to cost sharing if, as in the experiment, the cost sharing is less for low-income families. But our results do suggest that cost sharing unrelated to income would differentially affect lower-income families. Because, in the experiment, the Maximum Dollar Expenditure was less for poor families, they were more likely to exceed it and not face cost sharing for any additional use. Thus, they faced less cost sharing on the average. Because cost sharing affects use, and because income-related cost sharing affects income groups equally, cost sharing not related to income would have caused disproportionate reductions in use among the poor.

Another definition of equity requires minimal variation of utilization with income (Andersen, 1975). In three of the four sites for which we have results, the estimated relationship between expenditure and income is small and insignificant. In the fourth (Dayton), a 1-percent increase in income, other factors equal, elicits approximately a 0.2-percent increase in expenditure in each of the 3 years, and the relation is significant at the 1-percent level. We cannot, however, detect any difference among the plans in this relation; thus, providing free care does not appear to eliminate the variation of use with income in Dayton.

Perhaps the most frequently made argument for eliminating cost sharing is that medical services are a right for all and ought not to be rationed by price. Although this argument is philosophical, it may be based on the premise that full coverage improves health, or that cost sharing induces individuals to forego necessary services. By contrast, perhaps the most frequently made argument in favor of cost sharing is that its elimination will induce people to consume unnecessary services or seek care for trivial problems.

Our data are not yet sufficiently complete to determine if the additional services consumed by persons facing lower coinsurance affect health. In all likelihood these services represent a mix, some having a large benefit and others having none. We have, however, made extensive measurements of participants' health status (various authors, various dates; Brook et al., 1979; Eisen et al., 1980), and the sample size should ultimately be sufficient to identify any nontrivial changes in health status that the additional services may cause (Rogers et al., 1979).

COST SHARING AND HOSPITAL COSTS PER PATIENT

Whatever merits or demerits cost sharing may have as an abstract principle, the plans we studied did not greatly affect patients once hospitalized. This absence of effect on cost per hospitalized patient could have occurred because any additional hospital services a physician might have ordered were usually not subject to cost sharing; 70 percent of the hospitalized patients exceeded the Maximum Dollar Expenditure.

Complete or nearly complete coverage for additional inpatient services is common in this country. Moreover, the additional expense that comes from being admitted to a relatively costly hospital is also fully insured, or nearly so. Thus, neither patients nor physicians have much incentive to choose an economically efficient rather than an inefficient hospital, or to economize on services once the patient is admitted—a situation that may partially explain the persistent, above-average inflation in the hospital sector (Newhouse, 1978b).

Because cost per hospitalized patient is the most rapidly rising component of hospital expenditure (American Hospital Association, 1979), it has been a focus for policy reform efforts. Within the range of cost sharing encompassed by the experimental plans (up to $1000 in any one year), manipulating cost sharing had neither a systematic nor a statistically significant effect on cost per hospitalized patient. Expanding the range of expenditure to which cost sharing applies might affect cost per hospitalized patient, but it is an unattractive option because individuals would then probably face more financial exposure than they want to bear. In short, cost sharing appears to be a poor instrument for affecting costs once patients are admitted. Potentially more effective instruments include regulation, an example of which was the Carter Administration's hospital cost containment proposal, and greater competition in medical care (Enthoven, 1978; Newhouse and Taylor, 1971).

CAN THE RESULTS BE GENERALIZED?

The Health Insurance Experiment has measured how the demands of a small number of consumers increased as cost sharing fell, i.e., how many more services the participants sought and their physicians delivered as coinsurance decreased. Will the experimental results generalize to a widespread health insurance plan of a similar nature? The consistency of the results with national averages suggests they will, but certain circumstances could cause behavior to differ.

First, if insurance for ambulatory services were suddenly expanded, the resulting increase in the entire population's demand could exceed the short-run capacity of the medical care delivery system. If so, the additional demand could be rationed in several possible ways (Newhouse et al., 1974). Most likely, longer waits for an appointment would occur, as happened in Montreal when cost sharing was eliminated (Enterline et al., 1973). We do not yet have a good understanding of which services would not be delivered if appointment times lengthened.

Second, the delivery system might not be allowed to expand to meet any new demand; it could, for example, be constrained by budget limits or rate and fee controls so that only a certain proportion of the demand would be met. The experimental plan, in general, reimbursed billed fees or charges, but regulations or fee schedules might not permit such a procedure. We cannot predict from experimental data who might receive what services if budgets were so constrained that not all the demand could be met.

Third, if present cost sharing levels increased so that demand fell, some argue that physicians would create additional demand to offset the decline (Barer et al., 1979). The evidence supporting this argument, however, has been sharply questioned (Sloan and Feldman, 1978; Bureau of Health Manpower, 1980). Moreover, recent evidence on physician location behavior suggests that physicians cannot fully offset a decline in demand per physician (Schwartz et al., 1980).

In sum, unless budget limits or other regulations constrain the response, a reduction in cost sharing will expand the total volume of resources in medical care and conversely. Would such expansion be worth the foregone opportunities for other desired goods and services? One may wish to reserve judgment on that issue until more is known about how the additional medical services affect health and well-being.

Appendix A

METHODS OF ANALYSES

THE MODELLING OF EXPENDITURE

We use four behavioral equations to model utilization decisions. Equation 1 is a probit equation specifying the probability of using any services at all as a function of the family and individual characteristics described later in this section. Equation 2 is a second probit equation for the decision to use inpatient services conditional on a positive decision in the first equation, as a function of dummy variables for adult females and children, as well as dummy variables for plan that have been interacted with a dummy variable indicating adult or child status. These two equations divide the experimental participants into those with inpatient expenditure, those with ambulatory but no inpatient expenditure, and those with no expenditure. Equation 3 has as a dependent variable the logarithm of total expenditure for people with ambulatory expenditure but no inpatient expenditure; its explanatory variables are the family and individual characteristics described later in this section. This equation includes an unobserved variance component for each family member in the error term and is estimated by maximum likelihood methods. Equation 4 has as a dependent variable the logarithm of total expenditure for people with inpatient expenditure; its explanatory variables are dummy variables for site-year, adult female, and children. This equation is estimated by Tukey's biweight robust regression method (Hogg, 1979).

The predicted logarithm of expenditure (Eqs. 3 and 4) does not retransform consistently into expected expenditure; therefore, we have developed and used a nonparametric device, the smearing estimate, to adjust for retransformation bias (Duan et al., forthcoming). (The smearing estimate accounts for nonnormality in third and higher cumulants of the error term.) We noticed that in the third equation the variability of the logarithm of expenditure increases as the coinsurance rate rises, and so we accounted for this increase (heteroscedasticity) in our predictions. We have also found a substantial amount of intrafamily correlation, especially in the third equation (high use by one family member is associated with high use by another); the standard errors reported for the predicted expenditures have been adjusted for such correlations. There is, in addition, a moderate amount of intertemporal correlation in the second equation (ρ = .25) for which we did not adjust; this results in our slightly underestimating standard errors (by at most 7 percent).

We have not imposed a functional form on the coinsurance rate; rather, each coinsurance rate enters the regression equation as a separate indicator variable. Because the relationship between coinsurance and expenditure is nearly monotonic, the precision of these analyses is conservative. Thus, for example, if we regressed the logarithm of expenditure on the logarithm of (coinsurance + 1), we could reject the null hypothesis of no relationship at well under the 1-percent level.

With the current sample size, we do not reject the hypothesis that plan has no effect on expenditure made by those admitted to the hospital, as described in the text. Consequently, we have assumed that the conditional expenditure distribution for those admitted to a hospital is the same for each plan. Such an assumption seems reasonable because 70 percent of hospitalized individuals exceed the Maximum Dollar Expenditure, which is at most $1000 out-of-pocket per year per family. For individuals exceeding the Maximum, any additional expenditure is fully covered on all plans. For those not exceeding it, two effects may approximately offset each other. Lower coinsurance may sometimes induce additional expenditure, but the higher admission rates in plans with lower coinsurance may mean that hospitalized patients on such plans are, on average, less sick. Consequently, plan differences in the demand for inpatient services are likely to be principally in admission rates and not in expenditure per hospitalized patient. As noted in the text, expenditures per hospitalized patient show no systematic pattern by plan; e.g., expenditure per inpatient in the 95-percent coinsurance plan is only 0.8 percent different from that in the free care plan.

The estimated regression equations upon which the predictions are based are included as Appendix C. The following explanatory variables (covariates) have been included in the first and third equations: age, sex, race (black or other), income, family size, whether the individual had a regular physician at the beginning of the Study, the number of physician visits in the year prior to the Study, whether the individual was eligible for the Aid to Families with Dependent Children (AFDC) program at the beginning of the Study, self-assessed health status at the time of enrollment, and dummy variables for the experimental treatments described in the next section (e.g., 3-year enrollment). Some variables have been transformed to achieve homoscedastic residuals.

Plan is represented by four dummy variables, one for plans with

25-percent coinsurance, one for plans with 50-percent coinsurance, one for plans with 95-percent coinsurance other than the Individual Deductible Plan, and one for the Individual Deductible Plan; the intercept measures the zero coinsurance plan.

When site-specific total predicted expenditure is given, inpatient use has been predicted from equations by using data pooled across all sites to improve precision.

Expenditures have been predicted for each plan and site-year by using the entire sample for that site-year. That is, expenditure for each person was predicted as if he were enrolled in each plan, and the average was then computed. Such a procedure corrects for any remaining imbalances in the allocation by plan after operation of the Finite Selection Model.

EXPERIMENTAL ARTIFACTS

Hold-Harmless Payments. Many families received payments to indemnify them against possible financial loss, as described in the text. The effect of these payments was estimated by including the level of payments as an explanatory variable in a simpler version of the regression equations upon which the results in this report are based. The estimated effect of the payment was small and insignificant; indeed, it was smaller than the already small estimated effect of regular income, consistent with standard economic theory about the effects of permanent and transitory income.

Transitory Effects. There may have been transitory demand at both the beginning and end of the experiment. At the beginning, transitory demand could occur because of "catch-up" utilization (i.e., seeking care for previously ignored problems); in the final year, it could be caused by use either crowded in or deferred, depending on the relative generosities of the experimental and postexperimental insurance for each family.

Three years of data from Dayton permit two tests for transitory demand. First, if catch-up demand were an important factor, and if its magnitude varied with coinsurance, both higher levels of demand and a greater responsiveness of demand to price should be observed in the first year than in later years. But as described in the text, the first year appears similar to other years. Second, the 3- and 5-year groups began participation simultaneously. Because these groups are otherwise similar, comparison of their third-year utilization permits us to estimate final-year effects, assuming that the 5-year group will not experience such effects until after the third year. If crowding-in of services in plans with low coinsurance rates (or postponement of services in plans with high rates) is a prominent feature of the experiment's final year, the responsiveness of demand to insurance should have risen in the third year for the group completing participation in that year. Again, as described in the text, it did not. We conclude that transitory effects are unimportant for this analysis.

Health Questionnaire. Most families received a questionnaire every 2 weeks. This questionnaire elicited information about utilization that could not be captured on claims forms (e.g., time spent with the physician, telephone visits) and also asked about disability days. Because the questionnaire itself might induce utilization, its frequency of administration has been varied in two ways. In the first year in Dayton, a random half of the sample received the form weekly. During the first year of the Massachusetts and South Carolina sites, a random quarter of the sample did not receive the form at all. The effect of these variations was estimated by including an appropriate dummy variable in the regression equations upon which the results reported are based. Neither variable is significantly different from zero at the 5-percent level.

Screening Examination. One objective of the experiment is to measure how different levels of insurance coverage affect physiologic health status. For this reason, some families received a medical screening examination, the results of which were reported to a physician designated by the family; hence, abnormal values could be followed up, a process that might be more aggressive the lower the insurance rate. To estimate their effects on utilization, initial physiologic examinations were not given to the entire sample but only to a random portion (62 percent). Again, a dummy variable was included in the regression equations to estimate the effect of receiving the examination. This variable was also insignificant at the 5-percent level, as was the dummy variable when interacted with plan.

Incentive To File Claims. One could argue that the incentive to file claims for the 95-percent coinsurance plan is not worth the bother and that therefore the apparent difference in use is only an artifact of measurement. (The change from 100-percent coinsurance to 95-percent coinsurance after Dayton Year 1 that was referred to in the text was an attempt to increase the incentive to file, although there was no evidence of underfiling.) Two responses can be made to this argument. First, data have been collected (but not yet analyzed) from physicians' billing records; these data will permit a formal test of whether a differential incentive to file may have affected their results. Second, the decline in demand between the free care and 25-percent coinsurance plans should not be distorted by this phenomenon; if the individual can collect 75 percent of the bill, filing a claim for it should be almost as worthwhile to him as collecting 100 percent of the bill. If the observed difference between the free care and 25-percent coinsurance plans is approximately correct, the estimated further decline in the 95-percent coinsurance plan is quite plausible as a true difference rather than an artifact.

Appendix B

A COMPARABLE NATIONAL EXPENDITURE FIGURE

In order to arrive at a national expenditure figure that we could compare with the values in Table 3, we had to define a comparable package of medical services, a comparable population, and comparable price levels. Data on public and private expenditure in fiscal 1977, by age group, were taken from Gibson and Fisher (1979). Fiscal 1977 is approximately the midpoint of these data. The comparable package of medical services was assumed to include all private expenditure by those under age 65 for hospital, physician, and other professional services, for eyeglasses and appliances, and for nursing homes. Two-thirds of all private drug expenditure was also counted, because two-thirds is the approximate amount of total drug expenditure spent on prescription drugs (Newhouse, Phelps, and Schwartz, 1974).

Most public expenditure was excluded because it applied to populations excluded from the experiment (e.g., the Medicare eligible, the military). The entire Medicaid expenditure on the under 65 population was included, as was the Other Public Assistance Category. An expenditure of $7.3 billion for general hospital and medical care paid for by state and local governments was included in one calculation and excluded in another. Much of this money goes for care of the institutionalized population (e.g., patients in state mental hospitals), who were excluded from the experiment, but an unknown amount also goes to cover services for the population that was eligible. The calculations with and without this figure probably bracket the true value. Excluding the $7.3 billion figure, the total expenditure was $69.026 billion; including it, the total expenditure was $76.284 billion. Both figures include expenditure for outpatient mental health services. In the experiment, such services accounted for 4.25 percent of total expenditure. Because they are excluded from the data in Table 3, we have reduced the total by that amount.

To convert this total to a per capita figure, we had to define a comparable population. We used the under 65 population in 1977 (193.4 million), and excluded 2.2 million nonresidents and military (Bureau of the Census, 1980a). We then multiplied this figure by 0.9941, which is the proportion of the population that in 1970 was not institutionalized (excluding those in homes for the aged and dependent, who were assumed to be over 65 and already excluded) (Bureau of the Census, 1980b). Finally we excluded 2.325 million under 65 Medicare beneficiaries in 1975 (Health Care Financing Administration, 1978), although this may double-count some of those institutionalized. The resulting population figure was 187,711,000.

Finally, we had to define a comparable expenditure level. We used data on expenditure per aged Medicare beneficiary by state or county in 1976 compared with the national average to define a deflator for each county (Health Care Financing Administration, 1978). The deflator was simply the expenditure per beneficiary in the relevant geographic area compared with national expenditures per beneficiary. The relevant geographic areas were taken to be Montgomery County for Dayton, King County for Seattle, Worcester County for Fitchburg, and nonmetropolitan Massachusetts for Franklin County. This yielded a value of 0.9645; i.e., we estimate that per capita Medicare expenditure in our sites in 1976 was approximately 3.5 percent less than in the country as a whole. We therefore multiplied our expenditure values by 0.9645.

The resulting per capita values are $344 if the $7.3 billion of state and local expenditure is excluded, and $380 if it is entirely included. As stated in the text, we believe that a roughly appropriate figure is around $350.

Appendix C

THE ESTIMATED EQUATIONS

This appendix contains the estimated equations of the four-part model. The standard errors and t-statistics in Equation 1, which is estimated by a maximum likelihood probit routine, ignore intrafamily correlation. As a result, the standard errors are understated and the t-statistics are overstated by at most 1.36. A glossary of the acronyms employed follows the equations.

DAYTON YEAR 1
EQUATION 1 - PROBABILITY OF POSITIVE USER

OBL	COEF	STDERR	T-STAT
BZERO	-2.3867	0.9866	-2.4192
P25	-0.6460	0.1642	-3.9338
P50	-0.7491	0.1770	-4.2317
PFD	-0.8156	0.1587	-5.1409
IDP	-0.5820	0.2131	-2.7319
EXAM	0.0989	0.1046	0.9458
WEEKLY	0.1418	0.1045	1.3562
YR3	-0.1125	0.1043	-1.0784
LINC	0.4359	0.0989	4.4055
LFAM	-0.2121	0.1214	-1.7472
BLACK	-0.5343	0.1687	-3.1674
AFDC	-0.7109	0.2767	-2.5694
NOMD	-0.5821	0.2113	-2.7552
NOMDVIS	-0.1550	0.1511	-1.0257
INMDVIS	-0.8090	0.1861	-4.3462
HLTHG	-0.0881	0.1151	-0.7658
HLTHFP	0.2271	0.2586	0.8780
PAINL	0.0974	0.1182	0.8240
PAINSG	-0.0909	0.2520	-0.3606
WORRL	0.0528	0.1573	0.3355
WORRSG	-0.0594	0.1626	-0.3653
CHILD	0.1956	0.1567	1.2481
FEMALE	0.9431	0.7127	1.3232
FCHILD	-0.5927	0.2521	-2.3506
NEWMEM	0.3361	0.5701	0.5896
MAGE	0.3508	0.3395	1.0331
FAGE	0.1168	0.3373	0.3461

EQUATION 3 - LEVEL OF LOG(AMBULATORY ONLY) USE

OBL	COEF	STDERR	T-STAT
BZERO	2.1791	0.7956	2.7391
P25	-0.2817	0.1209	-2.3293
P50	-0.4264	0.1305	-3.2675
PFD	-0.5409	0.1187	-4.5586
IDP	-0.4922	0.1652	-2.9804
EXAM	0.0284	0.0852	0.3332
WEEKLY	0.1041	0.0854	1.2184
YR3	0.0323	0.0849	0.3800
LINC	0.1999	0.0825	2.4231
LFAM	-0.1262	0.0911	-1.3847
BLACK	-0.2203	0.1630	-1.3510
AFDC	0.1221	0.3705	0.3297
NOMD	-0.0261	0.2654	-0.0985
NOMDVIS	0.0043	0.1297	0.0329
INMDVIS	-0.4744	0.1304	-3.6393
HLTHG	0.0899	0.0864	1.0406
HLTHFP	0.0968	0.1803	0.5368
PAINL	0.0734	0.0859	0.8549
PAINSG	0.5059	0.1772	2.8549
WORRL	0.0642	0.1082	0.5930
WORRSG	0.1899	0.1128	1.6841
CHILD	-0.4351	0.1098	-3.9626
FEMALE	0.0378	0.5045	0.0749
FCHILD	0.0630	0.1724	0.3652
NEWMEM	0.2017	0.4331	0.4656
MAGE	0.6733	0.2093	3.2176
FAGE	0.6376	0.2454	2.5981

DAYTON YEAR 2
EQUATION 1 - PROBABILITY OF POSITIVE USER

OBL	COEF	STDERR	T-STAT
BZERO	-3.6468	0.9979	-3.6546
P25	-0.4097	0.1532	-2.6748
P50	-0.7404	0.1623	-4.5619
PFD	-0.6485	0.1456	-4.4549
IDP	-0.7892	0.1946	-4.0548
EXAM	-0.0578	0.1001	-0.5771
WEEKLY	0.0359	0.1000	0.3592
YR3	-0.0209	0.0997	-0.2095
LINC	0.4735	0.0937	5.0511
LFAM	-0.3267	0.1110	-2.9435
BLACK	-0.3086	0.1694	-1.8223
AFDC	-0.6078	0.2784	-2.1827
NOMD	-0.6658	0.2291	-2.9065
NOMDVIS	-0.3316	0.1473	-2.2514
INMDVIS	-0.7901	0.1757	-4.4968
HLTHG	-0.0275	0.1124	-0.2444
HLTHFP	-0.3578	0.2334	-1.5329
PAINL	-0.1602	0.1132	-1.4150
PAINSG	0.0451	0.2526	0.1786
WORRL	0.0393	0.1489	0.2641
WORRSG	0.1108	0.1624	0.6821
CHILD	0.1916	0.1513	1.2666
FEMALE	0.4673	0.7506	0.6225
FCHILD	-0.1591	0.2701	-0.5892
NEWMEM	-0.1425	0.4531	-0.3145
MAGE	1.1365	0.3885	2.9255
FAGE	0.8557	0.4115	2.0797

EQUATION 3 - LEVEL OF LOG(AMBULATORY ONLY) USE

OBL	COEF	STDERR	T-STAT
BZERO	2.6085	0.8846	2.9487
P25	-0.2202	0.1219	-1.8074
P50	-0.5635	0.1355	-4.1600
PFD	-0.4059	0.1228	-3.3050
IDP	-0.3326	0.1712	-1.9424
EXAM	-0.0049	0.0886	-0.0551
WEEKLY	-0.1017	0.0885	-1.1494
YR3	0.0682	0.0873	0.7814
LINC	0.2197	0.0874	2.5150
LFAM	-0.2485	0.0918	-2.7075
BLACK	-0.0183	0.1676	-0.1091
AFDC	-0.1708	0.3849	-0.4438
NOMD	-0.0862	0.2830	-0.3046
NOMDVIS	0.0626	0.1488	0.4206
INMDVIS	-0.3944	0.1483	-2.6592
HLTHG	0.2115	0.0947	2.2337
HLTHFP	0.2862	0.1918	1.4925
PAINL	0.0953	0.0949	1.0044
PAINSG	0.2866	0.1833	1.5633
WORRL	0.0500	0.1228	0.4069
WORRSG	0.1489	0.1226	1.2142
CHILD	-0.2785	0.1222	-2.2779
FEMALE	-0.9812	0.5780	-1.6976
FCHILD	0.0658	0.2064	0.3187
NEWMEM	0.2912	0.3452	0.8437
MAGE	0.2910	0.2526	1.1518
FAGE	0.9511	0.3128	3.0409

DAYTON YEAR 3
EQUATION 1 - PROBABILITY OF POSITIVE USER

OBL	COEF	STDERR	T-STAT
BZERO	-3.7145	1.0185	-3.6470
P25	-0.2869	0.1534	-1.8698
P50	-0.5267	0.1643	-3.2065
PFD	-0.6055	0.1439	-4.2080
IDP	-0.6198	0.1925	-3.2195
EXAM	0.0920	0.1007	0.9133
WEEKLY	0.1462	0.0994	1.4715
YR3	-0.0800	0.1000	-0.7996
LINC	0.3341	0.0903	3.6993
LFAM	-0.0778	0.1022	-0.7614
BLACK	-0.6750	0.1592	-4.2395
AFDC	-0.4339	0.2853	-1.5209
NOMD	-0.2618	0.2332	-1.1222
NOMDVIS	-0.2211	0.1497	-1.4763
INMDVIS	-0.5875	0.1758	-3.3412
HLTHG	-0.2618	0.1108	-2.3633
HLTHFP	-0.1840	0.2391	-0.7695
PAINL	0.2317	0.1141	2.0298
PAINSG	0.0897	0.2363	0.3798
WORRL	0.0028	0.1474	0.0187
WORRSG	-0.0064	0.1583	-0.0407
CHILD	0.1886	0.1519	1.2416
FEMALE	1.2419	0.9428	1.3172
FCHILD	-0.0577	0.3126	-0.1847
NEWMEM	0.3777	0.4906	0.7699
MAGE	1.6690	0.4607	3.6224
FAGE	0.7784	0.5014	1.5525

EQUATION 3 - LEVEL OF LOG(AMBULATORY ONLY) USE

OBL	COEF	STDERR	T-STAT
BZERO	1.3856	0.9084	1.5254
P25	-0.5182	0.1220	-4.2460
P50	-0.5333	0.1328	-4.0154
PFD	-0.8954	0.1208	-7.4151
IDP	-0.5483	0.1708	-3.2098
EXAM	-0.0105	0.0884	-0.1185
WEEKLY	0.1361	0.0873	1.5586
YR3	0.2187	0.0873	2.5048
LINC	0.3446	0.0879	3.9215
LFAM	-0.1909	0.0891	-2.1431
BLACK	-0.0485	0.1769	-0.2744
AFDC	0.5474	0.3658	1.4962
NOMD	0.0274	0.2463	0.1114
NOMDVIS	0.1049	0.1421	0.7383
INMDVIS	-0.4272	0.1480	-2.8867
HLTHG	0.0144	0.0931	0.1552
HLTHFP	0.1264	0.2054	0.6154
PAINL	-0.0213	0.0939	-0.2263
PAINSG	0.4142	0.1939	2.1357
WORRL	-0.0505	0.1178	-0.4287
WORRSG	0.0964	0.1241	0.7768
CHILD	-0.3565	0.1196	-2.9822
FEMALE	-0.2997	0.5358	-0.5593
FCHILD	0.1908	0.2045	0.9330
NEWMEM	-0.2314	0.3124	-0.7406
MAGE	0.4910	0.2812	1.7460
FAGE	0.6421	0.3071	2.0908

SEATTLE YEAR 1
EQUATION 1 - PROBABILITY OF POSITIVE USER

OBL	COEF	STDERR	T-STAT
BZERO	0.3259	0.7799	0.4178
P25	-0.1647	0.1341	-1.2285
PFD	-0.4220	0.1309	-3.2226
IDP	-0.3191	0.1257	-2.5377
EXAM	-0.0328	0.0951	-0.3446
YR3	-0.0181	0.1095	-0.1649
LINC	0.0046	0.0797	0.0576
LFAM	0.1012	0.1047	0.9662
BLACK	-0.7207	0.2534	-2.8441
AFDC	0.1558	0.2135	0.7295
NOMDVIS	-0.1985	0.1288	-1.5410
INMDVIS	-0.6279	0.1733	-3.6234
HLTHG	-0.0489	0.1153	-0.4244
HLTHFP	-0.1401	0.2272	-0.6168
PAINL	-0.0823	0.1113	-0.7399
PAINSG	-0.2391	0.2281	-1.0482
WORRL	0.2627	0.1378	1.9056
WORRSG	0.3304	0.1646	2.0065
CHILD	0.0419	0.1465	0.2860
FEMALE	1.1515	0.6256	1.8406
FCHILD	-0.4938	0.2259	-2.1855
NEWMEM	0.0796	0.3653	0.2180
MAGE	0.7339	0.2899	2.5314
FAGE	0.2419	0.2917	0.8291

EQUATION 3 - LEVEL OF LOG(AMBULATORY ONLY) USE

OBL	COEF	STDERR	T-STAT
BZERO	3.9865	0.6262	6.3658
P25	-0.1833	0.1078	-1.6998
PFD	-0.5015	0.1141	-4.3972
IDP	-0.2490	0.1042	-2.3884
EXAM	0.0736	0.0801	0.9182
YR3	0.2226	0.0920	2.4201
LINC	0.0311	0.0666	0.4672
LFAM	-0.0386	0.0857	-0.4501
BLACK	-0.5339	0.2762	-1.9328
AFDC	-0.0657	0.1739	-0.3775
NOMDVIS	-0.1238	0.1147	-1.0794
INMDVIS	-0.4549	0.1305	-3.4873
HLTHG	0.1017	0.0879	1.1573
HLTHFP	0.4820	0.1605	3.0029
PAINL	0.0468	0.0868	0.5387
PAINSG	0.2698	0.1594	1.6928
WORRL	0.0797	0.1014	0.7854
WORRSG	-0.0094	0.1152	-0.0817
CHILD	-0.5654	0.1151	-4.9136
FEMALE	0.7496	0.4263	1.7584
FCHILD	-0.1757	0.1626	-1.0805
NEWMEM	0.8440	0.3016	2.7980
MAGE	0.4118	0.1866	2.2065
FAGE	0.0964	0.2045	0.4717

SEATTLE YEAR 2
EQUATION 1 - PROBABILITY OF POSITIVE USER

OBL	COEF	STDERR	T-STAT
BZERO	-0.4933	0.7651	-0.6448
P25	-0.3081	0.1310	-2.3509
PFD	-0.6098	0.1297	-4.7004
IDP	-0.4573	0.1228	-3.7241
EXAM	-0.1878	0.0944	-1.9903
YR3	-0.0773	0.1083	-0.7143
LINC	0.0978	0.0763	1.2815
LFAM	0.1160	0.0995	1.1661
BLACK	-0.6740	0.2701	-2.4951
AFDC	0.4444	0.2243	1.9810
NOMDVIS	-0.3893	0.1299	-2.9978
INMDVIS	-0.3546	0.1709	-2.0748
HLTHG	0.0393	0.1128	0.3489
HLTHFP	0.1458	0.2366	0.6162
PAINL	-0.1261	0.1092	-1.1548
PAINSG	-0.2608	0.2330	-1.1196
WORRL	0.0683	0.1297	0.5264
WORRSG	0.2902	0.1649	1.7592
CHILD	-0.1368	0.1436	-0.9524
FEMALE	0.2947	0.6456	0.4565
FCHILD	-0.0950	0.2363	-0.4021
NEWMEM	0.3049	0.3334	0.9148
MAGE	0.7657	0.2871	2.6668
FAGE	0.6680	0.3275	2.0399

EQUATION 3 - LEVEL OF LOG(AMBULATORY ONLY) USE

OBL	COEF	STDERR	T-STAT
BZERO	4.0035	0.6664	6.0075
P25	-0.1720	0.1086	-1.5835
PFD	-0.2264	0.1186	-1.9085
IDP	-0.2638	0.1060	-2.4897
EXAM	-0.0240	0.0824	-0.2908
YR3	0.0065	0.0941	0.0692
LINC	0.0687	0.0680	1.0103
LFAM	-0.1857	0.0861	-2.1563
BLACK	-0.5341	0.3071	-1.7392
AFDC	-0.0111	0.1671	-0.0664
NOMDVIS	0.0981	0.1233	0.7954
INMDVIS	-0.4976	0.1388	-3.5857
HLTHG	-0.0184	0.0971	-0.1898
HLTHFP	-0.0234	0.1776	-0.1319
PAINL	-0.0445	0.0974	-0.4573
PAINSG	0.2887	0.1804	1.6005
WORRL	0.0404	0.1155	0.3497
WORRSG	0.1505	0.1300	1.1573
CHILD	-0.3427	0.1276	-2.6849
FEMALE	0.6149	0.4438	1.3855
FCHILD	-0.1875	0.1871	-1.0023
NEWMEM	0.2353	0.2835	0.8302
MAGE	0.4507	0.2319	1.9436
FAGE	0.1195	0.2456	0.4868

FITCHBURG YEAR 1
EQUATION 1 - PROBABILITY OF POSITIVE USER

OBL	COEF	STDERR	T-STAT
BZERO	-0.7429	1.2810	-0.5799
P25	-0.3390	0.2174	-1.5595
P50	-0.3205	0.2876	-1.1144
PFD	-0.5582	0.2237	-2.4950
IDP	-0.6890	0.1866	-3.6935
EXAM	0.4486	0.1544	2.9046
NOHR	-0.1428	0.1684	-0.8483
YR3	-0.2294	0.1742	-1.3169
LINC	0.2031	0.1305	1.5572
LFAM	-0.1241	0.1628	-0.7622
NOMD	-0.6464	0.2540	-2.5446
NOMDVIS	0.0348	0.1953	0.1780
INMDVIS	-0.5956	0.2462	-2.4197
HLTHG	0.3172	0.1789	1.7729
HLTHFP	0.3808	0.3398	1.1207
PAINL	-0.0562	0.1866	-0.3012
PAINSG	-0.3410	0.2335	-1.4603
WORRL	-0.2769	0.1953	-1.4184
WORRSG	-0.1502	0.2499	-0.6011
CHILD	0.2845	0.2042	1.3929
FEMALE	0.4207	0.9759	0.4311
FCHILD	-0.6651	0.3452	-1.9266
NEWMEM	0.2132	0.4410	0.4834
MAGE	0.5938	0.4231	1.4035
FAGE	0.6178	0.4480	1.3789

EQUATION 3 - LEVEL OF LOG(AMBULATORY ONLY) USE

OBL	COEF	STDERR	T-STAT
BZERO	4.5621	0.8837	5.1627
P25	0.0457	0.1505	0.3038
P50	-0.4546	0.2007	-2.2648
PFD	-0.6163	0.1581	-3.8991
IDP	-0.3768	0.1389	-2.7132
EXAM	0.0785	0.1223	0.6421
NOHR	0.3060	0.1353	2.2607
YR3	-0.0193	0.1217	-0.1587
LINC	0.0141	0.0945	0.1489
LFAM	-0.0885	0.1140	-0.7762
NOMD	-0.0067	0.2371	-0.0284
NOMDVIS	0.0295	0.1443	0.2042
INMDVIS	-0.4527	0.1624	-2.7871
HLTHG	0.0395	0.1164	0.3389
HLTHFP	0.2964	0.2360	1.2559
PAINL	-0.0790	0.1233	-0.6406
PAINSG	-0.0196	0.1505	-0.1300
WORRL	0.0598	0.1324	0.4521
WORRSG	0.0469	0.1586	0.2957
CHILD	-0.3983	0.1388	-2.8701
FEMALE	0.0234	0.5058	0.0462
FCHILD	-0.1453	0.1974	-0.7361
NEWMEM	0.3278	0.2754	1.1901
MAGE	0.1407	0.2174	0.6472
FAGE	0.2510	0.2281	1.1006

FITCHBURG YEAR 2
EQUATION 1 - PROBABILITY OF POSITIVE USER

OBL	COEF	STDERR	T-STAT
BZERO	0.7416	1.1014	0.6733
P25	-0.0810	0.1889	-0.4290
P50	-0.5711	0.2237	-2.5523
PFD	-0.6410	0.1838	-3.4881
IDP	-0.4094	0.1613	-2.5379
EXAM	0.1951	0.1385	1.4082
NOHR	0.0049	0.1495	0.0329
YR3	0.0355	0.1413	0.2512
LINC	0.0334	0.1118	0.2986
LFAM	0.0654	0.1408	0.4645
NOMD	-0.4735	0.2351	-2.0139
NOMDVIS	-0.2034	0.1707	-1.1916
INMDVIS	-0.5357	0.2129	-2.5160
HLTHG	-0.0500	0.1532	-0.3264
HLTHFP	0.6850	0.3753	1.8251
PAINL	0.0788	0.1627	0.4844
PAINSG	-0.1932	0.2035	-0.9490
WORRL	0.1568	0.1774	0.8840
WORRSG	0.2590	0.2202	1.1766
CHILD	-0.1003	0.1847	-0.5430
FEMALE	-0.7205	0.9436	-0.7636
FCHILD	0.2392	0.3216	0.7437
NEWMEM	0.8263	0.3925	2.1051
MAGE	0.1829	0.3453	0.5298
FAGE	0.5993	0.4678	1.2812

EQUATION 3 - LEVEL OF LOG(AMBULATORY ONLY) USE

OBL	COEF	STDERR	T-STAT
BZERO	3.2412	0.9918	3.2681
P25	-0.2375	0.1694	-1.4022
P50	-0.3212	0.2346	-1.3689
PFD	-0.4162	0.1886	-2.2070
IDP	-0.4267	0.1583	-2.6964
EXAM	0.0030	0.1391	0.0217
NOHR	0.0064	0.1541	0.0413
YR3	-0.0339	0.1396	-0.2429
LINC	0.1399	0.1039	1.3457
LFAM	-0.0966	0.1254	-0.7701
NOMD	-0.3441	0.2847	-1.2089
NOMDVIS	-0.2725	0.1696	-1.6066
INMDVIS	-0.1790	0.1901	-0.9414
HLTHG	0.1060	0.1358	0.7804
HLTHFP	0.7758	0.2440	3.1802
PAINL	-0.0765	0.1408	-0.5430
PAINSG	-0.1107	0.1724	-0.6419
WORRL	0.1334	0.1502	0.8883
WORRSG	0.0143	0.1761	0.0814
CHILD	-0.3966	0.1589	-2.4959
FEMALE	0.5063	0.6374	0.7943
FCHILD	-0.2129	0.2403	-0.8862
NEWMEM	0.2815	0.3053	0.9221
MAGE	0.2401	0.2727	0.8806
FAGE	0.1653	0.3065	0.5395

FRANKLIN YEAR 1
EQUATION 1 - PROBABILITY OF POSITIVE USER

OBL	COEF	STDERR	T-STAT
BZERO	-1.9608	1.0317	-1.9005
P25	-0.2788	0.1953	-1.4277
P50	-0.2465	0.2761	-0.8931
PFD	-0.9130	0.1721	-5.3044
IDP	-0.5732	0.1730	-3.3131
EXAM	0.0997	0.1388	0.7184
NOHR	-0.0421	0.1349	-0.3122
YR3	-0.1996	0.1473	-1.3546
LINC	0.2965	0.1066	2.7811
LFAM	-0.1489	0.1422	-1.0471
NOMD	0.0065	0.2583	0.0250
NOMDVIS	-0.4560	0.1688	-2.7017
INMDVIS	-0.4584	0.2110	-2.1729
HLTHG	0.1821	0.1449	1.2567
HLTHFP	0.0453	0.3792	0.1194
PAINL	0.2192	0.1705	1.2860
PAINSG	0.1066	0.2267	0.4703
WORRL	0.0883	0.1941	0.4551
WORRSG	0.2330	0.2233	1.0434
CHILD	0.4865	0.1907	2.5507
FEMALE	-1.0196	1.3706	-0.7439
FCHILD	-0.0939	0.4362	-0.2154
NEWMEM	2.9350	2.9770	0.9859
MAGE	0.7455	0.4316	1.7275
FAGE	1.4671	0.6907	2.1240

EQUATION 3 - LEVEL OF LOG(AMBULATORY ONLY) USE

OBL	COEF	STDERR	T-STAT
BZERO	4.3373	0.7084	6.1229
P25	-0.2613	0.1244	-2.1004
P50	-0.3945	0.1884	-2.0935
PFD	-0.4715	0.1292	-3.6483
IDP	-0.1368	0.1168	-1.1715
EXAM	-0.0573	0.1038	-0.5523
NOHR	0.0379	0.0998	0.3803
YR3	0.0759	0.1000	0.7587
LINC	0.0662	0.0741	0.8936
LFAM	-0.1265	0.0976	-1.2965
NOMD	-0.2534	0.2195	-1.1547
NOMDVIS	0.0318	0.1490	0.2137
INMDVIS	-0.2696	0.1499	-1.7977
HLTHG	0.1666	0.1006	1.6563
HLTHFP	0.6288	0.2225	2.8263
PAINL	0.1043	0.1129	0.9243
PAINSG	0.1500	0.1428	1.0509
WORRL	0.0896	0.1229	0.7291
WORRSG	0.1897	0.1376	1.3780
CHILD	-0.4329	0.1400	-3.0917
FEMALE	0.5185	0.4890	1.0602
FCHILD	-0.0531	0.1893	-0.2803
NEWMEM	0.6817	0.3621	1.8828
MAGE	-0.1210	0.2211	-0.5471
FAGE	-0.4201	0.2172	-1.9339

FRANKLIN YEAR 2
EQUATION 1 - PROBABILITY OF POSITIVE USER

OBL	COEF	STDERR	T-STAT
BZERO	-3.6683	1.0034	-3.6560
P25	-0.0140	0.1776	-0.0787
P50	-0.4270	0.2336	-1.8283
PFD	-0.8594	0.1566	-5.4883
IDP	-0.3647	0.1536	-2.3748
EXAM	0.0470	0.1334	0.3522
NOHR	0.2009	0.1291	1.5566
YR3	-0.2398	0.1347	-1.7806
LINC	0.3677	0.0927	3.9666
LFAM	-0.1014	0.1223	-0.8289
NOMD	-0.3148	0.2344	-1.3427
NOMDVIS	-0.4622	0.1662	-2.7811
INMDVIS	-0.1575	0.1986	-0.7929
HLTHG	-0.0464	0.1316	-0.3527
HLTHFP	0.4756	0.4079	1.1659
PAINL	0.1406	0.1532	0.9174
PAINSG	-0.0090	0.1990	-0.0452
WORRL	0.3663	0.1789	2.0476
WORRSG	0.4006	0.1968	2.0357
CHILD	0.4297	0.1732	2.4811
FEMALE	-0.3835	1.1422	-0.3357
FCHILD	-0.1470	0.3464	-0.4245
NEWMEM	0.5264	0.5569	0.9453
MAGE	1.2143	0.4836	2.5112
FAGE	1.4377	0.5326	2.6993

EQUATION 3 - LEVEL OF LOG(AMBULATORY ONLY) USE

OBL	COEF	STDERR	T-STAT
BZERO	4.4581	0.7824	5.6978
P25	-0.0302	0.1345	-0.2249
P50	-0.2325	0.2111	-1.1014
PFD	-0.3477	0.1463	-2.3764
IDP	-0.2137	0.1274	-1.6773
EXAM	-0.1885	0.1146	-1.6454
NOHR	0.0530	0.1084	0.4888
YR3	0.0031	0.1088	0.0286
LINC	0.0557	0.0829	0.6719
LFAM	-0.0619	0.0996	-0.6212
NOMD	0.3688	0.2380	1.5496
NOMDVIS	0.0742	0.1477	0.5024
INMDVIS	-0.1725	0.1498	-1.1514
HLTHG	0.2293	0.1050	2.1834
HLTHFP	0.7502	0.2119	3.5402
PAINL	0.0396	0.1133	0.3492
PAINSG	0.1295	0.1423	0.9104
WORRL	0.0331	0.1229	0.2696
WORRSG	0.1597	0.1390	1.1485
CHILD	-0.4435	0.1317	-3.3686
FEMALE	0.1558	0.5010	0.3109
FCHILD	-0.0733	0.1938	-0.3783
NEWMEM	0.7604	0.3431	2.2160
MAGE	-0.1797	0.2438	-0.7369
FAGE	-0.1659	0.2445	-0.6783

EQUATION 2 - PROBABLITY OF HOSPITAL USE

OBL	COEF	STDERR	T-STAT
BZERO	-1.1748	0.0491	-23.9214
AP25	-0.1157	0.0666	-1.7364
AP50	-0.2352	0.0963	-2.4428
APFD	-0.1165	0.0687	-1.6971
AIDP	-0.0788	0.0681	-1.1576
FAD	0.2179	0.0491	4.4357
CHILD	-0.3337	0.0613	-5.4434

EQUATION 4 - LEVEL OF LOG(MEDICAL) IF ANY INPATIENT

OBL	COEF	STDERR	T-STAT
BZERO	7.4439	0.0807	92.1877
DAY2	0.2232	0.0970	2.3006
DAY3	0.2092	0.0973	2.1495
SEA1	-0.0751	0.0918	-0.8184
SEA2	0.1570	0.0966	1.6249
FIT1	-0.0242	0.1062	-0.2278
FIT2	0.2951	0.1055	2.7971
FRA1	0.0067	0.1046	0.0641
FRA2	0.1384	0.1094	1.2646
FAD	-0.0143	0.0584	-0.2448
CHILD	-0.5446	0.0686	-7.9393

GLOSSARY OF ACRONYMS*

Acronym	*Meaning*
BZERO	Intercept
P25[a]	= 1 if individual on 25-percent coinsurance, = 0 otherwise.
P50[a]	= 1 if individual on 50-percent coinsurance, = 0 otherwise.
PFD[a]	= 1 if individual on 95-percent coinsurance, = 0 otherwise.
IDP[a]	= 1 if individual on Individual Deductible Plan, = 0 otherwise.
EXAM	= 1 if individual took entrance screening examination, = 0 otherwise.
WEEKLY	= 1 if individual received health questionnaire weekly in Dayton Year 1, = 0 otherwise.
YR3	= 1 if individual enrolled for 3 years, = 0 if individual enrolled for 5 years.
LINC[b]	= natural logarithm of a weighted average of 2 years of family income in 1972 dollars.
LFAM	= natural logarithm of family size.
BLACK	= 1 if family is black, = 0 otherwise.
AFDC	= 1 if someone in family received Aid to Families with Dependent Children, = 0 otherwise.
NOMD	= 1 if no regular physician for any family member at baseline interview, = 0 otherwise.
NOMDVIS	= 1 if no visits to physician in year prior to baseline interview, = 0 otherwise.
INMDVIS	= 1 if 0 or 1 visits to physician in year prior to baseline interview, = reciprocal of number of visits to physician otherwise.
HLTHG[c]	= 1 if self-rated health is good, = 0 otherwise.
HLTHFP[c]	= 1 if self-rated health is fair or poor, = 0 otherwise.

*For footnotes, see page 57.

PAINL[d]	= 1 if self-reported pain is little, = 0 otherwise.
PAINSG[d]	= 1 if self-reported pain is great or some, = 0 otherwise.
WORRL[e]	= 1 if self-reported worry about health is little, = 0 otherwise.
WORRSG[e]	= 1 if self-reported worry about health is some or great, = 0 otherwise.
CHILD	= 1 if age less than 18 years, = 0 otherwise.
FEMALE	= 1 if female, = 0 if male.
FCHILD	= FEMALE × CHILD
NEWMEM	= 1 if added to family after baseline interview, = 0 otherwise.
MAGE	= a transformation of age for males.[f]
FAGE	= a transformation of age for females.[f]
NOHR	= 1 if family did not receive health questionnaire in Year 1, = 0 otherwise.
AP25	= (1 - CHILD) × P25
AP50	= (1 - CHILD) × P50
APFD	= (1 - CHILD) × PFD
AIDP	= (1 - CHILD) × IDP
FAD	= (1 - CHILD) × FEMALE
DAY2	= 1 if observation from Year 2 in Dayton, = 0 otherwise.
DAY3	= 1 if observation from Year 3 in Dayton, = 0 otherwise.
SEA1	= 1 if observation from Year 1 in Seattle, = 0 otherwise.
SEA2	= 1 if observation from Year 2 in Seattle, = 0 otherwise.
FIT1	= 1 if observation from Year 1 in Fitchburg, = 0 otherwise.
FIT2	= 1 if observation from Year 2 in Fitchburg, = 0 otherwise.
FRA1	= 1 if observation from Year 1 in Franklin County, = 0 otherwise.
FRA2	= 1 if observation from Year 2 in Franklin County, = 0 otherwise.

FOOTNOTES TO GLOSSARY

[a]The omitted variable is the free plan.

[b]Income is set equal to $1000 if reported to be less. The years averaged are 1972 and 1973 in Dayton and 1973 and 1974 in the other sites. Each year received a weight of .5 in constant dollars.

[c]The omitted variable is self-rated health excellent.

[d]The omitted variable is self-reported pain none.

[e]The omitted variable is self-reported worry about health none.

[f]MAGE and FAGE are age-scaled by per person physician visits in the nation at that age, using NCHS Health Interview Survey data from 1971 (Vital and Health Statistics Series 10, No. 97, Table 3). The midpoint of the published age interval was selected, and the following regression fit, using OLS, was applied:

$$\ln \text{(mean visit rate)} = \alpha_0 + \sum_{i=1}^{6} \alpha_i[(\text{Age} - 30)/100)]^i.$$

(For the 75 and over interval, age 80 was used.) MAGE is the predicted ln of visits for males and FAGE is analogous for females.

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