# THE EFFECT OF INCOME ON MEDICAL CARE SPENDING\*

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## I. Introduction

The percentage of income allocated to medical care by the private sector of the economy has risen substantially in the post World War II period. Private expenditures for personal health services amounted to 4.05 per cent of disposable income in 1948 and remained below 4.20 per cent through 1951 when they began a steady climb to 5.71 per cent in 1962. Stated more dramatically, medical care spending was over 6,000,000,000, or 40 per cent, higher in 1962 than it would have been if the 4.05 per cent rate had been maintained. 1/ What were the causes of this large increase, and what is the prognosis for medical care spending?

The historical trend of expenditure reflects the influence of a multitude of factors which cannot readily be separated and is, therefore, of limited value for analytic purposes. A more promising approach for studies of this type has been found in the use of cross-section analysis. By examining data for a cross-section of families in the same time period, it is possible to assess the effect of factors influencing their expenditure over a wide range of values and also hold approximately constant the state of technology and other conditions which change over time but cannot easily be quantified. The precision of the analysis is thereby increased and the complexities substantially reduced.

The number of factors affecting medical care expenditure is still large, however, and they are of widely differing types--some having to do with state of health and others with social and economic conditions. The techniques best suited to the assessment of the effects of these variables differ somewhat, further complicating the problem. We have, therefore, decided to concentrate our attention on only one of the factors affecting the level of spending-one which the analysis to follow will show is of considerable importance, but which has long been overlooked--namely, family income.

The primary purpose of this paper will be to determine empirically the average net effect of income on private expenditures for personal health care in the United States and to appraise the stability of this relationship over time. We will first consider evidence of the apparent (unadjusted) relationship between income and spending for personal health services derived from cross-section surveys of medical care spending and from more general surveys of consumer expenditure which contain data on medical care. Next, factors which may bias the observed income-expenditure relationships will be pointed out. Various means will be employed to adjust for the influence of these factors in order to determine the net, or independent, effect of income on medical care spending. Finally, a best numerical estimate of this effect will be decided upon and its implications discussed.

### II. Review of Survey Data

### A. Evidence from Medical Care Surveys

Three nation-wide studies have been conducted on the relationship of family medical care expenditures to demographic and socioeconomic characteristics. The first was a part of the research program of the Committee on the Costs of Medical Care and was based on a survey conducted from 1928 to 1931 which provided data for 8,758 white families. 2/ Information relating to the incidence, causes, and severity of illness, as well as the utilization and costs of medical care, was gathered and presented. This study remained the primary source of statistics on medical care costs until a report on the first of two Health Information Foundation surveys was published in 1956. 3/ These surveys, based on data from 1952-53 and 1957-58, were designed to be comparable, thus making it possible to relate statistics over the five-year span. 4/ Area-probability samples provided information on the experience of 2,809 and 2,941 families in the respective periods. Little data were collected on the incidence of illness, but in addition to information on cost and utilization, evidence was gathered on the use of voluntary health insurance, which by this time had become an important element in medical care financing. 5/

In the 1928 to 1931 survey, it was found that the absolute level of charges for medical care rose with family income (Table 1). However, the percentage of income spent for personal health services remained approximately constant, except that it was higher in the lowest income class. In the two Health Information Foundation studies, the level of charges was also found to increase with income in an absolute sense. The percentage of income allocated to medical care, however, decreased with increased income. 6/

<sup>\*</sup> A longer version of this paper, which contains a more complete theoretical discussion and additional empirical evidence, is available from the authors on request.

#### Table l

Income class	Charg (1)	Ex	Expenditures as a per cent of average income (2)		
		2-53 and 1957	7-58		
	1952-53	1957-58	1952-53	1957-58	
All income classes Under \$2,000 \$2,000 to \$3,499 \$3,500 to \$4,999 \$5,000 to \$7,499 \$7,500 and over	\$207 130 152 207 259 353	\$294 165 226 287 336 411	4.8 11.8 6.1 5.4 4.7 3.0	5.513.08.46.45.43.9	
		B. 192	8-31		
All income classes Under \$1,200 \$1,200 to \$2,000 \$2,000 to \$3,000 \$3,000 to \$5,000 \$5,000 to \$10,000 \$10,000 and over	\$108 49 67 95 138 249 503		4.0 5.2 4.0 3.9 3.8 4.1 3.8		

# Average Family Medical Care Charges and Expenditures in Relation to Family Income, 12-Month Periods, 1928-31, 1952-53 and 1957-58\*

Source: I. S. Falk, Margaret C. Klem, and Nathan Sinai, <u>op. cit.</u>, pp. 151 and 206; Odin W. Anderson, Patricia Collette, and Jacob J. Feldman, op. cit., pp. 17-18.

\*Charges represent bills incurred during the survey year which may or may not have been paid. Expenditures represent money spent during the survey year and may include amounts paid on bills incurred prior to the survey year and exclude unpaid bills incurred during the year.

### B. Evidence from Consumer Surveys

It would be interesting to know if the relationships determined by the medical care surveys were supported by other data. A number of surveys of consumer expenditure conducted by the U. S. Government may be used to verify our knowledge and extend it to other time periods. In many of these, the averages of both income and medical care spending are shown for families classified by income group. This permits us to use regression analysis to calculate measures of the over-all relationships.

Regression lines were fitted to data covering various time periods and types of families. Table 2 shows, for each crosssection, average family income (column 1), average medical care expenditures (column 2), and the amount by which medical care spending changed per \$1,000 of income--a measure of the slope of each regression line (column 3). In each case, higher family income was associated with increased average medical care spending; the amount of increase per \$1,000 of income ranged from \$27.5 in 1944 to \$44.8 in 1960. 7/

In discussing the three nation-wide medical care studies, it was noted that the average percentage of family income allocated to spending for personal health services remained nearly constant regardless of income in 1928-31, but declined as we moved up the income scale in 1952-53 and 1957-58. Another way of showing the relative relationship is to calculate the average percentage difference in expenditure for each one per cent difference in income. This number, known as the income elasticity of demand, is shown for each of the ten cross-section series in column 5 of Table 2. 8/ The figure for cross-section 1 (1960: families in metropolitan areas) indicates that the income elasticity of medical care spending was about 0.699. This means that a 10 per cent higher income, for example, would be associated with approximately 7 per cent higher medical care expenditures on the average. The fact that the elasticities are less than one indicates, as before, that families in higher income groups generally allocate a smaller percentage of their incomes to medical care. Here, also, there is evidence of variation in the income-expenditure relationship over time

#### Regression Coefficients of Medical Care Expenditures with Respect to Family Income, and Related Information, 10 Cross-Section Series

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Cross Section Number	Year and Type of Family <sup>a</sup>	Average Income <sup>b</sup> (1)	Average Medical Care Expenditures <sup>b</sup> (2)	Regression Coefficient (average difference in expenditures per \$1,000 difference in income) <sup>C</sup> (3)	Coefficient of determination (arithmetic) <sup>d</sup> (4)	Income c Elasticity (5)	Coefficient of Determination (logarithmic) <sup>d</sup> (6)	Obser- vations used and Excluded <sup>e</sup> (7)	Source of Data <sup>f</sup> (8)
1	1960-61: families in cities	\$5,90 <b>6</b>	\$355	\$43.5 (1.8)	0.99	0.683 (0.027)	0.99	1-8-1	g
2	1950: families of two or more persons in cities	4,224	215	37.5 (1.3)	0.99	0.706 (0.023)	0. <b>99</b>	1-7-1	G 355 G 367
3	1950: families of city and clerical workers of two or more persons	3,923	200	36.9 (2.3)	0,98	0.735 (0.032)	0.99	1-6-2	G 246 G 258
4	1944: families of two or more persons in cities	3,411	148	27.5 (1.7)	0.98	0.500 (0.072)	0.89	1-8-0	G 375 G 385
5	1941: families of two or more persons in cities	2,672	107	37.8 (3.2)	0.96	0.952 (0.092)	0.96	1-7-1	G 393 G 404
6	1941: farm-operator families of two or more persons	1,163	62	39.7 (2.7)	0.98	0.496 (0.075)	0.90	0-7-1	G 447 G 458
7	1935-36: families of two or more persons in cities	1,971	89	40.9 (0.6)	0.99	0.9 <b>57</b> (0.018)	0.99	1-10-1	G 411 G 421
8	1934-36: families of employed city wage and clerical workers of two or more persons	1,518	59	36.2 (1.8)	0.99	0.915 (0.036)	0.99	1-7-2	G 266 G 277
9	1935-36: farm-operator families	1,237	50	30.7 (1.8)	0.98	0.730 (0.034)	0.99	0-9-3	G 466 G 476
10	1917-19: families of city wage and clerical workers with at least one child	1,505	64	34.2 (3.1)	0.98	0.854 (0.065)	0.98	1-5-1	G 285 G 297

<sup>a</sup>The characteristics used as criteria of eligibility for including families in the samples from which the income and expenditure data were obtained varied from survey to survey in some respects not disclosed in the brief descriptions presented here. In addition, there were differences between surveys as to the definition of income and also, no doubt, as to what was classified as medical care expenditure. The effect of this diversity on the income and expenditure figures for cross sections with similar descriptions is probably quite limited. However, the income figures for cross sections l through 4 and 10 refer to income after taxes while those for the other cross sections refer to income before taxes, but the effect of this difference is lessened by the fact that individual income taxes were a relatively small proportion of family income in the years for which pre-tax income is given. For a more precise description of the data (except that used to construct cross section 1), see the notes covering the series numbers shown in column 8 of this table in U. S. Bureau of the Census, <u>op. cit.</u>, pp. 169-74 and the sources to which reference is made therein. A description of the information used to construct cross section 1 is given in note <u>g</u> to this table.

<sup>b</sup>The averages of income and medical care spending shown are based on the entire cross sections of families before some of the observations representing families at the high and low ends of the distribution were excluded in fitting the regression lines, as explained in note e to this table.

<sup>C</sup>The figures in parentheses under the regression coefficients shown here and throughout this paper are the standard errors of these coefficients.

<sup>d</sup>The values of the coefficients of determination shown here and elsewhere in this paper are not adjusted for sample size. The coefficients of determination in column 6, which refer to the regressions used in finding the income elasticities in column 5, measure the strengths of the linear relationships of the logarithms of the original variables.

<sup>e</sup>The three numbers for each cross section refer, respectively, to the number of observations at the lower end of the income distribution excluded from fitting the regression line, the number used in fitting the line, and the number of observations at the upper end of the distribution which were excluded. Observations were not included if they represented less than five per cent of the total sample size counting from the lower end of the income distribution or less than five per cent of the total counting from the upper end. Observations representing families with very high and very low incomes were excluded in order to make the regression coefficients more comparable. This was necessary because some surveys used income classes which resulted in separate observations for those at the extreme ends of the income distributions while others did not. The inclusion of observations representing extreme incomes would have substantially altered the slopes of some of the regression lines (thus changing the regression coefficients) while others would have remained nearly unaffected.

<sup>f</sup>The series numbers shown in this column for regressions 2 through 10 refer to those in the tables of U. S. Bureau of the Census, <u>op. cit.</u>, pp. 179-80 and 182-84.

<sup>g</sup>Cross section 1 is based on data in U. S. Bureau of Labor Statistics, "Consumer Expenditures and Income, Urban United States, 1960-61," Report No. 237-38 (1964), p. 10.

and between different types of families in the same time period. The income elasticities of farm family expenditures in 1935-36 and 1941 are lower than the corresponding elasticities for city families in the same years. Also, the elasticity of expenditures of city families in 1944, a war year, is unusually low.

## III. The Effect of Factors Other Than Income

### A. Theoretical Analysis

Throughout this discussion, we have avoided making statements to the effect that measured differences in expenditure were caused solely by differences in family income. This is not the case because families at different income levels are also heterogeneous in other respects. Families with relatively large or small incomes may show great variations with respect to size, age composition, and other factors which have an important bearing on the level of expenditures for personal health services. To the extent that these factors are correlated with income, their effects will be included in the measured income-expenditure relationship. For example, if medical care spending increases with family size, other things being equal, and larger families have higher incomes on the average, then the effect of size will tend to bias the measured income elasticities upward. Other variables which affect medical care spending and are correlated with income will have similar effects. It is thus not possible to say that because there was a seven per cent difference in medical care expenditures among families with incomes differing by ten per cent (as in the previous example), increasing all incomes by ten per cent would increase medical care spending by seven per cent. In order to assess the independent effect of income, the income-related factors which influence expenditure must be taken into account and their effects held constant.

The variables which have an effect on a family's level of medical care spending may be divided, for purposes of analysis, into three main categories: (1) Socio-demographic variables which reflect factors such as physiological condition, considerations which influence the perception of health status, and attitude toward medical care, (2) resources available for spending in terms of income and wealth, and (3) the price of medical care as modified by eligibility for "free" care, tax deductibility, and insurance coverage. The first of these factors may be thought of roughly as a family's "desire" for medical care and is dependent primarily upon the perception of a health deficiency and a belief in the efficacy of medical treatment. In translating this desire to expenditure, the family is limited by the extent of its financial resources as care cannot generally be obtained free of charge. That is, the determination of the amount to be spent for personal health services becomes a part of the problem of allocating scarce financial resources among alternative means of want satisfaction.

We discuss next the socio-demographic and price variables with regard to their effect on the income-expenditure relationship. Later, the adequacy of the income measure itself will be considered.

1. Socio-Demographic Variables: We are interested not in predicting the expenditures of individual families but in predicting the average expenditures of families at different income levels. That is, the incidence of disease and other conditions which affect the level of spending for personal health services may be thought of as partially random and partially dependent on factors correlated with income, such as age, sex, marital status, and family size. It is the effects of these latter variables which may bias the observed incomeexpenditure relationships and in which we are, therefore, interested. Thus, those sociodemographic characteristics which are indicators of physiological condition, perception of illness, and attitude toward medical care will be considered.

The greater prevalence of chronic and degenerative diseases among older people lends support to the belief that, other things being equal, medical care expenditures may be expected to increase with age. In considering the difference in average expenditure between men and women, both marital status and age must be taken into account. Of course, there is not necessarily a direct correspondence between physiological condition and the desire for medical care. The need for care may not be perceived or, alternatively, a non-existent or imaginary "need" may be perceived. Also, a recognized health deficiency may not be translated directly into expenditure because of variations in disposition toward risk-taking and differences in belief in the effectiveness of medical treatment. Variables we might expect to explain these factors include family size, education and geographic area of residence.

We have now related medical care spending to various demographic and social characteristics, using age, sex, and marital status as proxy variables to represent physiological condition; education and family size as measures of perception, attitude, and their effect on health status; and the family size variable also to adjust the income variable.

2. Price: There are a number of pricerelated factors which may affect our estimate of the income-expenditure relationship and which should be distinguished in order to determine the possible direction and magnitude of the bias they may cause. Four important determinants of price differentials among income groups may be noted.

(a) Differences in prices charged, according to ability to pay, especially by physicians and other practitioners: There is evidence that charges for medical care, especially by physicians, are based to some extent on ability to pay. The so-called slidingscale practice has ostensibly developed in order to shift the cost of providing free or low cost service for indigent patients to those at higher income levels. 9/ Statistical evidence of the effect of this practice on prices paid by those at different income levels is lacking, no doubt because of the extreme difficulty of separating differences in price from variations in the amount of service and amenity received. 10/ If those in higher income groups pay higher prices for the same service and if higher prices result in greater expenditures, then estimates of income elasticity based on expenditure data will be biased upward to some extent.

(b) "Free" care and subsidies made available to those in low income groups by government and charitable organizations: Third party payments for or provision of care may serve to either increase or decrease family expenditures. If medical care is provided directly, the quantity utilized will be greater but family spending will be lower because the cost of care provided is not included in family data. On the other hand, if subsidies are paid to the family, both the quantity utilized and reported level of spending may be higher. Government welfare aid in the medical care field is generally made directly to the providers of care and benefit primarily those with low incomes. They would thus tend to raise the income elasticity from what it would otherwise be.

(c) Another factor which may alter the income-expenditure relationship is the partial tax deductibility of medical care spending. Deductions are more likely to be taken by those in low income groups because they spend a larger proportion of their reported incomes on medical care, but the value of the deduction is likely to be higher to those in the upper income categories because they pay higher marginal tax rates. In balance, it would be difficult to determine the net effect of tax considerations on the income distribution of medical care spending.

(d) The effect of health insurance enrollment: One of the possible effects of health insurance is that it may cause total medical care expenditures to differ among persons with and without coverage. This is because to those persons having insurance the price of the covered service is, in effect, lowered. To the extent that enrollment in insurance plans and the degree of coverage is correlated with income, this would tend to raise the income elasticity.

Possibly more important in its effect on the income-expenditure relationship, however, is that among those enrolled in group plans, the expenditures of individual families will tend to be equalized. This is the case because the coverage and cost to individual families under such plans is relatively uniform. Another factor, which should be taken into account in empirical analysis, is the fact that employer and other third-party contributions to health insurance premiums are not normally included in family expenditure data.

From our brief discussion on the effects of price-related factors, it is apparent that price differences related to income and welfare aid tend to raise the measured income elasticity. The over-all effects of the tax deductibility of medical care spending and health insurance enrollment are not clear. However, all sources of payment of insurance premiums should be included in estimating the income-expenditure relationship.

IV. The Adequacy of the Income Measure

#### A. Permanent-Income Theory of Consumption

The nature of the income variable must be understood if the multiple regression technique is to be applied meaningfully. A family's income in any given year may be abnormally low or high because of temporary loss of employment, windfall gains, and other similar causes. Empirical evidence suggests that total consumption (that is, the use of products and services) is not generally raised or lowered to correspond with temporary changes in income. Rather, a family's level of consumption is determined primarily by its expected normal, or "permanent" income. 11/ It is very likely that nearly all categories of consumption, as well as the total, exhibit this unresponsiveness to temporary income fluctuations.

In the general case, transitory income is hypothesized to have little or no effect on expenditure levels. 12/ Thus, if all income differences were transitory, a regression of

spending on income would have nearly zero elasticity. If, on the other hand, incomes differed but contained no transitory components, the regression line would approximate the effect of normal income. Empirical observations of incomes of individual families are composed of mixtures of normal and transitory components. Regression lines fitted to them will therefore lie somewhere between these two extremes. 13/

The relationships described in Table 1 and by the regression equations in Table 2 are those between medical care expenditures and total income, which includes both permanent and transitory components. A more useful estimate would be that between expenditures and normal (permanent) income alone. This is the case because we are most interested in the relationship between average income and average expenditure and, in the averages, differences in transitory income peculiar to individual families will cancel out. Since transitory income is included in the income variable but presumably has little effect on the level of expenditure, the indicated relationships presented in the earlier analyses provide a biased estimate of the effect of normal income on medical care spending.

Another income-related consideration which should be taken into account is the fact that physiological condition may affect both expenditure and income. Illness may result in higher medical care spending and, at the same time, reduce family income by causing the disability of a wage earner. This may occur in either the permanent or transitory sense. In both cases, the result will be to lower the measured effect of income on medical care spending. To the extent that physiological condition does not depend upon income, it should be held constant among income groups in calculating the incomeexpenditure relationship. Estimates based on family survey data are thus also biased downward by this factor.

### B. Empirical Study

It is obvious by now that a fairly large number of factors may bias the measured income-expenditure relationships, and although the direction of influence of some of these has been hypothesized, quantitative measures cannot be obtained from a priori reasoning. One major problem which must be handled in some way is that of transitory income. As mentioned earlier, differences in transitory income peculiar to individual families will tend to cancel out in group averages (provided the averages are not correlated with transitory income). Therefore, a regression of average incomes and average medical care expenditures of families grouped by city should provide a useful approximation of the effect of normal income on medical care spending. In addition, extreme values of various other factors which differ among families, such as age distribution, size and insurance coverage, will tend to be averaged out. Multiple regression analysis may then be

utilized to hold approximately constant and estimate the effects of differences in the city averages of many of these other factors for which data are available.

1. 1950 Cross-Section of City Averages: The results of regressions of average income. medical care expenditure and other variables in the form of city averages for 1950 are presented in linear form and as elasticities in Table 3. These estimates demonstrate that the effect of using cross-sections of city averages to approximate normal income is to raise the estimated effect of income considerably from the results based on family data described earlier in Table 2. 14/ The regression presented in Table 3, equation 4, indicates that the elasticity of medical care spending with respect to income was approximately 1.065 as opposed to 0.706 for the unadjusted cross-section of families in 1950. 15/

Among the 1950 city average estimates, income, family size and the two insurance variables had effects which may be considered statistically significant. It is interesting to note that the effect of increased family size was a decrease in medical care spending. The other variables were not statistically significant, possibly because there was little spread in their values relative to the unexplained variation in spending.

The insurance variables indicate medical care expenditures of families increased with insurance expenditures and decreased with insurance enrollment. One would expect medical care spending to increase with expenditures for insurance if for no other reason that these are included in the medical care total. The decrease in medical care expenditures with increased insurance enrollment (equation 2 of Table 3) is not surprising in view of the fact that third parties, particularly employers, pay a large proportion of the cost of insurance and such payments are not included in M.

2. 1960 Cross-Section of City Averages: The regressions based on 1960 city averages (summarized in Table 4) yielded considerably lower coefficients than those derived from the 1950 data. The effect of  $\underline{Y}$  on  $\underline{M}$  in 1960 was about \$27.9 per \$1,000, or, in terms of elasticity, 0.433. A number of possible explanations for this difference may be suggested: (a) There may have been a substantial transitory component in the city averages of income in 1960 due to the recession in that year, (b) higher insurance enrollment, especially in group plans, may have produced a downward shift, (c) the elasticities were calculated over a higher range of real incomes where they may have been lower, and (d) changes in the nature of the medical care "product" or of other goods and services competing for consumer expenditure may have produced a real shift in the elasticity.

Relationship of Medical Care and Health Insurance Expenditures to Income and Other Characteristics, 91 City Averages, Expenditure Survey, 1950\*

Equation Number	Y	S	A	E	N	I	%1	R <sup>2</sup>
	Α.	Medical	Care Expend	ditures:	Arithmetic	Estimates		
1.	52.8 (5.4)							0.52
2.	54.0 (6.8)	-21.5 (12.0)	0.2 (1.4)	-2.4 (4.7)	3.2 (34.7)	1.2 (0.5)	-1.0 (0.4)	0.59
	в.	Medical	Care Expend	ditures:	Elasticity	Estimates		
3.	1.059 (0.110)							0.51
4.	1.065 (0.135)	-0.349 (0.200)	0.094 (0.342)	-0.180 (0.255)	-0.012 (0.147)	0.251 (0.079)	-0.291 (0.112)	0.60
	с.	Health I	nsurance Ex	penditure	es: Arithmo	etic Estim	ates	
5.	6.8 (1.9)							0.12
6.	3.8 (2.4)	1.8 (4.3)	-0.6 (0.5)	0.8 (1.7)	16.5 (11.2)			0.19
	D.	Health In	nsurance Ex	penditure	es: Elastic	city Estima	ates	
7.	0.901 (0.229)							0.15
8.	0.484 (0.286)	-0.105 (0.429)	-0.949 (0.721)	0.273 (0.550)	0.538 (0.281)			0.23
Mean	3.77	3.03	46.5	10.3	0.85	33.4	61.5	
Standard Deviation	0.54	0.29	2.6	0.8	0.12	10.6	14.0	

Source: Study of Consumer Expenditures, Incomes and Savings, Statistical Tables, Urban, U. S.--1950 (tabulated by the Bureau of Labor Statistics for the Wharton School of Finance and Commerce, Philadelphia: University of Pennsylvania, 1956-57), Vol. VIII, Summary of Family Expenditures for Medical Care and Personal Care, pp. 2-3.

\* Brief descriptions of the measures used in these analyses are given below. More complete information is available in the Study of Consumer Expenditures volumes.

#### Definition

- Y Annual net money income, in thousands of dollars, after deduction of personal taxes and occupational expenses.
- S Family size, measured by the number of equivalent full-year members.
- A Age of the head of the family in years.
- E Education of the head of the family as measured by the number of years of schooling completed.

- N Number of family members who were gainfully employed 48 weeks or more in 1950.
- I Family expenditures for medical care group plans and insurance in dollars.
- %I Per cent of families in each city reporting expenditures for health insurance. (Note that this measure will not reflect enrollment under which the entire premium is paid by third parties.)
- M Medical care expenditures, including expenditures for health insurance, in dollars.
- $R^2$  Coefficient of determination.

Relationship of Medical Care and Health Insurance Expenditures to Income and Other Characteristics, 39 City Averages, Expenditure Survey, 1960\*

Equation Number	Y	S	A	Е	N	I	%1	R <sup>2</sup>
	Α.	Medical C	are Expend	itures:	Arithmetic 3	Estimates		
1.	34.0 (6.8)							0.40
2.	27.9 (10.6)	39.9 (45.2)	-1.8 (3.5)	0.6 (11.6)	-74.2 (92.2)	0.2 (0.7)	1.2 (1.2)	0.47
	в.	Medical	Care Expen	ditures:	Elasticity	Estimates		
3.	0.567 (0.116)							0.39
4.	0.433 (0.182)	0.523 (0.416)	-0.164 (0.469)	0.083 (0.314)	-0.201 (0.242)	0.034 (0.179)	0.304 (0.258)	0.48
	с.	Health In	surance Ex	penditure	s: Arithme	tic Estima	tes	
5.	4.9 (2.4)							0.10
6.	1.0 (3.3)	36.8 (12.2)	1.3 (1.1)	9.2 (3.3)	-59.9 (26.9)			0.35
	D.	Health In	surance Ex	penditure	s: Elastic	ity Estima	tes	
7.	0.336 (0.149)							0.12
8.	-0.005 (0.209)	1.081 (0.436)	0.280 (0.549)	0.809 (0.340)	-0.617 (0.263)			0.32
Mean	5.58	3.14	47.3	10.2	0.84	86.6	74.8	
Standard Deviation	0.93	0.27	2.8	1.3	0.10	14.6	8.0	

Source: U. S. Bureau of Labor Statistics, Survey of Consumer Expenditures, 1960-61, <u>Report Numbers 237-1 through 237-27.</u>

\*The definitions of variables used in these analyses are very similar to those in Table 3.

The possibility that there was a greater degree of transitory income in the 1960 city averages may be tested by aggregating the data into larger groups. The results of regressions calculated after combining the 39 cities into 8 urban areas are shown in Table 5. Upperbracket estimates, derived from regressions of income on expenditure, are also presented. These estimates, which indicate a substantially larger income effect, suggest that there may have been a large transitory component of income in the 1960 city averages. 16/

Another factor which must be taken into account in the empirical analysis is the fact that employer and other third-party contributions to health insurance premiums are not normally included in family expenditure data. Although spending for group plans is probably fairly independent of the incomes of individual families within a given plant or company, it appears likely that the average income of the group as a whole exhibits a strong influence on third-party expenditures for health insurance. Not only may the direct effect of income be at work, but there are tax considerations which provide an incentive for increased employer contributions at higher average income levels. Contributions of employers toward the payment of health insurance premiums do not constitute

taxable income to the recipients. Thus, the higher the average income tax bracket, the larger the potential tax saving and the greater the incentive to have payments made by the employer. 17/ These employer contributions act as substitutes, to some extent, for family payments. Any estimate of the over-all income elasticity of medical care spending will, therefore, be biased downward if third-party payments of health insurance premiums are not included. We would expect the bias to be greater in 1960 than in 1950 because the percentage of private medical care expenditures accounted for by insurance rose from 12.8 to 29.7 per cent over this period. 18/

Regressions were calculated which related total health insurance premiums to per capita income for a cross-section of 48 states in 1960. The results of these regressions are presented in Table 6. <u>19</u>/ The average increase in total expenditures for health insurance premiums per \$1,000 increase in income was about \$25.0. In terms of elasticity, the effect of income on total premium payments was approximately 0.981. 20/

In calculating the over-all income elasticity of medical care spending in 1960, it is necessary to consider the portion of

Equation Number		2	Ĩ	R <sup>2</sup>
	Α.	Medical Care Arithmetic	Expenditures Estimate	:
1.		42. (11.	.8 .6)	0.69
	В.	Medical Care Upper-Brack	Expenditures set Arithmetic	: c Estimate
2.		61.	.6	0.69
	с.	Medical Care Elasticity	Expenditures Estimate	:
3.		0 (0	.676 .173)	0.72
	D.	Medical Care Upper-Brack	Expenditures ket Elasticit	: y Estimate
4.		0	.942	0.72
Mean		5.	.55	
Standard	Deviation	0	.79	

Relationship of Medical Care Expenditures to Income 8 Urban Areas, Expenditure Survey, 1960\*

Table 5

\*These regressions were calculated by combining the data for the 39 cities of Table 4 into groups of both large and small cities in the Northeast, North Central, South, and West regions as defined by the Bureau of the Census.

Equation Number		Per Capita Personal Income		ree of anization	R <sup>2</sup>
	A. He	alth Insurance	Premiums:	Arithmetic	Estimates
1.		26.0 (3.4)			0.55
2.		25.0 (4.9)	0.07 (0.23)		0.55
	В. Не	alth Insurance	Premiums:	Elasticity	Estimates
3.		0.896 (0.119)			0.55
4.		0.981 (0.179)	-0.098 (0.154)		0.56
Mean		2.06	37.3		
Standard De	viation	0.42	9.0		

# Relationship of Health Insurance Premiums to Per Capita Income and Degree of Urbanization, 48 States, 1960

Source: U. S. Bureau of the Census, <u>Statistical Abstract of the</u> <u>United States, 1963</u> (84th ed. Washington: U. S. Government Printing Office, 1963), pp. 10, 20 and 329, and Health Insurance Institute, <u>Source Book of Health Insurance</u> <u>Data, 1962</u> (New York: Health Insurance Institute, 1962), <u>pp. 42-43.</u>

health insurance premiums paid by third parties. When these contributions were included, the 1960 estimate was increased to about 0.883. 21/

#### V. Conclusion

## A. Estimate of the Income-Expenditure Relationship

We began this analysis by noting the relationships which have been determined between medical care spending and income from unadjusted cross-section data. In 1950 these indicated an elasticity of about 0.7. 22/ Allowance for the transitory component of income raised the elasticity measure considerably, to over 1.0 in 1950. The elasticity estimates derived from the 1960 city-average cross-sections, however, dropped to about one-half their 1950 levels while the elasticity derived from the cross-section of families classified by income remained nearly constant at 0.7. Evidence suggests that this discrepancy may be explained largely by transitory income in the 1960 city averages and the growth of health insurance enrollment. When these factors were allowed for, the estimated elasticity for 1960 increased to approximately 0.883. Considering that the elasticity measures were all based on lowerbracket estimates, it is our belief that the adjusted income elasticity in 1960 was probably near 1.0. 23/

### FOOTNOTES

1/ Data on private consumer medical care expenditures in relation to national disposable personal income may be found in Louis S. Reed and Dorothy P. Rice, "Private Consumer Expenditures for Medical Care and Voluntary Health Insurance, 1948-62," Social Security Bulletin, Vol. 26, No. 12 (December, 1963), p. 7.

The change in private medical care spending was accompanied by a nearly proportionate increase in government provision for medical services. Public expenditures for personal health care amounted to 20.1 per cent of the total in the 1949-1950 fiscal year and 21.2 per cent in 1961-1962. See Ida C. Merriam, "Social Welfare Expenditures, 1962-63," <u>Social Security Bulletin</u>, Vol. 26, No. 11 (November, 1963), p. 10.

- 2/ I. S. Falk, Margaret C. Klem, and Nathan Sinai, The Incidence of Illness and the Receipt and Costs of Medical Care Among Representative Families: Experiences in Twelve Consecutive Months During 1928-31. (Publication of the Committee on the Costs of Medical Care, No. 26, Chicago: University of Chicago Press, 1933.)
- 3/ Odin W. Anderson and Jacob J. Feldman, Family Medical Costs and Voluntary Health Insurance: A Nation-Wide Survey (New York: McGraw-Hill, 1956).
- <u>4</u>/ Odin W. Anderson, Patricia Collette, and Jacob J. Feldman, <u>Changes in Family Medical</u> <u>Care Expenditures and Voluntary Health</u> <u>Insurance: A Five-Year Resurvey (Cambridge,</u> <u>Mass.: Harvard University Press, 1963).</u>
- 5/ Data from another study of medical care spending in relation to family income are contained in U. S. National Center for Health Statistics, Medical Care, Health Status, and Family Income, United States (Public Health Service Publication No. 1000, Series 10, No. 9. Washington: U. S. Government Printing Office, 1964). In this report, however, expenditures are presented on a per-person rather than a per-family basis.

In addition to the national surveys, there have been numerous local and specialized studies of health care expenditures and the utilization of medical services. References may be found in footnote three of Odin W. Anderson and Jacob J. Feldman, <u>op. cit.</u>, pp. 1-2, and footnote six of Odin W. Anderson, Patricia Collette, and Jacob J. Feldman, op. cit., p. 3.

6/ In each of the three studies, charges were also related to other characteristics of families and their members, such as age, family size, and area of residence.

- 7/ Cross-sections in addition to the ten presented here may be found in Helen Hollingsworth, Margaret C. Klem, and Anna Mae Baney, Medical Care and Costs in Relation to Family Income: A Statistical Source Book (U. S. Social Security Administration, Bureau of Research and Statistics, Memorandum No. 51, 2nd ed. Washington: U. S. Government Printing Office, 1947); U. S. Bureau of the Census, Historical Statistics of the United States: Colonial Times to 1957 (with the cooperation of the Social Science Research Council. Washington: U. S. Government Printing Office, 1960); Life Study of Consumer Expenditures: A Background for Marketing Decisions, Vol. 1 (conducted for Life by Alfred Politz Research, Inc. New York: Time, Inc., 1957); and George Katona, Charles A. Lininger, and Richard F. Kosobud, 1962 Survey of Consumer Finances (The University of Michigan, Institute for Social Research, Survey Research Center, Monograph No. 32. Ann Arbor, Michigan: The University of Michigan, 1963). These cross-sections were not used because they relate to nearly the same population as those discussed or to specialized areas, or because averages were not provided for both income and medical care spending.
- 8/ The income elasticities were calculated by transforming the income and expenditure data to logarithmic form and fitting a regression line to the logarithms, the elasticity being the coefficient of the slope of this line. This regression model differs from the one used previously in that it assumes a constant percentage change in medical care spending per per cent change in income rather than a constant dollar change in expenditure per dollar change in income.

For reasons to be discussed below, the calculated elasticities are not necessarily the "true," or structural, elasticities of demand because they do not measure the effect of income on medical care spending exclusive of the other factors affecting the level of expenditure.

- 9/ For a contrary view, see Reuben Kessel, "Price Discrimination in Medicine," Journal of Law and Economics, I (October, 1958), 20-53.
- 10/ It is difficult to think of medical care as being a service of homogeneous quality. Therefore, even with similar "quantities" of service, a person with a relatively high income paying a higher price may be receiving a somewhat different product. Because of this element of "trading-up," income elasticities calculated from expenditure data will result in higher estimates than elasticities based on quantities as they are usually measured, e.g., dental visits.

11/ The distinction between permanent and transitory components of income and their relationship to consumption is set out in Friedman's permanent-income theory of consumption. See Milton Friedman, <u>A Theory of</u> the Consumption Function (Princeton, N. J.:

Princeton University Press, 1957).

- 12/ Transitory income may have an important effect on expenditures involving investment, such as the purchase of durable goods, even though the consumption of services provided by these items is not significantly affected by temporary income variations. This phenomenon would apply to medical care to the extent that it may be considered as an investment and that the timing of expenditures is discretionary.
- 13/ Random errors in the amount of income reported will bias the income-expenditure regression in the same direction as differences in transitory income because they affect the level of income reported but not the level of expenditure.
- 14/ It is possible that the increase in the estimated effect of income could have resulted from the averaging of other factors affecting medical care expenditure. However, a multiple regression analysis based on family data using the same variables as those in Table 3 resulted in a lower income elasticity estimate than one based on family income alone.
- 15/ Those who find difficulty in believing that failure to take the transitory component of income into account can lead to such a large downward bias in the measured incomeexpenditure relationship should consult Margaret G. Reid, Housing and Income, (Chicago: University of Chicago Press, 1962). The thorough and painstaking analysis in this monograph reveals that the elasticity of housing expenditure with respect to normal income is in the range of 1.5 to 2.0, whereas other cross-section estimates, based on reported income, had placed it below 0.5. Most of the techniques of analysis applied to medical care here were suggested by Miss Reid's work on housing. Those interested in the application of the concept of permanent income to consumer demand studies will find worthwhile reading in Chapter 2 of Housing and Income, in which the theory is set forth and methods of deriving estimates are summarized.
- 16/ Urban area estimates were also calculated for 1950 by combining the city average data but did not raise the estimated effect of income.
- 17/ In considering the relation of third-party payments to health insurance plans, we have been aided considerably by discussion with Robert G. Rice of the University of Chicago, who is carrying out an extensive study of

factors affecting employer expenditures for private wage supplements.

- 18/ See Table 2 of Louis S. Reed and Dorothy P. Rice, <u>op. cit.</u>, p. 4.
- 19/ Degree of urbanization was included as a variable because it was thought that there was a greater likelihood of enrollment in group plans in the more highly urbanized and industrialized states. The fact that imputed income from farm products is not reflected in the income variable may have been a factor in lowering the measured effect of urbanization. This is the case because the level of insurance premiums predicted from income alone would be too low in the less urbanized states due to the understatement of income.
- 20/ Robert Rice has estimated that roughly onehalf of total health insurance premiums are paid by third parties. Thus, the fact that the elasticity of family health insurance expenditures in 1960 was nearly zero (Table 4, equation 8) implies that the income elasticity of third-party payments must be much greater than 1.0.
- $\underline{21}/$  Using the standard formula for point elasticity:

$$\mathbf{M} = \frac{\mathrm{dM}_1 + \mathrm{dM}_2}{\mathrm{dY}_1} \cdot \frac{\mathrm{Y} + \mathrm{M}_2}{\mathrm{M}_1 + \mathrm{M}_2} =$$
$$= \frac{\$42.8 + \$24.0}{\$1,000} \cdot \frac{\$5,550 + \$86.6}{\$335.8 + \$86.6}$$

= 0.883

where  $M_1$  = average family medical care expenditures = 335.8, M<sub>2</sub> = average thirdparty payment of health insurance premiums (per family) = \$86.6, Y = average family income (Table 5) =  $$5,550, dM_1 = regression$ coefficient of family medical care expenditures (Table 5, equation 1) = 42.8, dM<sub>2</sub> = estimated regression coefficient of thirdparty payment of health insurance premiums (Table 6, equation 2, minus the value in Table 4, equation 6) = \$24.0, dY = income unit used in calculating regression estimates = \$1,000. Average third-party payments of health insurance premiums were assumed equal to family expenditures for health insurance. Although the data upon which this estimate of the elasticity was based were obtained from different sources, it is believed that the derived estimate is a reasonable approximation.

22/ The real elasticity of medical care spending may have been more stable than the other cross-section estimates in Table 2 appear to indicate. Much of the variation in measured elasticity may be accounted for by differences in the degree of transitory income or by variations in survey eligibility requirements. For a discussion of these considerations, see Milton Friedman, <u>op. cit</u>., Chapter 4, pp. 38-114.

23/ The estimate of income elasticity derived in this paper is higher than that found in two previous studies: Grover Wirick and Robin Barlow, "The Economic and Social Determinants of the Demand for Health Services," in The Economics of Health and <u>Medical Care</u> (Ann Arbor, Michigan: The University of Michigan, 1964), pp. 95-127, and Paul J. Feldstein, "The Demand for Medical Care," in <u>Report of the Commission</u> on the Cost of Medical Care, Vol. I, <u>General Report (Chicago: American Medical</u> Association, 1964), pp. 57-76. It is possible that these differing estimates may be reconciled, however. In the former study, for example, data relating to individuals were used. In the latter study, employer contributions to health insurance were not added to the family data.