Estimating the Probability and Level of Ambulatory Mental Health Services Use

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Analysis of the National Medical Care Utilization and Expenditure Survey for persons with positive out-of-pocket expenses for one or more ambulatory mental health visits indicates that demand for such visits is responsive to price, and considerably more so than demand for health visits. Income, education, and insurance coverage interact in predicting demand, and price elasticity varies across income groups.

After years of neglect, studies of the demand for ambulatory mental health care have recently multiplied. Frank and McGuire [1] have provided a critical review of all but the most recent of these studies. This article presents the findings of a demand analysis using data from the National Medical Care Utilization and Expenditure Survey. The results are compared to other demand analyses for mental health services, including another recent national probability sample survey of health utilization, the National Medical Care Expenditure Survey (Horgan, 1986 [2]); the Rand Health Insurance Experiment (Wells et al., 1982 [3]); the Federal Health Benefits Program (Watts and Scheffler, 1986 [4]); and the first econometric study of mental health

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demand based on an American Psychiatric Association Survey of office-based psychiatrists (McGuire, 1981 [5]).

Each of these studies had particular strengths and weaknesses. McGuire's [5] study was hampered by having data only on people in treatment and overrepresentation of heavy users, and by not having completed episodes of visits—the dependent variable. However, his study sparked the field and introduced an invaluable empirical anchoring for policy discussions surrounding mental health coverage. The generalizability of Wells et al.'s [3] sophisticated analysis may be limited by factors unique to the HIE, including: limit of 52 visits for mental health care in the study design, a truncation of the higher-income persons in the study population, and a maximum dollar expenditure per family similar to catastrophic insurance coverage (but set at a relatively low level).

Watts and Scheffler's study [4] of insured federal employees is limited in generalizability to heavily insured populations. Horgan's [2] analysis has the advantage of a national probability sample and good measures of psychiatric insurance coverage, but has problems associated with self-reporting of mental health conditions and, to date, reports are published only on the use of special mental health services.

The analysis presented here has three advantages compared to previous cross-sectional studies similar in basic design:

1. We examine use of mental health services in both the specialty mental health sector and in the general medical sector. This is important because of previous research, which showed that the majority of persons with mental disorders use the general medical sector rather than the specialty mental health sector during a given year. A parallel approach was taken by the Rand investigators.
2. Also similar to the Rand investigation, the price elasticities for ambulatory mental health care are compared with general health care. The difference between the two estimates is an issue of considerable health policy importance. Large third-party payers have for years restricted mental health coverage to their beneficiaries on the basis of early poor experience with this coverage and because it has been presumed that demand for mental health care is more responsive to price than is demand for general health care [5]. Research prior to the Rand Health Insurance Study seemed to bear out this latter supposition, but this has been challenged by Wells et al. [3].

3. A specific analysis of an interaction between income, education, and private insurance coverage is undertaken in an attempt to address issues bearing on the relationship between socioeconomic status, accessibility, and education, and use of mental health services. This subanalysis also has considerable relevance in the health policy arena.

This new investigation represents the initial analysis of the NMCUES database, the most recent probability sample of the noninstitutionalized U.S. population. Along with the findings from Horgan, and from subsequent studies of this type, we can discern trends in the demand for ambulatory mental health care which may be important to resource allocation decisions.

METHODS

This study is based on the National Medical Care Utilization and Expenditure Survey (NMCUES), reflecting the period of calendar year 1980. NMCUES was designed to provide estimates of the health of the civilian noninstitutionalized population of the United States, its utilization and expenditures for various types of medical care, and health insurance coverage and amounts paid by insurers for health care. About 17,900 persons were included in the NMCUES national household sample. Information for all family members was collected from a single household respondent through a set of five interviews approximately three months apart. In each interview, usually one primary respondent reported medical care received and health expenditures incurred for each family member during a specified interval (although other family members present could respond). The respondent also reported information regarding disability days, illness episodes, and sociodemographic characteristics for each member of the family. If no one in the family was able to respond, a proxy acted as respondent. Further background of the survey may be found in Bonham [6].

ANALYTICAL FRAMEWORK

Similar to previous analyses of demand for mental health care by Wells et al. [3] and Horgan [2], separate models for the probability of any ambulatory mental health use and the level of use given positive use are

estimated. This approach is helpful when only a small proportion of the population has any use of a specified type [7].

The probability of a mental health visit is low. An estimated 9.6 million people or 4.3 percent of the civilian noninstitutionalized population had one or more ambulatory mental health visits during the year. For the first part of the model, therefore, a logistic regression model was used to estimate the probability of use.[1]

The level of use equation was a constant elasticity model of the following form:

$$Q = aP^b I^c EXP^{\sum \alpha_i X_i}$$

where

Q	=	number of visits.
P	=	average percent out-of-pocket expenses.
I	=	family income.
X	=	vector of social and demographic characteristics.
a, b, c, α_i	=	regression parameters.

For persons with a mental health visit, the average annual number of visits per person was 8.2, ranging from 10.9 and 12.5 for persons seen primarily by office-based psychiatrists and psychologists, respectively, to 5.3 and 4.4 for persons seen by other office-based providers and by organized settings, respectively. These averages are for use in a calendar year, and do not necessarily correspond to the average visits associated with a course of treatment for a clinical episode. Half of those with visits had fewer than 3 visits, while 10 percent of those with visits had 25 or more per year.

Because of this skewness, the log of the number of visits was taken as the dependent variable. The logarithmic transformation of level of use equation, therefore, was used in an OLS regression analysis.[2]

Analysis of the price elasticity of demand using the NMCUES database is complicated by the lack of a variable which measures the fair market price for each mental health visit independent of the insurance coverage of the user, an exogenous price variable. The use of average percent out-of-pocket expenses is probably a particularly poor proxy for mental illness due to the combined effects of deductibles, high coinsurance, and upper limits on the number of covered visits. For these reasons, the analysis of level of use considers only those persons (N = 440 persons) with positive out-of-pocket expense for ambulatory mental health care. While this partially addresses some of

the problems, the difficulties of estimating price elasticity of demand given deductibles, coinsurance, and caps remain considerable [3, 5, 8].

DEFINITION OF MENTAL HEALTH VISIT

A mental health visit was defined as any visit with a mental health condition given as a reason for that visit regardless of the provider type or setting, and all visits to a psychiatrist, psychologist, or psychiatric clinic whether or not a mental health reason prompted the visit. This definition of mental health condition may be viewed as conservative. Only specific mental disorders were included. If reports of "nerves," not elsewhere classified, were included, the estimated number of mental conditions (but not necessarily the number of persons with a mental health condition) would increase almost 50 percent. Because of the lack of specificity of the self-reported "nerves" category, this condition was not used in the definition. Further, while the estimates of mental health visits from NMCUES are higher than those from prior surveys [2], there is probably still underreporting of specific mental health conditions by household members [9].

Of the estimated 78 million mental health visits, 74 percent had a reported mental health condition as the reason for visit. The remainder occurred in psychiatric settings with no self-reported mental health condition. By definition, visits to a nonpsychiatric setting with no self-reported mental health reason for visit are not included. Some of these in fact may have been for a mental health problem; such visits would be those unrecognized or unreported by the patient.

Studies of primary care physicians' ability to recognize mental disorders indicate that only 10–15 percent of persons with a mental disorder are recognized and recorded in the chart by primary care physicians [10]. Further, in 72 percent of the visits of persons with a psychiatric diagnosis presenting to a primary care physician, the physician reported the reason for the visit as some sort of physical symptom [11]. From this perspective, the definition of mental health visit used here may be considered conservative.

Some major limitations in the measurement of the dependent variable should be kept in mind. First, the definition of the presence of a mental condition is by the respondent and, therefore, depends on the respondent's knowledge of his/her condition or the respondent's knowledge of and willingness to report someone else's condition. Since specific diagnoses are not examined in this analysis, the main impact should be on underreporting or overreporting of mental conditions. A

constant bias in this regard would not necessarily affect relationships or patterns of expenditures or financing across subgroups of the population. Such a constant relationship is assumed in these analyses, although the empirical basis for this assumption has not been demonstrated.

Second, there is potential inaccurate identification of provider type (i.e., location of visit), expenses, and sources of payment. Again, the differential error across subgroups of the population is unknown.[3]

The estimates of costs and utilization here exclude use by persons in institutions such as nursing homes or state mental hospitals. This would include professional services to such persons by nonstaff physicians or other providers of these institutions. Also, inpatient use and expenditures either in the short or long term, are not covered here. All ambulatory care for the noninstitutionalized population is covered—including that provided in office practice, emergency rooms, or outpatient departments of general hospitals, freestanding outpatient mental health clinics, community mental health centers, or outpatient services provided by psychiatric hospitals. Charges for prescribed medicine are not included, nor are expenditures for health insurance premiums.

INDEPENDENT VARIABLES

Five groups of variables were incorporated in the models for level of use and four in the model for any use. The first set consisted of demographic variables.

The second set incorporated six variables related to health status. The NMCUES database does not contain a measure of mental health status. Measures of general health were included as a proxy for mental health status because of the known relationship between health and mental health status [12]. Limitation of activity was coded on a four-point scale from cannot perform usual activity to not limited. Perceived health status was coded as excellent, good, fair, poor, from 1 to 4, respectively. Bed disability days and number of conditions were continuous variables referring to both health and mental health conditions. Annual health expenditures was also continuous and excluded ambulatory mental health expenditures.

The third set of variables related to insurance coverage and income. Insurance variables were included in the probability of use model. Two variables reflecting insurance coverage were the presence of private insurance or Medicaid for all or part of the year.[4] Neither of these variables in the NMCUES survey was reflective of mental health

coverage specifically, and only reflected insurance coverage in general. The relationship was expected to be significant and positive with both for probability of use, but—because of lack of specificity—not necessarily very strong. Finally, family income was included.

Price is measured as the average percent paid out-of-pocket for mental health visits (annual dollars paid out-of-pocket as a percent of total reported expenditures for ambulatory mental health visits). Problems with this specification are well known, but the NMCUES database does not allow other specifications [8, 13]. Since we are estimating a demand curve for individuals, price should be exogenous, that is, a measure of the fair market price for each visit independent of the insurance coverage of the user. The public-use NMCUES data file, however, does not enable geographic coding of sufficient detail to incorporate an exogenous price variable, nor are such data readily available for all types of ambulatory mental health providers. Therefore, the only choice was to use the average percent paid out-of-pocket as the price variable, despite the limitations.

Finally, employment status was coded as 1 if the person was employed full- or part-time for all or part of the year, and as 0 if the person was unemployed or not in the labor force (i.e., children, unemployed spouses).

SMSA versus non-SMSA was included to measure urban-rural differences in supply, cultural factors affecting demand, and financial accessibility. The four census regions were also used to measure regional differences in practice and supply, and cultural differences affecting demand, although it is not possible to control for these effects independently or directly.

Individuals with positive use in the year were classified by the primary setting in which such care was received. Primary setting was coded to either office-based or organized setting. Within office-based setting, a division was made by psychiatrists, psychologists, and other providers. The last category can be further subdivided into visits to nonpsychiatric physicians (43 percent), social workers or counselors (29 percent), and other providers (28 percent). Due to small sample sizes, these are collapsed into one group for this analysis. A person was classified into one of these categories based on which provider type accounted for the majority of his/her visits. Since 77 percent of the people had visits in only one of these categories, this coding algorithm was needed in only 23 percent of the cases. Of the persons with one or more mental health visits, 24.5 percent were seen primarily in psychiatrists' office practice; 23.5 percent in psychologists' office practice; 40.1 percent in office practices of other providers (such as nonpsychiatrist

physician, social worker); and 11.9 percent in organized settings such as a hospital, OPD, emergency room, and specialty mental health clinic.

RESULTS

A logistic regression model was estimated, with the probability of any ambulatory mental health visit as the dependent variable (Table 1). A second model was estimated for all persons with one or more mental health visits and positive out-of-pocket expenses (Table 2), in which the dependent variable was the log of the annual number of mental health visits.[2, 5]

Age and age-squared were highly significant in the equations for any use but not in the equation for level of use as measured by number of visits. This latter finding is inconsistent with other results, indicating an inverted J-relationship of age with both probability of use and level of use; but the standard errors of the coefficient are large, and the *p*-value level is close to significant.

Sex was not significantly related to probability or level of use. This is consistent with Horgan's findings for the NMCES survey as it applies to specialty mental health providers and health facilities [2]. McGuire [5] also found no sex effect for level of use. The finding is not consistent with Watts and Scheffler [4] nor with Wells et al. [3]. Both found that sex affects probability of use but not level.

Wells et al. [3] found that the extra use of services by women is in the "informal" system (by their definition the health system itself, not the specialty mental health system). This would explain why Horgan [2] failed to find a sex difference in the specialty mental health system. In a model for NMCUES for formal use only (not shown), sex was not significant.

Race is significant in predicting probability of use but not level of use. Due to the small sample size, this may reflect lack of power to detect a significant difference in the level of use equation. Whites have a higher probability of use than nonwhites, consistent with Horgan [2] and Watts and Scheffler [4]. Wells et al. [3] did not find a race effect, and McGuire [5] found no significant race difference in level of use.

The effect of being married is significant for probability but not level of use. Married persons have a lower probability of use but not less use once they enter treatment. This is consistent with the general literature on mental health use, which consistently reports higher admission rates for outpatient and inpatient services for the widowed,

Table 1: Results of Logistic Regression Model for Probability of Any Ambulatory Mental Health Use (Based on 1980 Data from the National Medical Care Utilization and Expenditure Survey)

	B	*Standard Error*	*Design Effect**	*Adjusted Chi-Square*†
Intercept	-4.71	.41	1.48	
Non-SMSA	-0.19‖	(.09)	1.34	3.3
Northcentral region	-0.41§	(.11)	2.45	5.8
South region	-0.32§	(.11)	2.25	3.8
West region	-0.11	(.11)	2.15	0.5
Age	1.09‡	(.13)	1.09	64.2
Age-squared	-0.15‡	(.02)	1.19	47.3
Race (white = 1)	0.71‡	(.15)	0.66	35.0
Sex (male = 1)	-0.07	(.09)	0.60	1.0
Married	-0.19‖	(.10)	1.25	2.9
Not married under 17	0.58§	(.21)	1.41	5.4
Not employed (any reason)	-0.16	(.12)	1.24	1.4
Private insurance coverage all or part of year	0.07	(.12)	1.46	0.2
Medicaid coverage all or part of year	0.53‡	(.14)	1.93	7.5
Perceived health status (1-4, EGFP)	0.09	(.06)	1.72	1.3
Limitation of activity (1-4, L-NL)	-0.24‡	(.05)	1.19	19.0
Bed-days (any cause)	-0.01‖	(.00)	1.66	2.7
Hospital nights (any cause)	0.00	(.01)	0.90	0.3
Health conditions (any type)	0.23‡	(.01)	2.09	269.9
Health charges excluding mental (0000)	0.03	(.13)	0.56	0.1
Poverty level	-0.06	(.02)	1.98	2.1
Family income (0000)	0.01	(.01)	0.69	0.1

*The ratio of the variance based on the complex sample to the variance under simple random sample assumptions.

†The Chi-square calculated by the logistic regression program assumes simple random sampling (SRS). Adjustment for the design effect has been incorporated as follows:

$$X^2 = \frac{B}{\sqrt{SE_B \cdot \text{design effect}}}$$

Where SE_B is that calculated based on the SRS assumption.

‡$p = < .01$.

§$p = < .05$.

‖$p = < .10$.

Table 2: Weighted Least-Squares Regression Equations for the Log of Annual Mental Health Visits Given Positive Out-of-Pocket Expenses (Based on 1980 Data from the National Medical Care Utilization and Expenditure Survey)

Independent Variable	*Log of Annual Visits*			
	Mean	B	*Standard Error*	p
Demographic				
Age (10-year intervals)	3.54	0.265	.175	.13
Age-squared	15.85	-0.032	.019	.10
Sex (male = 1)	0.38	-0.081	.114	.48
Race (white = 1)	0.94	-0.020	.218	.93
Under 17 single (yes = 1)	0.16	0.408	.302	.18
Married (yes = 1)	0.51	-0.012	.129	.93
College graduate (yes = 1)	0.19	0.256	.146	.08
Health Status				
Limitation of activity	3.61	-0.051	.067	.45
Perceived health status	1.89	0.101	.070	.15
Bed disability days	8.16	0.005	.004	.28
Number of health conditions	5.69	0.006	.017	.72
Annual health charges (000's)	1.05	-0.056	.033	.09
Financial				
Log of family income (000's)	2.92	-0.980	.288	.01
Log of percent out-of-pocket expense	4.04	-0.980	.202	.01
Interaction of log of family income and log of percent out-of-pocket expenses	11.81	0.247	.070	.01
Employed (yes = 1)	0.37	-0.168	.157	.28
SMSA and Region				
SMSA (1 = non-SMSA)	0.27	-0.168	.121	.17
Northcentral (1 = yes)	0.21	-0.531	.154	.01
South (1 = yes)	0.27	-0.280	.143	.05
West (1 = yes)	0.23	0.077	.146	.60
Primary Setting				
Psychiatrist office	0.22	0.678	.200	.01
Psychologist office	0.24	1.242	.198	.01
Other provider office	0.45	0.113	.185	.54
Intercept		4.381		
R^2	.307			
N		440		
D.F.		23,417		

separated, divorced, and never married [14]. Horgan [2] reports a higher probability of use for these nonmarried categories for the specialty mental health sector but did not include marital status in her level of use equations. McGuire [5] found that married persons had significantly fewer visits than nonmarried persons.

Educational level was not included in the probability of use model, due to the high correlation with income variables.[6] College-level education but not high school was significantly related to level of use, however, once the decision to use care had been made.[7] Horgan [2] found that college education (16 + years) but not high school was significantly related to level of use and probability of use. Wells et al. [3] found that college-level education was significantly related to probability of use and was related to level of use of formal (i.e., specialty provider) but not informal providers.

Of the variables relating to physical health status, limitations of activity and number of health conditions were positively related to the probability of using mental health services but not level of use. Horgan [2] found that perceived health status and number of disability days were highly related to probability of use but not level of use. Watts and Scheffler [4] did not find disability days significantly related to either probability or level of use. Wells et al. [3] found effects of the combined health status variables on probability of use but not level of use. Because Wells et al. had measures of both health and mental health status, however, their measure of health status may have a different meaning than studies measuring only health status.

Neither poverty level nor family income was related to probability of use—a finding consistent with those of Horgan [2] and Wells et al. [3]. This is true even though the data available in NMCUES do not allow for the separation of the relation of higher income and better insurance coverage for mental health. As Wells et al. point out, unless insurance coverage is properly controlled for in the analyses, one cannot determine whether the higher use is due to better insurance or higher income. Horgan, controlling for psychiatric insurance coverage, found no income effect on probability of use nor did Wells et al. Watts and Scheffler [4], however, found positive income effects among a heavily insured population. They suggest that the fact that the RAND experimental design truncated the high-income group precludes the finding of an income effect by Wells et al. However, NMCUES data do not support this conjecture.

McGuire [5] and Watts and Scheffler [4] found income positively related to level of use while this analysis found a significant negative relationship. Wells et al. [3] found no significant income effect on level

Table 3: Average Number of Visits by Income, Insurance, and Educational Level (Standard Errors in Parentheses)

	No High School	*At Least Some High School*
Family income under $20,000		
Insured all year*	4.0 (1.15)	6.5 (1.04)
Insured part year or less*	8.6 (1.99)	9.3 (1.48)
Family income over $20,000		
Insured all year*	3.4 (0.95)	8.17(0.93)
Insured part year or less*	5.0 (1.35)	12.3 (3.38)

*Private insurance coverage, excludes Medicaid.

of use. Horgan [2] found a negative but insignificant effect for income.[8]

Private insurance coverage for all or part of the year was not related to probability of mental health use. This variable did not measure specific mental health coverage in the NMCUES data set. Horgan [2] was able to measure mental health insurance coverage and found that probability of use was positively related to first-dollar coverage for psychiatric visits and that the psychiatric coinsurance rate was negatively related. Wells et al. [3] found that cost-sharing was related to probability but not level of use. Medicaid coverage was significantly related to probability of use, increasing mental health use.

Because of the contradictory findings relating to income, education, and insurance, the interaction of these three variables (Table 3) in predicting the annual number of visits was investigated using the GSK-weighted least-squares methodology and the computer program GENCAT [15,16]. This analysis indicated the following:

1. Income by itself does not affect the number of visits.
2. For persons with a high income, there is no effect of insurance coverage, but there is an education effect—number of visits is positively related to education level.
3. For persons with low income, there is an insurance effect—better insurance coverage is related to more visits.
4. For persons with low income and poorer insurance coverage, there is no education effect, but for low-income persons with good insurance, there is an education effect.

The price variable used here—percent out-of-pocket for mental health expenses—is significant and negative. The lower the cost to the patient, the higher the number of visits. This is consistent with economic theory. The coefficient can be interpreted as the price elasticity,

Table 4: Predicted Annual Number of Mental Health Visits for Different Levels of Percent Out-of-Pocket Expenditures for Ambulatory Mental Health Care

Annual Percent Out-of-Pocket Expenses	*Predicted Annual Number of Visits**
Under 25%	6.3
25–49%	5.4
50–74%	4.7
75+%	3.5

*Predictions are based on the regression equation given in Table 2. The predicted log of visits was converted to visits for each person, and then averaged over the percent out-of-pocket expense categories above.

and for the population with positive out-of-pocket expenditures for mental health visits, the value is -.980. Horgan [2], using a similar price variable, calculated a price elasticity for persons with positive out-of-pocket ambulatory expenses in the specialty mental health sector, which she found to be -.438. A model estimated with an insurance variable (to be more comparable with Horgan's model) indicated a price elasticity of -.539 in this data set.

Table 4 shows the predicted annual number of mental health visits, based on the regression model shown in Table 2, for different levels of out-of-pocket expenses. As the percent out-of-pocket changes from under 25 percent to over 75 percent, a drop occurs in predicted visits, from 6.3 to 3.5.

There was a positive and significant interaction of percent out-of-pocket and income (Table 2) indicating, as McGuire [5] found, that price elasticity varies across income groups. A separate model (not shown) with dummy variables for income groups indicated that for the low- (under $10,000) and middle-income group ($10,000–$24,000) the price elasticities were -.433 and -.425, both significant at the .01 level. For the over-$25,000 income group, the price elasticity was .02, not significant. This is consistent with McGuire's findings that demand elasticity is greatest for patients with the lowest income and with the analyses discussed earlier of the interaction of income, education, and insurance.

In the level of use equations, setting was significant. If the pri-

mary setting was either a psychiatrist's or psychologist's office-based practice, the level of use was higher than that found for other providers or organized settings.

DISCUSSION

The findings regarding the impact of demographic factors on demand for care in this study are generally consistent with the results of similar studies: a curvilinear relationship of age to probability of use; a higher probability of use by whites; a positive correlation of use and education; and a lower probability of use for married persons. This study did not find the sex differences reported in the literature, but is consistent with some of the other demand studies in mental health.

Since a price variable was not available for the probability of use models (Table 1), the price elasticity for the total population studied here cannot be determined. The price elasticities discussed in this analysis apply only to persons with one or more mental health visits. Further, because the population with some visits but zero out-of-pocket expenses for care behaves differently than the population with positive out-of-pocket expenses, the price elasticities are presented only for the latter group.

The price elasticity found for ambulatory mental health care was -.980. This is a higher value than that found using the same price variable specification for the NMCES study, -.438. Horgan's study [2] was restricted to specialty mental health providers, while the study here includes all providers. This elasticity is lower than that found by McGuire [5] and by Frank [17], who found elasticities of around 1 and 1-2, respectively.

These elasticities are based on visits to all settings, including organized settings. Since organized settings may ration care by mechanisms other than price, a separate model for level of use was estimated, excluding persons seen primarily in organized settings. The price elasticity, as measured by the average percent of out-of-pocket expenditures, increased from -.98 to -1.12, and the interaction of income and percent out-of-pocket increased slightly from .25 to .29. Inclusion of the persons seen in organized settings, therefore, may be dampening the price elasticity as measured in Table 2.

Horgan [2] and McGuire [5] both found that demand for the mental health visits was more elastic than demand for ambulatory health visits, while Wells et al. [3] found the price responsiveness to be

about the same for health visits and mental health visits (although the demand for mental health visits was about 10 percent more elastic).

In our study, a comparable regression model with the same price variable was estimated for persons with no mental health visits but positive out-of-pocket expenses for health visits. The price elasticity was highly significant, -.117, compared to -.980 for ambulatory mental health visits. This analysis would, therefore, be in accord with McGuire [5] and Horgan [2] in indicating a higher elasticity for ambulatory mental health care. The price elasticity found here for ambulatory health visits (-.117) is similar to that found by other studies, where the range is from -.03 to -.18 [18, 19].

The higher price elasticity of the demand for mental health visits compared to health visits has formed the basis for introducing limits in benefit packages when mental health services are covered, the presumption being that the higher elasticity is due to the fact that high use is less related to medical necessity and more subject to non-medical need factors such as self-actualization. This also has been a theoretical basis for interpreting the correlation of use with education and income found in earlier studies. However, high use is found in low-income groups also. The Medicaid population in the NMCUES sample, for example, had an average of 12 visits for ambulatory mental health care, compared to 7 visits for the non-Medicaid population.

The findings relating to income elasticity represent an anomaly that deserves further exploration. The income elasticity for probability of use, while not significant, may be estimated to be .24 and positive.[9] The income elasticity for number of visits was negative and significant. A separate model (not shown) excluding the price variable was estimated on the assumption that these two variables were highly collinear. The income coefficient was still negative but not significant in this model. An additional model excluding the Medicaid population was estimated on the assumption that the higher average visits for this group were causing the negative income elasticity. The income elasticity remained high and negative (-0.92) in this model also.

It is possible that lower-income persons have more severe disorders requiring more visits and, in fact, the negative income elasticity does reflect this phenomenon. These data include all types of providers, most significantly office practices of psychologists in addition to psychiatrists. Other studies have generally focused on ambulatory visits to psychiatrists only. A model was estimated for psychiatrist visits only. The income elasticity was not significant, and not as large as for all mental health visits (-.57 versus -.98).

These anomalous findings, plus the interactions found here

between income, education, and insurance; the higher mental health use found for Medicaid populations; and the finding that a large proportion of high mental health service use occurs outside psychiatrists' office practices, in settings such as psychologists' office practices and organized practices such as outpatient clinics [20], indicates that more research is needed to understand these phenomena.

Further, it should be kept in mind that the regression model for mental health visits explained less variation (R^2 = .304) than the model for health visits (R^2 = .508). In addition, of the explained variation in both models, only a small proportion is due to the price variable, about 8 percent for health and 18 percent for mental health. These findings underscore Frank and McGuire's [1] caution that price is only one of many variables affecting ambulatory mental health use and that it is probably not the most important. They also would indicate that price is more important in ambulatory mental health use than in ambulatory health use.

The different elasticity found by income is important for public policy, as pointed out by McGuire [5]. High-income groups were not responsive to price in this study. The low- and middle-income groups in this study both exhibited a negative elasticity, however, an indication that the effect of cost-sharing will be more severe in these income groups.

Assuming need is equal across income groups, these elasticity findings would indicate that restricting benefits would differentially affect access to care. If one assumes that need is greater in low-income groups, as evidenced by the higher use in the Medicaid population, then benefit restrictions will limit use where need is highest.

Future research directions in studies of the demand for ambulatory mental health care might be on better modeling of the interactions which seem to be taking place and replication of studies in different population groups with larger sample sizes. The Watts and Scheffler [4] analysis in a highly insured population is an important replication. Similar analyses should be done in other income groups using, to the extent possible, exogenous price variables which were unavailable here.

Equally important would be to specify more refined categories of the types of ambulatory care, such as acute treatment, emergency care, and long-term therapy. Analysis by different diagnostic groups also would be essential to a more complete understanding of the demand for mental health care. Persons with chronic mental disorders, perhaps, will differ from persons with acute disorders, and there may be differential patterns among acute disorders.

Finally, the demand for mental health care is not on a visit-by-visit basis, but generally is for a treatment course of a number of visits negotiated between the therapist and the patient. Current statistical models need to be extended to explore this dimension.

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NOTES

1. Since these data are based on a complex multistage sample design, the identical equation was estimated using SURREGR [20]. In this program, weighted least-squares, in conjunction with the Taylor series expansion of the variance and covariance, is used to calculate the estimates of the *R*-square and the regression coefficients. This technique takes into account the sample design in the estimation of variances and covariances, which in complex sample designs are usually larger than estimates obtained by simple random sampling. The design effects of the regression coefficients, generated by SURREGR [20], were used to assess the significance of the regression coefficients generated by the logistic regression models, which assumed simple random sampling in estimating the standard errors of the regression coefficient [21].
2. The log transformation is as follows:

$$\log q = \log a + b \log p + c \log I + \alpha_i \chi_i$$

   The coefficient b for the log p is the price (average percent out of pocket) elasticity of visits, and the coefficient c for log I is the income elasticity of visits.
3. Comparisons are possible on the reported number of visits with the National Medicare Expenditure Survey (NMCES). This is the most comparable survey in terms of having a self-report situation in a household panel sample. Data on the NMCES provider follow-up are not used. The percentage of persons reporting a mental health visit are similar, 4.6 and 4.3 percent in NMCES and NMCUES, respectively. Almost 50 percent more visits per person with a visit were reported in NMCUES, however, an average of 8.2 versus 5.5 per person with a mental health visit. The distribution of these visits was comparable, with 67–70 percent reported to specialty mental health settings in both surveys, and 30 percent to general medical settings. Shapiro et al. [22] report that in an urban

household sample in three metropolitan areas in which more intensive interviewer probing occurred in regard to mental health visits, there was a rate of 6.0–7.1 percent of the adult population with one or more mental health visits. The comparable urban rate for NMCUES is 4.8 percent. The number of visits per person in the Shapiro study ranges from 6.7 to 10.1 in the three urban areas.

4. Persons with Medicaid coverage may have some out-of-pocket expenses. This analysis includes persons with Medicaid coverage who had out-of-pocket expenses during the year. Excluding these persons did not change any of the reported results.
5. The log transformation for the annual number of visits results in a reasonably normal error distribution.
6. Neither age nor age-squared alone is significant, and dropping all age variables from the model does not make a significant difference in the explained variation. For all dummy variables in the level of use equation, an overall test was made of the effect of including the variable in the model. These results are consistent with the results reported in the text with regard to each dummy variable.
7. When education was included in the model, either high school or college level, it was positively and significantly related to probability of use. Income remained insignificant.
8. Horgan's model included insurance variables. If an insurance variable is included here, then the income effect is small, negative, and significant.
9. The income elasticity has been estimated for the logistic models as $B \cdot (1 - p) \cdot X$ where p = percent of population with a mental health visit and X is the mean of family income. This formulation was suggested by Richard Frank.

REFERENCES

1. Frank, R. G., and T. G. McGuire. A review of studies of demand and utilization of specialty mental health services. *HSR: Health Services Research* 21(2, Part 2), 241–66, June 1986.
2. Horgan, C. M. The demand for ambulatory mental health services from specialty providers. *HSR: Health Services Research* 21(2, Part 2), 291–320, June 1986.
3. Wells, K. B., et al. *Cost Sharing and the Demand for Ambulatory Mental Health Services*. Santa Monica, CA: Rand Corporation, September 1982.
4. Watts, C. A., and R. M. Scheffler. Demand for outpatient mental health services in a heavily insured population: The case of Blue Cross/Blue Shield federal employees health benefits plan. *HSR: Health Services Research* 21(2, Part 2), 267–90, June 1986.
5. McGuire, T. G. *Financing Psychotherapy: Costs, Effects, and Public Policy*. Cambridge, MA: Ballinger Publishing Company, 1981.
6. Bonham, G. S. Procedures and Questionnaires of the National Medical Care Utilization and Expenditure Survey. *National Medical Care Utilization and Expenditure Survey*. Series A, Methodological Report No. 1. Department of Health and Human Services Publication No. (ADM)83-2001,

National Center for Health Statistics, Public Health Service. Washington, DC: U.S. Government Printing Office, March 1983.

7. Duan, N., et al. A comparison of alternative models for the demand for medical care. *Journal of Business and Economic Statistics* 12(1):44-60, April 1983.
8. Keeler, E., J. Newhouse, and C. Phelps. Deductibles and the demand for medical services: The theory of the consumer facing a variable price schedule under uncertainty. *Econometrica* 45(3):641-55, 1977.
9. Feuerberg, M. A., L. G. Kessler, and C. A. Taube. National Estimates of the Social and Demographic Characteristics and Medical Expenditures of the Population Who Report a Mental Health Condition in 1980. In *Priorities in Health Statistics*, Proceedings of the 19th National Meeting of the Public Health Conference on Records and Statistics. DHHS Publication No. (PHS)81-1214, National Center for Health Statistics, Hyattsville, MD, 1983, pp. 326-31.
10. Hoeper, E. W. Observations of the impact of psychiatric disorder upon primary medical care. In National Institute of Mental Health, Series DN, No. 2. *Mental Health Services in Primary Care Settings: Report of a Conference.* Department of Health and Human Services, Publication No. (ADM)83-995, Rockville, MD: Government Printing Office, 1983, pp. 88-96.
11. Shurman, R., P. D. Kramer, and J. B. Mitchell. The hidden mental health network. *Archives of General Psychiatry* 42(1):89-94, 1985.
12. Eastwood, M. R. *The Relation Between Physical and Mental Illness: The Physical Status of Psychiatric Patients at a Multiphasic Screening Survey.* Toronto: University of Toronto Press, 1975.
13. Newhouse, J., C. Phelps, and M. S. Marquis. On having your cake and eating it too—econometric problems in estimating the demand for health services. *Journal of Econometrics* 13(3):365-90, 1980.
14. Bachrach, L. L. Marital Status and Mental Disorders: An Analytical Review. National Institute of Mental Health, Department of Health, Education and Welfare Publication No. (ADM)75-217, Superintendent of Documents, U.S. Government Printing Office, Washington, DC, 1975.
15. Grizzle, J. E., C. F. Starmer, and G. G. Koch. Analysis of categorical data for linear models. *Biometrics* 25(3):489-504, 1969.
16. Forthofer, R. N., and R. G. Lehner. *Public Program Analysis: A New Approach to Categorical Data Analyses.* Belmont, CA: Learning Publications, 1981.
17. Frank, R. G. Pricing and Location of Physician Services in Mental Health. Unpublished Ph.D. Dissertation, Boston University, 1980.
18. Goldman, F., and M. Grossman. The demand for pediatric care: An hedonic approach. *Journal of Political Economy* 86(2):259-80, April 1978.
19. Phelps, C. The Effects of Insurance on Demand for Medical Care. In R. Anderson et al. *Equity in Health Services: Empirical Analyses in Social Policy.* Cambridge, MA: Ballinger Publishing Company, 1975.
20. Shah, B. V. SESUDAAN: Standard Errors Programs for Computing Standardized Rates from Sample Survey Data. Research Triangle Institute, Chapel Hill, NC, 1980.
21. Cohen, S. B. Present limitations in the availability of statistical software

for the analysis of complex survey data. *Review of Public Data Use* 11(4):338-44, 1983.

22. Shapiro, S., E. A. Skinner, and L. G. Kessler. Utilization of health and mental health services: Three epidemiological catchment area sites. *Archives of General Psychiatry* 41(10):971-78, 1984.