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Variations in use of medical services have been documented across nations and states and between populations living in neighboring communities. Among neighboring medical service areas, the differences are often more extensive than among larger, politically defined areas. Lembcke's finding of variations among neighboring medical care systems[1] have been reported in Hanover, West Germany;[2] in Saskatchewan;[3] in Kansas;[4] Vermont;[5,6] and Maine.[7,8] Among Hospital Service Areas in Vermont and Maine, rates for medical admissions, diagnostic procedures, expenditures for hospitals and reimbursements under the Medicare Part B program are as varied as for surgical procedures.[5,8,9]

Published evidence suggests that variations in the amount, type and cost of medical care relate to the characteristics of the suppliers of medical care (the physicians and hospitals)[4,5] and the pattern of use of specific procedures suggest differences in physician decisions in defining need and belief in technology contribute to variations.[3,7,10,11,12] The assertion that supply factors bear the major responsibility for variations in utilization among neighboring areas rests on the assumption that the populations are (more or less) similar in health needs or behavior in purchasing care. However, with the exception of the rate of having health insurance, which was controlled for in the Kansas study, no direct evidence has been published to show that the distribution of individual determinants of demand for health care are, in fact, similar.

It should be noted that it is critical to directly evaluate the contribution of consumer characteristics to small area differences in rates of expenditure and utilization. In the face of mounting evidence that health care facilities and personnel determine per capita variations in costs and utilization among neighboring health care markets, the dominant strategies for affecting health care use continue to be aimed at the patient's own decision — increasing his ability to pay for health care, or building in deductibles to discourage individuals from unnecessary use of physicians or hospitals. The efficacy of such approaches rests on the assumption that patients in the aggregate control, or at least significantly affect,

consumption rates in the local market in which they participate.

There are a number of factors that influence the medical care that individuals receive: their income, their education, their age, their morbidity, whether or not they have health insurance, their access to physicians. This paper addresses the question of whether or not average differences in these characteristics that affect individual behavior can account for between-area differences in the amount of medical care received.

METHOD

Areas in Vermont have previously been shown to vary extensively in the quantity and cost of health care delivered. When a state-wide health survey was designed, six areas within the state were selected to be over-sampled so that reliable estimates could be made of population characteristics for each area.

The six areas chosen include two where the residents most often went to a major university hospital, two where they used a local hospital with more than 100 beds, and two where they used a hospital with fewer than 100 beds. As Table 1 shows, in all cases over 60% of resident hospitalizations are in the main local hospital. The six selected areas varied considerably in their hospital admission rates, their rates of surgery and the expenditure for health care as reflected in Medicare Part B payments. Age-adjusted admission rates vary from a low of 127 to 220 patients per 1,000 population. The Hospital Service Areas served principally by smaller hospitals are strikingly different. The two areas served principally by university hospitals show some difference with Area 1, 14% higher than Area 2; however, in the area with the lower rate, a greater portion of local residents are hospitalized in non-university hospitals. Use of surgery shows a similar pattern of variations.

Per capita reimbursements under the Medicare Part B program differ: enrollees in Area 1 receive 1.8 times the amount received by those in Area 6. The differences do not relate strictly to size or function of the principal hospital. Residents in Area 1 ($162 per enrollee) and Area 2 ($116 per enrollee) receive most of their care in university hospitals; Area 5 ($140 per enrollee) and Area 6 ($92 per enrollee) are each served by a smaller hospital.

The detailed methodology for these calculations has been described in previous articles, as well as the associations between these variations and such

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TABLE 1

USE OF MEDICAL CARE IN SIX SAMPLED HOSPITAL SERVICE AREAS						
	Area 1	Area 2	Area 3	Area 4	Area 5	Area 6
Patient Hospitalized in:						
Community Hospital <100 Beds	3.9	31.8	3.6	3.3	75.4	66.3
Community Hospital >100 Beds	18.2	4.4	80.0	90.3	8.5	3.8
University Hospitals	77.9	63.8	16.4	6.4	16.1	29.9
Hospitalization Rate (Discharges per 1,000, 1973)*	145	127	160	173	220	132
Surgery Rate (Discharges per 1,000, 1973)*	58	54	58	66	80	49
Medicare Part B ($ Reimbursement Per Enrolled, 1972)	$162	116	141	121	141	92
Number of Local Hospitals	2	2	1	1	1	1

*Age-adjusted to Vermont population

TABLE 2

CHARACTERISTICS OF SAMPLED VERMONT HOSPITAL SERVICE AREAS							
	Area 1	Area 2	Area 3	Area 4	Area 5	Area 6	State-Wide
Interviews Completed	326	258	283	262	280	245	2,190
Number of Adults in Interviewed Households	649	474	551	525	541	478	4,292
Number of Individuals in Interviewed Households	986	704	807	853	858	765	6,681

supply characteristics as the per capita number and specialties of physicians serving the areas and the per capita bed supply of hospitals.[5]

The survey questionnaire was designed by a research team at the National Center for Health Services Research and Development for use in different sections of the United States as part of the federally funded Experimental Health System Delivery Program. Vermont was a program participant when this study was carried out. The survey instrument dealt in a standard fashion with demographic information and obtained data on service utilization and morbidity. Options for additional questions permitted Vermont investigators to inquire into insurance status and use of certain ambulatory services.

The interviews were taken (February through March, 1973) by telephone wherever possible (about 70%) and by personal interview when a telephone call could not be completed. At least 6 calls were made to locate difficult-to-reach respondents. Telephone interviews were conducted by the regular, experienced SRP† field staff. A specially trained staff of interviewers in Vermont, supervised by SRP, carried out the personal interviews. At each selected housing unit, the person who "knows most about the health of the family" reported for him or herself and for other related persons living there.

†The sample design and field work for the household survey was the responsibility of the Survey Research Program (SRP), a facility of the University of Massachusetts and the Joint Center for Urban Studies of the Massachusetts Institute of Technology and Harvard University.

Proxy information was not taken regarding non-relatives in the household; a separate interview was conducted with each unrelated individual in a household. The sample yielded about 2,300 housing units. The response rate was 87%. The number of households, adults and individuals for whom information was obtained in each area are given in Table 2.

The statistical methods of assessing variations in the case of the household survey are based on Chi-Square distribution. The null hypothesis postulates equality between expected proportions of individuals with a given attribute in each area and is rejected if any area differs from the others ($P \leqslant .05$). For attributes for which the null hypothesis is rejected, their association with hospital utilization and expenditures is tested by partitioning the Chi-Square into a linear trend component related to the utilization variable and a residual component.

RESULTS

Population characteristics

In contrast to their use of hospital care or reimbursements, the populations are homogeneous on most factors that relate to individual use of care (Table 3). The areas are similar in racial composition, in number of adults born in Vermont and in the percent of adults who have lived 20 years or more in their current areas of residence. High and low hospital use areas have rather similar portions of adults who were born on a farm; the high and the low expenditures areas have about the same percentage

TABLE 3

CHARACTERISTICS OF POPULATIONS LIVING IN SIX SAMPLED HOSPITAL SERVICE AREAS

	Area 1	Area 2	Area 3	Area 4	Area 5	Area 6	Statistical Comparison Among Areas
Socio-demographic Characteristics of Adults:							
Percent with One or More Years of College	35	35	31	21	26	33	.05
Percent White	98	99	99	99	97	98	N.S.
Percent Raised on Farm	31	33	35	34	50	42	.001[2]
Percent Vermont or New Hampshire Born	66	60	68	64	61	59	.05[2]
Percent Living in Area More Than 20 Years	47	49	47	57	47	47	N.S.
Houshold Economic Characteristics:							
Percent Below Poverty Level	21	19	20	21	23	20	N.S.
Percent with Health Insurance[1]	83	84	83	82	84	84	N.S.
Percent of Insurance Policies Blue Cross	51	54	47	47	54	50	N.S.
Households with Regular Place of Physician Care	98	99	98	98	99	97	N.S.
Illness Level:							
Percent with Any Restricted Days in Last 2 Weeks for Chronic Condition	5	5	6	7	4	5	N.S.
Percent with Chronic Condition	26	28	29	28	23	23	.05[2]
Percent with More Than 2 Weeks of Bed Days in Last Year	6	6	5	7	5	4	N.S.

[1]Excluding Medicare and Medicaid.

[2]Linear Trend Component of Chi-Square Statistic related to rank on expenditures and utilization of hospitals not significant

TABLE 4

RESIDENT ACCESS TO PHYSICIANS AND HEALTH SCREENING SERVICES IN SIX SAMPLED HOSPITAL SERVICE AREAS

Health Services	Area 1	Area 2	Area 3	Area 4	Area 5	Area 6	Statistical Comparison Among Areas
Percent of Population With Physician Contact Within Year Preceding Interview	77.3	76.1	74.2	70.9	73.4	72.6	.001[2]
Percent of Population With Episode of Illness Contacting Physician Within 2 Weeks of Interview	29.3	29.8	34.1	34.4	26.1	30.2	N.S.
Percent of Females 18 Years or Older Receiving One or More Papanicolou Tests[1] Within Year Preceding Interview	59.5	52.2	56.5	49.8	54.8	63.2	N.S.

[1]Within 1 year of interview.

[2]Linear trend component of Chi-Square significant P<.001 for hospital utilization; non-significant for Medicare Part B expenditures

of persons with some higher education.

Residents of the different areas tend to have similar economic circumstances. There is little difference in percent of population below poverty level. Between 83% and 85% of area residents have health insurance. Between 47% and 54% of insured households have purchased Blue Cross insurance. Very nearly all households have a regular place of physician care. In contrast to large urban areas, emergency rooms play almost no role in providing routine care. Private doctors' offices are the most common places where primary care is received.

An estimate of chronic conditions was obtained by asking household members if during the last year they had "any health problem or illness" for a period of three months or more. While statistical differences exist between areas in chronic illness levels, they are not large and do not relate to relative consumption of hospital care. Two other measures of illness level (restricted activity within two weeks of interview and percent of population with more than two weeks of illness which confined an individual to bed during the previous year) showed no difference between areas.

Patient initiated demand for service

The similarities across the areas in availability of a regular place of physician care and in socio-demographic, economic, and illness factors which relate at an individual level to use of health services suggest that, on the average, residents of the area will not differ in their own ability, need or interest in consuming medical care. Their rates of contact with physicians bear out this expectation (Table 4). On an annual basis, between 71% and 77% of persons see a

ANTICIPATED ROLE OF CONSUMERS IN CHOICE OF HOSPITAL
(By Level of Education)

Respondent Expectation About Role in Selecting a Hospital	Educational Level		
	Less Than High School N = 688	High School Graduate N = 796	One or More Years of College N = 764
Percent Who Would:			
Rely on Own Judgment	24	18	16
Rely on Physician	66	70	60
Make a Joint Decision With Physician	10	12	25

physician. While these differences are statistically significant, they are not large and are unrelated to Medicare Part B reimbursements. The linear trend component of the Chi-Square is significant for the relationship with discharge rate: areas with lower contact rates tend to have higher hospitalization rates. The difference is small, and if there is a significance it is opposite that expected if lower rates of use of hospital result from lower rates of contact with physicians.

Behavior in seeking care among those who are ill also appears similar: for an episode of illness that occurred within two weeks of interview (defined as one or more disability days), about the same portion of persons who were ill saw a physician in the different areas. No differences were detected between areas in use of cervical tests for cancer.

Finally, we might present one further table that bears not on the between-area variations *per se*, but on the basic question of the extent to which patients control the health care they receive. In Vermont, as elsewhere, the decision of which hospital one uses has a marked impact on the cost of service. It is possible to think that patients choose their hospital; and no doubt some do. However, when we asked people directly how they would decide on a hospital, the overwhelming response was that they would rely on their physician's judgment (Table 5).

DISCUSSION

Our study does not support the hypothesis that the variations across neighboring communities are explained by consumer behavior. The personal resources of individuals and families appear to be the same in areas of high and areas of low use of hospitals: the populations-at-risk are similar in extent and variety of insurance coverage, portion below poverty, racial background and in rates of reported illnesses. Nearly all have a personal physician; the percentage of occupancy of the hospital is also similar and in a range indicating that beds are available if needed. The population of different Vermont areas thus appear reasonably well matched on the essential characteristics that predict individual utilization of health care. Also, on an annual basis and for an episode of illness, about the same number of patients in each area contact their physician.

The observation that similar populations living in neighboring areas receive widely differing amounts of care runs counter to an important theory about the market for professional services. This theory holds that lay uncertainty is the critical, distinguishing market factor. In the case of health care, patients are uncertain about the nature of their symptoms or the seriousness of their illnesses; they also do not know the value of a particular treatment nor know the alternatives. Rational behavior in this "information poor" environment requires what in other markets is irrational: delegation of the choice of treatment to the seller, the physician, who recognizes health needs and understands the value of alternative therapies.[13,14]

Yet, quite apart from the data on variations, there is evidence that physicians themselves do not agree on the need or the value of therapies. There are differences among physicians in interpreting or recognizing clinical signs and symptoms and disagreement on the meaning of diagnostic tests.[15,16] Technical innovations in medicine are commonly adopted without controlled tests on outcome and there is considerable skepticism about the claims for effectiveness of many common medical and surgical practices.[17,18]

Awareness of the importance of professional influence on utilization should influence the debate over national health insurance. The popular model for "control" of utilization is directed at the consumer, at the time of contact: to make a patient think twice about the relative importance or seriousness of his illness before consuming care, a deductible or co-payment is assessed. Is this an effective strategy? The Vermont data suggest not. While the homogeneity of insurance resources available to Vermont populations preclude analysis of the effects of varying co-insurance factors, we have seen the co-insurance and deductible provisions of the Medicare Part B program are ineffective in rationalizing strategies for allocation of health care, supporting a nearly three-fold variation in program expenditures.

The major factor in the expenditure differential between Vermont communities is varying use of institutionalized "higher technology" care. Price related factors do not appear to play an important

role in determining the variation in per capita expenditures for hospital care.[9] Within tolerable limits of self-insurance, it is unclear how a patient-directed co-insurance strategy would reduce these variations or lead to better decisions affecting health outcome.

SUMMARY

The data presented herein make it improbable that consumers determine variations in rates of health care or the per capita expenditure among neighboring areas. Any serious policy directed at the consumption of health care — its increase, decrease, or typology — must directly address the affect on consumption of the providers of health care. The fundamental and unanswered question is the impact on health status of the varying strategies for treating common illnesses.

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