

Trends and Regional Variations in Hospital Use Under Medicare

by Marian Gornick

Large regional differences have long been noted in hospital admission rates, in average length of stay, and in the days of care rate for Medicare beneficiaries. This paper provides an overview of national trends in the use of inpatient hospital services by Medicare beneficiaries and reviews past work on geographic differences in hospital use. It reassesses Medicare program experience and provides some new views on the subject. Perhaps the most surprising finding from this re-examination of regional differences in hospital use is that the number of days of care per capita in one area can differ substantially from that of another area while the per capita costs of care can be nearly equal. The major conclusion from this study is that no one utilization statistic is adequate for supplying information for the many current policy issues. Rather, there is a continuing need to understand national trends and regional differences in hospital utilization and to study the disparities by area in Medicare per capita spending for program benefits.

Introduction

The use of inpatient hospital services increases significantly with age. The prevalence of chronic conditions and the incidence of serious illness rise with advancing years, resulting in more frequent episodes of hospital care for the aged population. This is especially true in the last year or two of life when a final illness so often requires one or more hospital stays.

The need for more hospital care as age increases, the reduced income that accompanies retirement from the labor force, and the relatively low level of health insurance coverage held by the aged were the compelling issues that brought about the enactment of the Medicare law.¹ With the passage of the Medicare program, and its companion program Medicaid, public concern focused on anticipated demand for health care services from those who would be newly entitled to publicly-financed services. Some believed demand for physicians' services and hospital care would increase so significantly as to place a serious strain on the ability of the health care system to deliver care. In contrast to this concern, Klarman has noted that there appeared to

be an absence of concern in 1965—the year the Medicare and Medicaid legislation was passed—that price or unit cost of health care services might increase significantly or concern about the effect of the retrospective cost-based method adopted for reimbursement. (Klarman, 1966).

It is near-legendary now that it was costs—rather than patient demand as measured by the number of physician office visits or hospital days of care—that spiraled the first year these programs were implemented and for several years to follow. Program expenditures were far beyond those anticipated, shifting the focus of governmental health policy concerns away from a national program to an overriding need to contain costs.

The dramatic rise in health care costs in the decade following the implementation of Medicare and Medicaid has been analyzed in many studies. Several different factors in the health care system have been identified with the increase in costs: the rise in wages and price levels in the health care industry (Gaus and Cooper, 1977); increases in the intensity of use of certain customary services such as laboratory tests (Scitovsky, 1977); the development of new and costly medical technologies such as open-heart surgery and computerized tomography scanners (Inglehart, 1977); changes in the organization of care such as the growth of intensive care units in hospitals and increases in personnel; and the growth of institutions for long-term care. What gave impetus to these costly changes? Factors often cited are the increase in third party payment, which removed the individual from the direct consequences of the costs of services, the response of the health care providers

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¹ Prior to Medicare the percentage of the aged with any hospital insurance coverage (estimated at 56 percent in 1963) was lower than all other age groups (see Andersen *et al.*, 1976).

to reimbursement methods which offered financial incentives to increase medical care spending, and the rising expectations in the nation with regard to health care services.

In the search for solutions to contain costs, every aspect of the health care system came under scrutiny. A series of initiatives were undertaken to test new methods for paying providers of care, with the primary goal of containing hospital budgets and capital growth. The reimbursement methods tested included incentive reimbursement schemes (sharing the savings of reduced costs) and prospective reimbursement mechanisms. Several States instituted hospital rate review programs with the underlying goal of controlling the amount of future reimbursement to which hospitals would be entitled. To control hospital utilization, the Congress established the Professional Standards Review Organization (PSRO) program to review the care received by all federally-funded patients to ensure the economy, efficiency, and quality of care delivered. A major emphasis of the PSRO program was to eliminate unnecessary hospital days of care by reviewing utilization while the patient was in the hospital (concurrent review). With regard to surgery, experiments were designed to test the value of a second opinion on reducing unnecessary elective surgeries. The government also encouraged the growth of Health Maintenance Organizations (HMOs) as a way of promoting the use of preventive services and decreasing the need for costly hospital care. To control the development of health care resources, the Congress established a network of Health Systems Agencies (HSAs) with the responsibility of overseeing area-wide health planning and resource development. The HSAs were authorized to review and approve hospital capital outlays in excess of \$100,000 to stem the growth of costly medical technology, and to approve changes in bed supply and services.

Not without reason, the major efforts to contain health care costs focused on acute care hospital inpatient services. Of the total expenditures made in the U.S. for health care services, hospital services account for the largest part (40 percent in 1980). For several years following the implementation of Medicare and Medicaid, expenditures for hospital services rose faster than all other types of health care services. The acute-care hospital also was the site of many of the new and costly technological innovations as well as the provider of an increasing intensity of services. The issue of spiraling hospital costs took on a special significance with regard to the Medicare population aged 65 years and over—who comprise about

11 percent of the total population in the U.S. but account for about 30 percent of total hospital expenditures. In recent years, Medicare reimbursements for the aged for acute care hospital inpatient services have accounted for more than 65 percent of total Medicare reimbursements. In addition, reimbursements for physicians' services that are performed for inpatients in the acute-care hospital account for at least 50 percent of all Medicare reimbursements to physicians. Taken together, Medicare benefits for services provided in the acute-care hospital setting account for approximately 75 percent of total Medicare outlays for the aged. Thus, assurance of the efficiency of the delivery of hospital services is of primary importance to the Medicare program.

As hospital utilization statistics became available to the central administration of the Medicare program, one aspect of hospital use that was puzzling to those concerned with the program was the large differences found in the four U.S. census regions in average length of stay. Medicare beneficiaries hospitalized in the Northeast region generally stayed several days longer than patients with the same diagnosis in the West. There were also consistent regional variations in the rate of hospitalization although not as large as the differences found in length of stay. The number of hospital stays per 1,000 persons enrolled in Medicare was higher year after year in the South and North Central regions compared to the West and Northeast regions. These regional variations in use give rise to a number of concerns: To what extent does the admission of patients or duration of stay depend upon the needs of the population or upon the area's customary practice of medicine? What are the factors in the regions influencing these variations? What impact do these variations have on cost? Concern about regional differences also centers on quality and appropriateness of care. Differences in the rate of certain procedures, especially surgical services, raise the question as to whether or not higher rates of surgery in certain areas reflect some instances of unnecessary surgery.

Although the patterns relating to geographic variations in hospital use by Medicare beneficiaries have been relatively unchanged over time, there have been new and important trends nationwide that also stimulate concern. On the one hand (beginning in 1969) the average length of stay has been declining nearly everywhere. On the other hand (beginning in 1972) there has been an increasing number of hospital stays per 1,000 Medicare enrollees in nearly every part of the country.

Medicare Program Coverage and Expenditures

The purpose of this chapter is to trace the use of inpatient hospital services by Medicare beneficiaries aged 65 years and over. First, the chapter covers national trends in the rate of hospitalization and in average length of stay, endeavoring to answer these questions: Do the changes in the rate of hospitalization reflect changes in the composition of the population? Are the trends in hospital use observed for Medicare beneficiaries also found in the population under 65 years of age? What are some of the factors behind the trends in hospital use? Secondly, the chapter focuses on regional variations. It looks at single factors that might explain regional differences and then provides a multi-variate analysis of selected factors generally considered to influence patterns of hospital use. The chapter ends with a discussion of regional differences in Medicare reimbursements and relates these differences to regional differences in hospital use.

The impact of the many programs undertaken to control utilization and costs very likely affected some aspects of Medicare hospital use. However, knowledge gained about the impact of these programs is not easily summarized and will not be attempted here.

For ease of discussion, the chapter omits the hospital experience of Medicare enrollees under age 65—disabled persons receiving cash benefits under the Social Security law and persons entitled to Medicare because of End-Stage Renal Disease. It is known, however, that hospital trends and regional variations that exist for the aged population (who comprise about 90 percent of all Medicare enrollees) are largely the same for the disabled population under Medicare (who comprise the remaining 10 percent of Medicare enrollees).

Most of the information presented in this chapter is derived from the Medicare administrative record keeping system, which provides a rich source of data to describe national trends and to measure regional variations in the rate of hospital use. However, information on several important variables—such as need, access to care, health status and outcome of care—is largely unavailable from the usual flow of data to correlate with hospital use. Nor is detailed information available on the use and costs of ancillary services in the hospital to analyze national trends or regional differences in intensity or diffusion of medical technology. As the final section of this chapter shows, Medicare reimbursements per enrollee are not necessarily highest where the number of days of care per enrollee are highest or, conversely, lowest where days of care are lowest. Thus, there is very little knowledge of the important variables needed to interpret whether or not the observed trends in hospital use are beneficial to health status or whether or not certain regional patterns of use are to be preferred over other patterns with regard to health or cost-efficiency.

Before proceeding with the major subjects of this chapter, the next section covers background material in two areas: an overview of Medicare program coverage and expenditures; and the sources of the data discussed in this chapter.

Coverage

The Medicare program has two parts. Hospital Insurance (Part A) covers 90 days of inpatient hospital care in a benefit period—which begins with the first day of hospitalization and ends when the beneficiary has not been an inpatient in a hospital or skilled nursing facility (SNF) for 60 continuous days. There is no limit to the number of benefit periods an individual may use. The program also provides a one-time reserve of 60 days to use if the beneficiary exhausts the 90 days available in a benefit period. In addition to inpatient hospital care, Part A covers up to 100 post-hospital days in an SNF if the beneficiary is certified to require such care. Part A also covers home health agency visits. Of the nation's aged population, 95-97 percent are covered by Part A. On July 1, 1966, as the Medicare program became operational, there were 19.1 million persons enrolled in Part A. By January 1, 1980, the number of aged persons in Part A had increased to 24.9 million.

Nearly everyone covered by Part A voluntarily enrolls or is enrolled through Medicaid State "buy-in" agreements in the Supplementary Medical Insurance (Part B) Program which provides payments for physicians and related services and supplies ordered by the physician. Part B also covers out-patient hospital services and home health visits. Several health care services that the aged generally use on a continuing basis such as drugs, dental care, routine eye examinations and preventive services are not covered by Medicare. Long-term institutional services are not covered either.

To hold down program costs and to deter over-utilization, the Medicare program requires beneficiary cost-sharing. Under Part A, in each benefit period the patient is required to pay an inpatient hospital deductible that approximates the cost of one day of hospital care. Coinsurance based on the inpatient hospital deductible is required for the 61st-90th day of inpatient hospital care (always equal to $\frac{1}{4}$ of the deductible), for the 21st-100th day of skilled nursing facility care ($\frac{1}{6}$ of the deductible), and for the 60 life-time reserve days ($\frac{1}{2}$ of the deductible). The patient is also liable for the cost (or replacement) of the first three pints of blood.

Under Part B, in addition to requiring a monthly premium, the beneficiary must meet a \$75 deductible each year. On each claim for payment, physicians can accept or reject assignment. Acceptance of assignment means that the physician agrees to accept as full payment the amount Medicare allows for the service. The program reimburses 80 percent of allowed charges. Beneficiaries are liable for the remaining 20 percent (coinsurance) of allowed charges as well as the difference between the physician's charge and the allowed charge on unassigned claims.

It is important to observe that in addition to the beneficiaries with Medicaid coverage (11 to 13 percent of enrollees) who are relieved of cost-sharing, the majority of the remaining Medicare beneficiaries have purchased private health insurance (Medigap) policies to supplement Medicare. These policies generally pay some or all of the deductible and coinsurance that the beneficiaries would have had to pay out-of-pocket without them.

Two separate trust funds exist to pay the benefits and administrative expenses. The Part A trust fund is financed primarily through a tax on current earnings from employment covered under the Social Security Act. The Part B trust fund is financed through premiums paid by or on behalf of persons enrolled in the program and by the federal government from general revenues.

Expenditures

Total per capita health care expenditures for persons aged 65 years and over increased from \$646 in 1968 to \$1,745 by 1977. The Medicare program covered an estimated 41.5 percent of the aged person's total health care bill in 1968 and 44.3 percent in 1977, with the level remaining relatively constant in the years in-between (Table 1). Although Medicare covered about the same percentage of the total per capita health care bill for the aged during this period, the more than doubling of per capita health care spending coupled with the 19 percent rise in enrollment resulted in large increases in program expenditures. Total Medicare outlays which were \$5.1 billion in 1968 rose to \$18.3 billion by 1977.

During the period 1968 to 1977, the Consumer Price Index (CPI) for all items rose 75 percent, the medical care component rose 104 percent and the hospital semi-private room component rose 174 percent. Clearly, the dramatic rise in the costs of hospital care has been a major factor in the sharp rise in Medicare spending.

Total charges for Medicare beneficiaries aged 65 years and over for short-stay hospital (defined as a general or special hospital reporting an average length of stay of under 30 days) inpatient services were \$4.4 billion in 1968 and \$16.8 billion in 1977 (Table 2). The charge for an average hospital stay was \$781 in 1968; by 1977 the charge for an average hospital stay reached \$2,138. Medicare reimbursements for short-stay inpatient hospital services rose from \$3.5 billion in 1968 to \$12.2 billion in 1977. Of the total short-stay hospital charges, beneficiaries were liable for about 8 percent in 1968 and about 7 percent in 1977.² Patient liability averaged \$64 per discharge in 1968 and \$141 in 1977. The deductible is the greatest burden, accounting for 50-70 percent of total beneficiary liability during the period 1968-77. Coinsurance

² The small percentage of short-stay hospital inpatient charges for which beneficiaries are liable is in contrast to the relatively large percentage beneficiaries owe for physicians' services under Part B. Data for 1977 indicate that the program reimbursed about 65 percent of charges due physicians and the beneficiaries were liable for the remaining 35 percent.

accounted for only about 10 percent and the blood deductible only 1-3 percent. Any remaining liability was due to noncovered charges such as telephone and TV charges.³

Sources of the Data

Utilization data that follow are derived primarily from information in the Medicare Statistical System (MSS). This system was designed and already in place when the Medicare program began to operate on July 1, 1966, and has been in continual operation for 15 years. The MSS is based upon claims that are submitted throughout the nation to Medicare fiscal intermediaries and carriers for payment. The hospital claim contains billing and medical information including the patient's Medicare identification (ID) number, the dates of admission and discharge, hospital charges, the principal discharge diagnosis and other diagnoses, and major procedures performed. After processing, records of all claims are sent to the central office for administrative purposes, although diagnostic and surgical information is transmitted for only a 20 percent sample.

The MSS also depends upon two major files that can be linked to the bill files. The first is the master enrollment file maintained in the central office for all persons who apply and are eligible to receive Medicare benefits. For each enrollee, the file contains the enrollee's unique identification number, demographic and other information including age, sex, race, state and county of residence, type of entitlement, and, if deceased, date of death. The other major file is the Provider of Service file which contains information for each hospital, SNF, home health agency, laboratory, and other providers certified to participate in Medicare. The information maintained for hospitals includes a unique hospital ID number, bed size type of control, teaching status, and state and county where the hospital is located.

Data from all three files are linked using the ID number of the patient and the ID number of the hospital to form a single hospital-stay record. Each stay record has fields that contain the demographic characteristics of the patient, the characteristics of the hospital, and charge and medical information from the claims file.

Because of the unique ID number of the beneficiary, records can be linked in many different ways for a broad array of files for special statistical and research activities. Of primary importance, because enrollment information is maintained centrally, utilization rates can be generated by demographic characteristics of the beneficiaries and by area of residence. Unless otherwise indicated, the data that follow are derived from the MSS files. Because several different files from the MSS have been used, trend data are sometimes shown through different time periods, depending upon either availability or completeness of the data file used.

³ Hospital charges exceeding audited cost reports are not recoverable from the Medicare program. See Helbing, 1980.

TABLE 1
Medicare's Role in Personal Health Care Expenditures for Persons Aged 65 Years and Over, U.S., Selected Years 1968-1977

Fiscal Year	Per Capita Expenditures For the Aged	Estimated Percentage Paid by Medicare			Total Medicare Reimbursements (in billions)
		All Services	Hospital Care ¹	Physicians' Services	
1968	\$ 646	41.5	62.9	56.4	\$ 5.1
1969	735	43.9	66.5	60.0	6.3
1971	926	39.3	63.6	54.6	7.5
1973	1,081	39.1	67.8	50.9	9.0
1975	1,360	42.0	72.2	54.1	13.4
1977	1,745	44.3	74.4	55.6	18.3

¹ Includes inpatient and outpatient care.

Source: R. Gibson and C. Fisher—Health Care Financing Administration, National Health Expenditure Studies.

TABLE 2
Short-Stay Hospital Use: Charges, Medicare Reimbursements, and Patient Liability for Medicare Enrollees Aged 65 Years and Over, All Areas, Selected Years 1968-1977

Year	Hospital Charges		Medicare Reimbursements ¹ (in billions)	Patient Liability	
	Total (in billions)	Average per Discharge		Total (in billions)	Average per Discharge
1968	\$ 4.389	\$ 781	\$ 3.493	\$.361	\$ 64
1969	5.269	892	4.124	.416	70
1971	6.500	1,090	4.935	.481	81
1973	8.010	1,226	6.040	.590	90
1975	11.027	1,637	8.228	.752	112
1977	16.815	2,138	12.233	1.113	141

¹ Represents interim payments. Additional payments of approximately 3-5 percent of the amount shown are reimbursed through final cost accounting procedures.

Source: Medicare Statistical System

One final comment should be made about the organization of the files. Annual rates of hospitalization for a specific year can be generated by aggregating all records of hospital stays in which the admission occurred between January 1 and December 31 of the reference year. This procedure allows the development of admission rates. Alternatively, all records can be aggregated in which

the hospital discharge occurred between January 1 and December 31 of the reference year, thereby permitting the development of discharge rates. Either way produces similar trend data. The MSS generally uses the discharge date for aggregating records and hence the discussion that follows focuses on discharge rates rather than admission rates.

National Trends in Hospital Use

This section covers national trends in the discharge rate, average length of stay, and the days of care rate. These utilization measures are presented from the first full year of the program, 1967, through 1977.

Trends in the Discharge Rate

In 1967, the discharge rate was 259 discharges per 1,000 aged persons enrolled in Medicare. This rate was estimated to be 5-7 percent greater than the discharge rate for the population 65 years of age and over in the year before Medicare began (Pettengill). The rate increased again the next two years, reaching 295 discharges per 1,000 enrollees in 1969 and remained at about that level for the next two years. The increase in the rate of hospitalization that occurred with the implementation of the Medicare program was thought to be due primarily to satisfying unmet needs that the aged had accumulated when so many of them were without hospital insurance. But in 1972, the discharge rate began to rise again and has been climbing slowly ever since; as Figure 1 shows, reaching 335 discharges per 1,000 enrollees by 1977.

Is the upward trend in the rate of hospitalization accounted for by changes in the distribution of the enrolled population by age, sex, or race? Traditionally, age has been a very significant factor in the rate of hospitalization. During the period 1967-77, the discharge rate for persons 85 years and over has been approximately 75-85 percent higher than the rate for persons in the age group 65-66 years. Sex and race are also factors that are related to the rate of hospitalization. The rate for men enrolled in Medicare has averaged about 15 percent more than the rate for women. The rate for white persons has also averaged more than the rate for persons of all other races although the difference has diminished significantly. In 1967, the rate for white persons was 40 percent greater; by 1977 the difference declined to 20 percent.

Analysis of the distribution of the Medicare population by age, sex, and race shows that it shifted somewhat during the period 1967-77. The proportion of older beneficiaries and the proportion of women increased. In 1967, 37.8 percent of the population was over 75 years of age; in 1977 the percentage was 40.4. The proportion of women rose from 57.7 percent in 1967 to 59.4 percent in 1977.

To determine if shifts in the composition of the population significantly affected the rise in the discharge rate, the 1977 discharge rate was standardized (by the Direct Method) using 1977 age-sex-race specific discharge

rates with the 1967 distribution of enrollees by age, sex, and race. This calculation had only a minimal effect, adjusting the crude rate in 1977 from 335.1 discharges per 1,000 population to 332.3.⁴

Figure 2 shows the age, sex, and race specific discharge rates for 1967 and 1977 and reveals that the discharge rate rose for men and women, for white and non-white persons—in all age groups. The increase for non-white men and non-white women has been greater than the increase for white men and women. Thus, the rise in the discharge rate does not reflect changes in the composition of the population but rather reflects an increase in the discharge rate for all population subgroups.

Does the rise in the hospital discharge rate reflect beneficial or detrimental practices? The increase in hospitalization could reflect the growth of undesirable patterns of care such as the use of institutional services that could otherwise be provided on an outpatient basis. The increase in hospitalization might also reflect the provision of unnecessary medical or surgical services. Alternatively, the increase in the rate of inpatient stays could reflect desirable patterns of care. Perhaps persons who are chronically or terminally ill (that is, stroke patients)—and who formerly stayed in the hospital after an acute illness for a long period of time or until death—are now more frequently discharged if their condition stabilizes; perhaps they are then readmitted if they became acutely ill again. Such cases would cause an increase in the discharge rate but a decrease in the number of days of care. Or the rise in the discharge rate might reflect, in part, increased admissions for new life-saving and life-enhancing services, such as the insertion or replacement of a pacemaker, which would then help explain the widely reported decline in deaths due to heart disease and stroke that occurred in the past decade. The question about whether the increased hospitalization has generally been beneficial or detrimental has not been resolved, but certain aspects of the increase can be analyzed. Are a higher proportion of beneficiaries being hospitalized? Is the readmission rate increasing? Are the trends experienced by the Medicare population also found for the population under 65 years of age? Of those who die during the year is the place of death more frequently in the hospital, compared with earlier years? Does the increase in the discharge rate reflect more medical or surgical cases? These questions are examined next.

⁴ For a discussion of the methods for standardizing rates by the Direct and Indirect Methods see Spiegelman, 1968.

FIGURE 1
Short Stay Hospital Use: Discharge Rate, Average Length of Stay, and Days-of-Care Rate for Medicare Beneficiaries Aged 65 Years and Over, U.S., 1967-1977

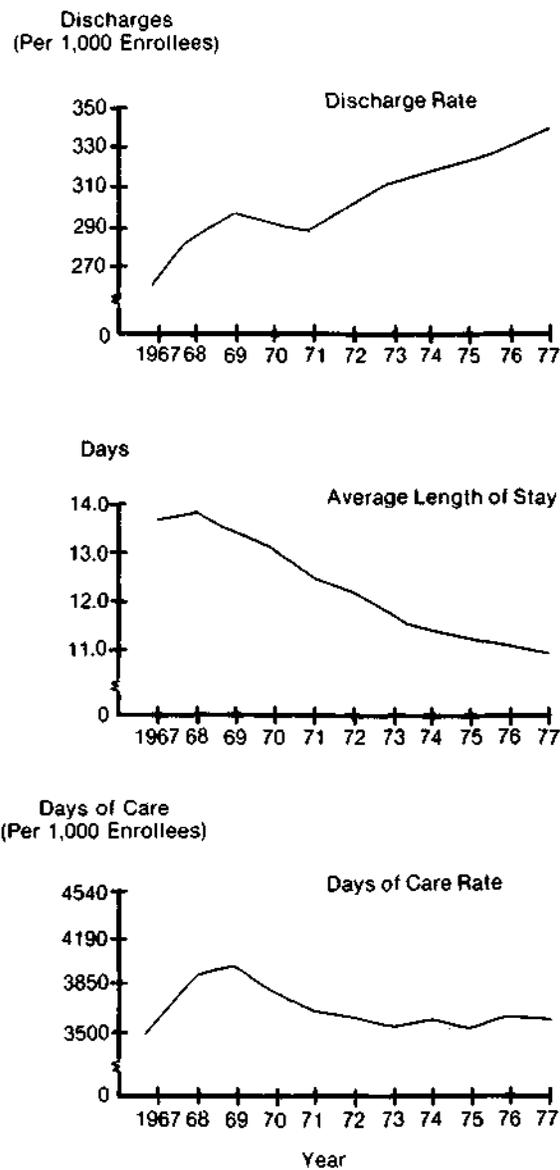
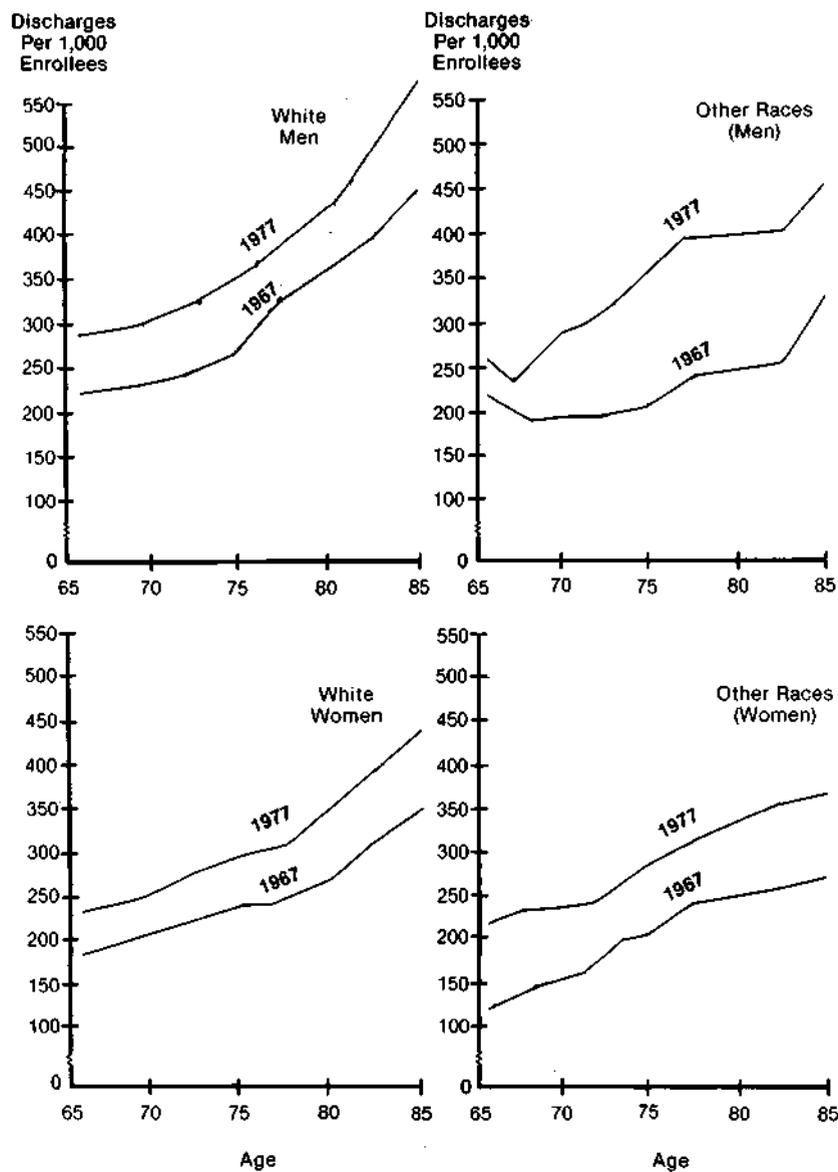


FIGURE 2
Short Stay Hospital Use: Trends in the Discharge Rate by
Age, Sex, and Race, all Medicare Beneficiaries Aged 65 Years
and Over, 1967 and 1977



Some Factors Explaining The Rising Discharge Rate⁵

Impact of Changes in the User Rate and Multiple Stay Rate

The discharge rate for a specific year depends upon two variables: The proportion of the population that is hospitalized during the year (called the user rate) and the average number of hospital stays per user per year (called the multiple stay rate). The discharge rate will increase over time if either the user rate or the multiple stay rate rises, or if both rise.

During the period 1967-77, the discharge rate increased from 259.3 discharges per 1,000 enrollees to 335.1 discharges per 1,000 enrollees. This was an increase of 75.8 discharges per 1,000 enrollees for that period. As shown in Table 3, both the user rate and the multiple stay rate rose. The user rate increased from 187.2 persons hospitalized per 1,000 enrolled in 1967 to 226.0 in 1977, or 21 percent. The multiple stay rate increased from an average of 1.38 hospital stays per user in 1967 to 1.48 in 1977, or 7 percent.

Of the total increase in the discharge rate (75.8 discharges per 1,000) the upward trend in the user rate was responsible for 70 percent of the increase, as shown in Table 3, and the upward trend in the multiple stay rate was responsible for 25 percent. The joint effect of changes in both variables was responsible for the remaining increase of 5 percent. Thus, the increase in the user rate contributed nearly three times as heavily as the increase in the multiple stay rate.

The proportion of the Medicare population hospitalized in 1977 was higher in all age groups compared to 1967. The proportion hospitalized in the age group 65-74 years rose from 16 percent in 1967 to 19 percent in 1977; for persons aged 75-79 years the proportion rose from 21 percent to 25 percent; for persons aged 80-84 years the proportion rose from 24 percent to 28 percent, and for the oldest age group, persons 85 years and over, the proportion rose from 27 percent to 31 percent. Thus, there was a tendency toward hospitalizing more of the Medicare population in all age groups.

The rise in the multiple stay rate from 1.38 to 1.48 reflects the fact that in 1967 of all those hospitalized during the year, 75 percent had only one hospital episode while the remaining 25 percent were readmitted one or more times during the year. By 1977 the proportion of those hospitalized during the year with only one stay decreased to 69 percent while the proportion who were readmitted one or more times that year increased to 31 percent.

⁵ For a more comprehensive discussion of this topic, see Lubitz, James and Ronald Deacon, "The Rise in the Incidence of Hospitalizations for the Aged, 1967-1979," *Health Care Financing Review*, March 1982.

TABLE 3

Short-Stay Hospital Use: Discharge Rate, User Rate, and Multiple Stay Rate for Medicare Enrollees Aged 65 Years and Over, All Areas, 1967 and 1977¹

Rate	Percent Contribution to Change in Discharge Rate		
	1967	1977	
Discharge Rate (Number of discharges per 1,000 enrollees)	259.30	335.10	100
User Rate (Number of persons hospitalized per 1,000 enrollees)	187.20	226.00	70
Multiple Stay Rate (Average number of stays per hospitalized person)	1.38	1.48	25
Interaction Term	—	—	5

¹ Table from "The Rise in the Incidence of Hospitalizations for the Aged, 1967-79," by J. Lubitz and R. Deacon, *Health Care Financing Review*, March 1982.

Source: Medicare Statistical System.

Comparison of Trends for the Population Under Age 65

The National Center for Health Statistics (NCHS) gathers data from the Hospital Discharge Survey (HDS) and from the Health Interview Survey (HIS) on hospital utilization for the entire population in the U.S. Data from the HDS indicates that the discharge rate rose more for the population age 65 years and over during the period 1967-77 than it did for younger age groups. For persons in the age group 15-44 years, the discharge rate was nearly the same in 1977 as it was in 1967 (162 discharges per 1,000 in 1967 and 160 in 1977). For persons under 15 years of age, the rate was also nearly the same (75 discharges per 1,000 in 1967 and 73 discharges per 1,000 in 1977). For persons 45-64 years of age, there was a substantial rise, the rate increasing 23 percent from 161 discharges per 1,000 population in 1967 to 198 in 1977. But for the population aged 65 years and over, NCHS data showed an increase of 30 percent, the rate rising from 289 discharges per 1,000 in 1967 to 374 in 1977. Thus, NCHS data indicates that persons 65 years of age and over experienced increases in the hospital discharge rate between 1967 and 1977 that exceeded other population subgroups in the U.S.⁶

⁶ Discharge rates reported by NCHS and Medicare differ somewhat for several reasons including sampling errors and small differences in the universe (see Lubitz, 1981).

Changes in Mortality and Deaths in the Hospital

Does the increase in the discharge rate for the aged population reflect changing mortality rates or in the place where death occurs? If more persons are dying in the hospital who in earlier time periods might have died at home or elsewhere that would explain some of the increase in the hospital discharge rate. Earlier it was noted that the Medicare population is aging, with a higher proportion of enrollees 75 years of age and over in 1977 compared to the year Medicare began. The data indicate, however—and consistent with the downward trend in mortality from heart and stroke—that the death rate for persons enrolled in Part A fell from 56.3 deaths per 1,000 enrollees in 1967 to 52.9 deaths per 1,000 in 1977. Of the deaths, about 43 percent occurred in a short-stay hospital in both 1967 and 1977. Thus, the death rate has not increased nor was the short-stay hospital any more frequently the place of death in 1977 than it was in 1967 to help account for the rise in the hospital discharge rate.

Growth in Medical and Surgical Discharges

The rise in the discharge rate for Medicare beneficiaries reflects a rise in the rate of both medical and surgical cases. The rate of discharges with surgery increased from 82.6 discharges per 1,000 enrollees in 1967 to 112.7 in 1977, reflecting an increase of 36 percent.

Correspondingly, discharges without surgery rose from a total of 176.7 discharges per 1,000 in 1967 to 222.4 in 1977, representing a 26 percent increase (Table 4). It is of interest to inquire what types of diagnostic and surgical cases increased.

First, it is important to note that a series of studies were conducted by the National Academy of Sciences, Institute of Medicine, to assess the reliability of diagnostic and surgical data in the Medicare Statistical System, in four private abstracting services, and in the Hospital Discharge Survey conducted by the National Center for Health Statistics. In each of these studies patients' medical records were reabstracted by an Institute of Medicine field team and compared with data from the statistical system under study. Significant discrepancy rates were reported for all the systems studied. The discrepancies were attributed less to errors in coding than to the selection of the principal discharge diagnosis and procedure, especially in cases in which the patient had multiple diagnoses (Institute of Medicine, 1977, 1980).

In addition to problems revealed about the reliability of abstracted data there are other problems that add to the difficulty of analyzing changes in case mix. One problem arises from using sample data. Another comes from the periodic revisions in classification schemes, which make it difficult to analyze changes in hospital rates for specific conditions across time periods in which a revision occurred.

TABLE 4
Short-Stay Hospital Use: Discharge Rate With Surgery and Without Surgery for Medicare Enrollees Aged 65 Years and Over, All Areas, 1967-1977

Year	Number of Discharges Per 1,000 Enrollees			Average Length of Stay			Days of Care per 1,000 Enrollees
	Total	With Surgery	Without Surgery	Total	With Surgery	Without Surgery	Total
1967	259.3	82.6	176.7	13.8	15.2	13.1	3,575
1968	284.2	86.3	197.9	13.8	14.9	13.2	3,910
1969	295.2	89.8	205.4	13.5	14.8	13.0	3,990
1970	293.2	90.3	203.0	13.0	14.2	12.5	3,807
1971	287.6	86.7	200.9	12.5	13.8	11.9	3,584
1972	299.3	92.5	206.8	12.1	13.4	11.5	3,611
1973	302.8	96.5	206.2	11.7	13.1	11.0	3,547
1974	317.0	102.0	215.0	11.5	13.1	10.7	3,646
1975	321.0	104.0	217.0	11.2	13.0	10.5	3,595
1976	326.5	103.1	223.4	11.1	13.0	10.3	3,632
1977	335.1	112.7	222.4	10.9	12.7	10.0	3,651

Source: Medicare Statistical System.

In recent years, new sources of error were introduced into Medicare's diagnostic and surgical data through changes in the way billing information was transmitted and processed. Unexpectedly, one of the changes that had a major impact on reducing the quality of Medicare's diagnostic and surgical data was an increased use of electronic data processing throughout the collection process—that is, at the hospital, at the intermediary, and at the central office—without the proper edits and quality control procedures. As a result, it is difficult to use Medicare data to analyze changes over time in the discharge rate for specific diagnostic or surgical conditions. Currently, a large effort is underway to evaluate the different methods used in transmitting diagnostic and surgical information to the Medicare Statistical System and to improve and monitor the data as it enters the Medicare Statistical System.

Because of the problems in Medicare data cited above, data from the Hospital Discharge Survey conducted by the National Center for Health Statistics were used to analyze changes over time in hospital discharge rates for specific diagnostic and surgical categories. Considering the high discrepancy rates found by the Institute of Medicine with

regard to diagnostic and surgical data in every system studied, data provided next by diagnosis or surgical procedure should be viewed with caution.

For the period 1970-77, data from the Hospital Discharge Survey indicated that discharges for persons 65 years and over increased from 306.8 discharges per 1,000 persons in 1970 to 374.4 discharges per 1,000 in 1977. This was an increase of 22 percent or an additional 67.6 discharges per 1,000 persons. Table 5 shows the diagnostic categories that accounted for the greatest increases in the number of discharges per 1,000 persons. The categories listed account for 59.5 discharges out of the additional 67.6 discharges per 1,000 persons in 1977. In the forefront of diagnostic categories with the greatest increases in discharges were those classified as Diseases of the Circulatory System. They accounted for an additional 22.7 discharges per 1,000 persons or 33.4 percent of the total additional discharges in 1977. The next highest category was Malignant Neoplasms which accounted for 8.9 additional discharges in 1977 or 13.3 percent of the increase in 1977. Two specific diagnoses in themselves, Cataract and Chronic Ischemic Heart Disease were responsible for 4.3 percent and 5.0 percent respectively of the additional discharges in 1977.

TABLE 5
Short-Stay Hospital Use: First Listed Diagnoses Accounting for the Greatest Increases in the Number of Discharges Between 1970 and 1977, for Persons Aged 65 Years and Over, U.S.¹

ICDA-8 Code	Diagnostic Category	Discharges per 1,000 persons 65 years +		Percent Increase	Additional Discharges in 1977	
		1970	1977		Discharges per 1,000	Percentage Distribution
	All Conditions ²	306.8	374.4	22.0	67.6	100.0
140-209	Malignant Neoplasms	27.1	36.0	33.1	8.9	13.3
320-389	Dis. of Nerv. System & Sense Organs	16.0	21.4	33.5	5.4	8.0
(374)	Cataract	(8.2)	(11.1)	(34.8)	(2.9)	(4.3)
390-458	Dis. of Circ. System	88.2	110.9	25.7	22.7	33.4
(412)	Chronic Ischemic H.D.	(29.0)	(32.4)	(11.7)	(3.4)	(5.0)
460-519	Dis. of Resp. System	30.1	35.2	17.0	5.1	7.6
520-577	Dis. of Dig. System	42.9	48.2	12.2	5.3	7.7
580-629	Dis. of Geni.-Urin. System	24.9	28.1	12.8	3.2	4.7
710-738	Dis. of Musculoskel. System	13.0	17.0	30.8	4.0	5.9
800-999	Accidents, Poisoning and Violence	26.6	31.5	18.2	4.9	7.1
	Sub-total	—	—	—	59.5	—

¹ Table from "The Rise in the incidence of Hospitalizations for the Aged, 1967-79," by J. Lubitz and R. Deacon, *Health Care Financing Review*, March 1982.

² Includes discharges for conditions not listed below.

Source: Published and unpublished tabulations from the National Center for Health Statistics (NCHS).

Of the additional 67.6 discharges per 1,000 in 1977, there were 29.2 discharges per 1,000 with surgery. Table 6 focuses on this subset showing the surgical categories with the greatest increases in the number of discharges. The surgical categories listed accounted for 27.1 out of the 29.2 additional surgery cases. Vascular and Cardiac surgery showed the greatest increases, contributing 7.3 additional discharges per 1,000 persons or 25.0 percent of the additional surgeries in 1977. Orthopedic surgery was the next largest category, accounting for an additional 4.6 discharges per 1,000 or 15.8 percent of the additional surgeries. Following that was Ophthalmologic surgeries, accounting for an additional 4.0 discharges per 1,000 persons or 13.7 percent of the additional surgeries in 1977.

There were five specific surgical procedures that outranked all others identified as increasing the most between 1970 and 1977: Extraction of Lens; Insertion or Replacement of Electronic Heart Device; Resection of Small Intestine or Colon; Prostatectomy; and Reduction of Fracture of Femur with Fixation.

Thus, NCHS data indicate that increases in hospital treatment for diseases of the circulatory system played the major role in the rise in the discharge rate. Such cases accounted for one-third of the rise in the discharge rate between 1970 and 1977. The surgical data indicate that insertion or replacement of an electronic heart device accounted for nearly 10 percent of the additional surgeries.

TABLE 6
Short-Stay Hospital Use: First Listed Operations Accounting for the Greatest Increases in the Number of Discharges Between 1970 and 1977, for Persons Aged 65 Years and Over, U.S.¹

ICDA-8 Code	Surgical Category	Discharges per 1,000 persons 65 years +		Percent Increase	Additional Surgeries in 1977	
		1970	1977		Discharges per 1,000	Percentage Distribution
	All Surgeries ²	89.6	118.8	32.6	29.2	100.0
01-05	Neurosurgery	1.4	2.2	57.0	0.8	2.7
06-14	Ophthalmology	10.6	14.6	37.7	4.0	13.7
(14.4-14.6)	Extraction of Lens	(8.3)	(11.0)	(32.5)	(2.7)	(9.2)
24-30	Vascular and Cardiac Surgery	4.8	12.1	152.1	7.3	25.0
(30.4-30.5)	Insertion or Replacement of Elec. Heart Device	(1.4)	(3.9)	(178.6)	(2.5)	(8.6)
32-35	Thoracic Surgery	1.7	2.9	70.6	1.2	4.1
38-48	Abdominal Surgery	19.0	20.7	8.9	1.7	5.8
(47.4-47.6)	Resection of Small Intestine or Colon	(1.8)	(2.6)	(44.4)	(0.8)	(2.7)
54-61	Urological Surgery	14.5	17.6	21.4	3.1	10.6
(58.1-58.3)	Prostatectomy	(6.9)	(7.9)	(14.5)	(1.0)	(3.4)
80-90	Orthopedic Surgery	14.5	19.1	31.7	4.6	15.8
(82.2)	Reduction of Fracture of Femur With Fixation	(5.6)	(7.1)	(26.8)	(1.5)	(5.1)
A1-A2	Biopsy	5.8	10.2	75.9	4.4	15.1
	Sub-total	—	—	—	27.1	—

¹ Table from "The Rise in the Incidence of Hospitalizations for the Aged, 1967-79," *Health Care Financing Review*, March 1982, by J. Lubitz and R. Deacon, Health Care Financing Administration.

² Includes operations not listed below.

Source: Published and unpublished tabulations from the National Center for Health Statistics (NCHS).

Trends in Average Length of Stay

In contrast to the rising discharge rate for Medicare beneficiaries, the average length of stay has been declining over time. When the program began in 1967 the average length of stay under Medicare was 13.8 days. It remained at that level in 1968 (Figure 1) but then began a steady decline, reaching 10.9 days by 1977. As shown in Table 4, length of stay declined for cases with and without surgery during this time period.

Traditionally, age has had a significant impact on average length of stay, the duration of the hospital stay rising more than 20 percent from the age group 65-66 years to the age group 85 years and over. Sex and race have had an impact also. The length of stay for women has averaged nearly one day longer than that for men, while the length of stay for non-white persons has averaged more than one day longer than that for white persons.

To determine if shifts in the composition of the population over time had an impact on changes in average length of stay, the 1977 average length of stay was

standardized using the age, sex, and race composition of the population in 1967. The calculation adjusted the crude average length of stay only 0.2 days from 10.9 days to 10.7 days, reflecting the fact that length of stay declined for all age, sex and race groups.

Does the decline in average length of stay reflect merely a change in case mix or has case management or treatment practices changed? To answer this, it is necessary to look at specific conditions. Table 7 shows the average length of stay for selected common diagnoses and surgeries for 1970 and 1977 from NCHS data. The average stay for all conditions combined declined from 12.6 days to 11.1 days. Length of stay for each specific condition shown fell also. Cataract declined the most, decreasing more than 3 full days from 7.6 days in 1970 to 4.4 days in 1977. The average stay for all surgeries also fell, declining from 14.5 days in 1970 to 13.1 days in 1977. Length of stay for each specific surgery fell also. Complete tabulations indicate that length of stay generally declined for all conditions and surgeries.

TABLE 7
Short-Stay Hospital Use: Average Length of Stay for Persons Aged 65 Years and Over, For Selected Diagnoses and Surgeries, U.S., 1970 and 1977

ICDA-8 Code(s)	Diagnostic Category	Average Length of Stay (Days)	
		1970	1977
	All Conditions	12.6	11.1
250	Diabetes Mellitus	14.7	12.1
374	Cataract	7.6	4.4
410	Acute Myocardial Infarction	16.1	13.6
412	Chronic Ischemic Heart Disease	12.9	10.6
430-438	Cerebral Vascular Disease	14.7	13.2
480-486	Pneumonia, all forms	12.5	11.4
550, 552	Inguinal Hernia	9.8	7.5
574	Cholelithiasis	13.7	12.8
600	Hyperplasia of Prostate	12.8	10.4
	Surgical Category		
	All Operations	14.5	13.1
14.4-14.6	Extraction of Lens	7.8	4.6
38.2-38.3	Repair of Inguinal Hernia	10.2	7.6
43.5	Cholecystectomy	17.7	15.6
47.4-47.6	Resection of Small Intestine or Colon	22.7	21.6
58.1-58.3	Prostatectomy	15.1	12.6

Source: Unpublished tabulations from the National Center for Health Statistics (NCHS).

Length of Stay at Selected Percentiles, 1972 and 1977

Does the decline in average length of stay reflect the fact that long staying cases have been curtailed through utilization review? Or has there been a general shortening of the duration of stay for all cases? To answer these questions, it is necessary to examine length of stay at different percentiles for specific conditions.

Table 8 shows the mean length of stay for selected conditions and surgeries in 1972 and 1977 and the length of stay at the 10th, 25th, 50th, 75th and 90th percentiles of the distribution of cases ordered by length of stay. For most conditions and procedures shown, length of stay at the 75th and 90th percentile of the distribution was shorter

in 1977 compared to 1972. For example, in 1972, 90 percent of the cases hospitalized for Diabetes Mellitus stayed 25 days or less while the remaining 10 percent stayed more than 25 days. In 1977, 90 percent of the cases with that condition stayed only 22 days or less. But there was also a general shortening of length of stay for many conditions at the 25th and 50th percentiles between 1972 and 1977. For cataract patients, there was a shortening of the hospital stay by two days at the 75th percentile and by three days at the 90th percentile, and at the 50th and 25th percentiles by one day. Thus the data indicate that there has been a general decrease in long staying patients as well as a general shortening of stays for patients at all percentiles of the distribution for many conditions.

TABLE 8
Short-Stay Hospital Use: Average Length of Stay and Length of Stay at Specified Percentiles, for Selected Conditions and Surgeries, Medicare Enrollees Aged 65 Years and Over, U.S., 1972 and 1977

ICDA-8 Code	Diagnostic Category	Average Length of Stay (Days)	Length of Stay (in days) At Specified Percentile					
			10th	25th	50th	75th	90th	
174	Malignant Neoplasm Of Breast	1972	14.3	4	7	11	16	27
		1977	12.2	3	6	10	15	24
250	Diabetes Mellitus	1972	12.9	3	5	9	15	25
		1977	11.5	3	5	9	14	22
374	Cataract	1972	6.9	3	4	5	7	11
		1977	4.6	2	3	4	5	8
410	Acute Myocardial Infarction	1972	16.0	1	6	15	21	29
		1977	13.2	1	5	13	18	24
480-486	Pneumonia	1972	12.5	3	6	9	15	23
		1977	11.6	3	6	9	14	22
550	Inguinal Hernia	1972	8.6	3	5	7	9	13
		1977	7.3	3	4	6	9	12
600	Hyperplasia of Prostate	1972	12.4	4	6	10	15	22
		1977	10.3	3	6	9	13	19
CPT-1 Code	Surgical Category							
0470	Radical Mastectomy	1972	13.1	7	8	11	15	20
		1977	11.4	6	8	10	13	18
1150	Reconstruction of Hip	1972	23.7	11	15	20	28	38
		1977	21.7	11	15	19	25	35
3375	Hemorrhoidectomy	1972	9.7	4	5	7	11	16
		1977	8.8	4	5	7	10	15

Source: Medicare Statistical System

Distribution of Discharges by Length of Stay, 1967 and 1977

Changes in case mix that have occurred over time as well as the general shortening of stays for most conditions have resulted in significant changes in the overall distribution of cases by length of stay intervals.

Table 9 shows the distribution of discharges by length of stay intervals in 1967 and 1977 for all patients combined and according to whether the patient was discharged alive or dead. For all cases combined, there was a notable decline in the percentage of long-staying cases. In 1977, only 10.8 percent of all patients stayed more than 3 weeks while 17.3 percent of the patients were hospitalized that long in 1967. There was also an increase in the percentage of relatively short-staying patients. Of the total cases, 23.7 percent were discharged within 2-5 days in 1967 while 30.5 percent were discharged with that short of a stay in 1977.

The distribution of discharges for patients discharged dead is considerably different from the distribution for patients discharged alive. Of those discharged dead, a high percentage occur on the first day (20.0 percent in 1967

and 20.6 percent in 1977). In fact, of the total cases discharged the first day, death accounts for more than 44 percent of the discharges in 1967 and 33 percent in 1977. A comparison of the distributions over time for patients discharged alive as well as for patients discharged dead shows that there was a decrease in the proportion of cases discharged after being hospitalized more than three weeks. The total number of patients discharged after three weeks declined from 875,000 in 1967 to 848,000 in 1977. This suggests that there has been some change in the management of chronically and terminally ill patients. Very likely such patients are more frequently discharged when they are stabilized and then admitted at a later stage.

Comparison of Trends for Persons Under Age 65

The trend in average length of stay for persons under age 65 years has also been downward. Data from NCHS show that between 1967 and 1977 average length of stay declined from 5.5 days to 4.2 days for the age group under 15 years, from 6.2 days to 5.3 days for the age group 15-44 and from 10.1 days to 8.5 days for the group 45-64 years of age.

TABLE 9
Short-Stay Hospital Use: Percentage Distribution of Discharges by Length of Stay Intervals and by Discharge Status for Medicare Enrollees Aged 65 Years and Over, All Areas, 1967 and 1977

Length of Stay (Days)	Discharge Status					
	1967			1977		
	Total	Alive	Dead	Total	Alive	Dead
Total Discharges (In thousands)	5,055	4,557	498	7,866	7,345	521
In Percent	100.0	100.0	100.0	100.0	100.0	100.0
1 day	4.5	2.9	20.0	4.2	3.0	20.6
2-3 days	11.1	10.9	13.0	14.8	14.9	13.7
4-5 days	12.6	13.0	9.2	15.7	16.1	9.9
6-7 days	12.4	12.9	7.5	13.4	13.8	7.8
8-10 days	14.9	15.6	8.9	15.7	16.1	9.4
11-14 days	13.6	14.1	9.4	13.3	13.6	9.5
15-21 days	13.6	13.9	10.9	12.1	12.2	10.9
22-28 days	7.0	6.9	6.8	5.1	5.0	6.7
29-35 days	3.8	3.7	4.6	2.4	2.3	4.0
36-42 days	2.2	2.1	3.0	1.3	1.2	2.6
43 days and over	4.3	4.0	6.7	2.0	1.8	5.1
Mean	13.8	13.8	13.9	10.9	10.8	12.6

Source: Medicare Statistical System.

Trends in the Days of Care Rate

The number of days of care per 1,000 persons depends upon the discharge rate and the average length of stay. Because the discharge rate for Medicare patients has been rising over time while average length of stay has been declining at about the same pace, they have largely offset each other. Thus, the range in the rate of days of care has been relatively small over time, with the number of days of care per 1,000 enrollees moving up or down a little each year (Figure 1 and Table 4) depending upon whether the rise in the discharge rate or the decline in the average length of stay was the more dominant factor.

On the basis of the count of days, the data indicate that Medicare beneficiaries used a little more in the way of days of care per 1,000 in 1977 (3,651 days) than they did in 1967 (3,575 days). Despite this fact, the Medicare population experienced considerably more hospital episodes in 1977 than it did in 1967. As shown by the trends in the user rate and the multiple stay rate, substantially more persons were hospitalized at least once and more than once in 1977 than was the case in 1967—and more were operated on. For example—because of the large decline in average length of stay for patients operated on for cataract—in the same number of days of hospital care twice as many patients could have been treated for cataract in 1977 as could be treated in 1967. It appears, moreover, from preliminary data for the years following 1977 that the upward trend in the discharge rate is continuing.

The next section focuses on regional variations in short-stay hospital utilization. It describes variations in the discharge rate and average length of stay and examines several variables in the regions in an attempt to explain these variations.

Regional Differences in Hospital Use

As noted earlier, differences in the four U.S. census regions⁷ in average length of stay and in the rate of hospitalization have been puzzling to those concerned with the administration of the Medicare program. The overall patterns of hospital use in the regions are quite distinctive relative to each other, and each region's pattern has been notably consistent over the time period studied.

Regional Patterns in the Discharge Rate, Average Length of Stay, and Days of Care⁸

The Northeast has been notable as the region having the highest average length of stay and the lowest discharge rate. It might be expected that these opposite tendencies would balance each other so that the rate of days of care in the Northeast would be near the U.S. average. In point of fact, the number of days of care per 1,000 Medicare enrollees in the Northeast was highest in the Nation in 1976 and 1977 and second highest in all previous years—because average length of stay is extremely long in the Northeast, relative to the other regions.

⁷ The four Census Regions are defined as follows: The *Northeast* region consists of Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, Connecticut, New York, New Jersey and Pennsylvania. The *North Central* region consists of Ohio, Indiana, Illinois, Michigan, Wisconsin, Minnesota, Iowa, Missouri, North Dakota, South Dakota, Nebraska and Kansas. The *South* region consists of Delaware, Maryland, District of Columbia, Virginia, West Virginia, North Carolina, South Carolina, Georgia, Florida, Kentucky, Tennessee, Alabama, Mississippi, Arkansas, Louisiana, Oklahoma and Texas. The *West* region consists of Montana, Idaho, Wyoming, Colorado, New Mexico, Arizona, Utah, Nevada, Washington, Oregon, California, Alaska and Hawaii.

⁸ With one exception, rates reported in this chapter by geographic area are based upon the residence of the enrollees. In the section providing a multi-variate analysis of regional differences, rates are based on the location of the providers.

The pattern in the South is generally opposite to that of the Northeast. The South has had the highest discharge rate in the Nation but a relatively low average length of stay, resulting in a days of care rate at about the national average.

The West has been distinguished as the region with the lowest average length of stay and with a relatively low discharge rate. These low values combine to produce a rate of days of care per 1,000 Medicare enrollees in the West that is strikingly lower than the other three regions.

The pattern in the North Central region is generally opposite to that of the West. The discharge rate is relatively high and average length of stay is also relatively high. These high values combine to produce a rate of days of care that has been highest in the Nation every year except for 1976 and 1977. Figure 3 shows the discharge rate, average length of stay and the days of care rate in the four regions during the period 1967-77. The figure illustrates that the trend in each of the regions parallels the national trends with regard to each of the three utilization measures. The figure also shows that the relative position of the regions in each of these measures has remained nearly constant over time.

It should be noted that regional differences in average length of stay increased over time and were substantially more pronounced in 1977 than regional differences in the discharge rate. As shown in Table 10, in 1967 the average length of stay in the Northeast (the highest region) was 36 percent greater than in the West (the lowest region); by 1977 average length of stay in the Northeast was 49 percent greater than in the West. The widening of the regional variation in average length of stay between 1967

and 1977 reflects the fact that of all the regions, the West, with the shortest average length of stay in 1967, exhibited the greatest percent decline in average length of stay. In contrast, the percent difference in the discharge rate between the South (the highest region) and the Northeast (the lowest region) decreased from 30 percent in 1967 to 22 percent in 1977.

As shown in Table 10, differences increased between the highest and lowest regions in the rate of days of care in the period 1967 to 1977. Regional differences increased primarily because the rate in the West in 1977 fell to 24 percent below the U.S. average. In contrast, the rate in the Northeast was 9 percent above the U.S. average in 1977. Thus, beneficiaries enrolled in Medicare in the Northeast had a rate of days of care that was 43 percent greater than beneficiaries had in the West. The difference was almost as great for beneficiaries in the North Central region, where the rate was 40 percent greater than in the West.

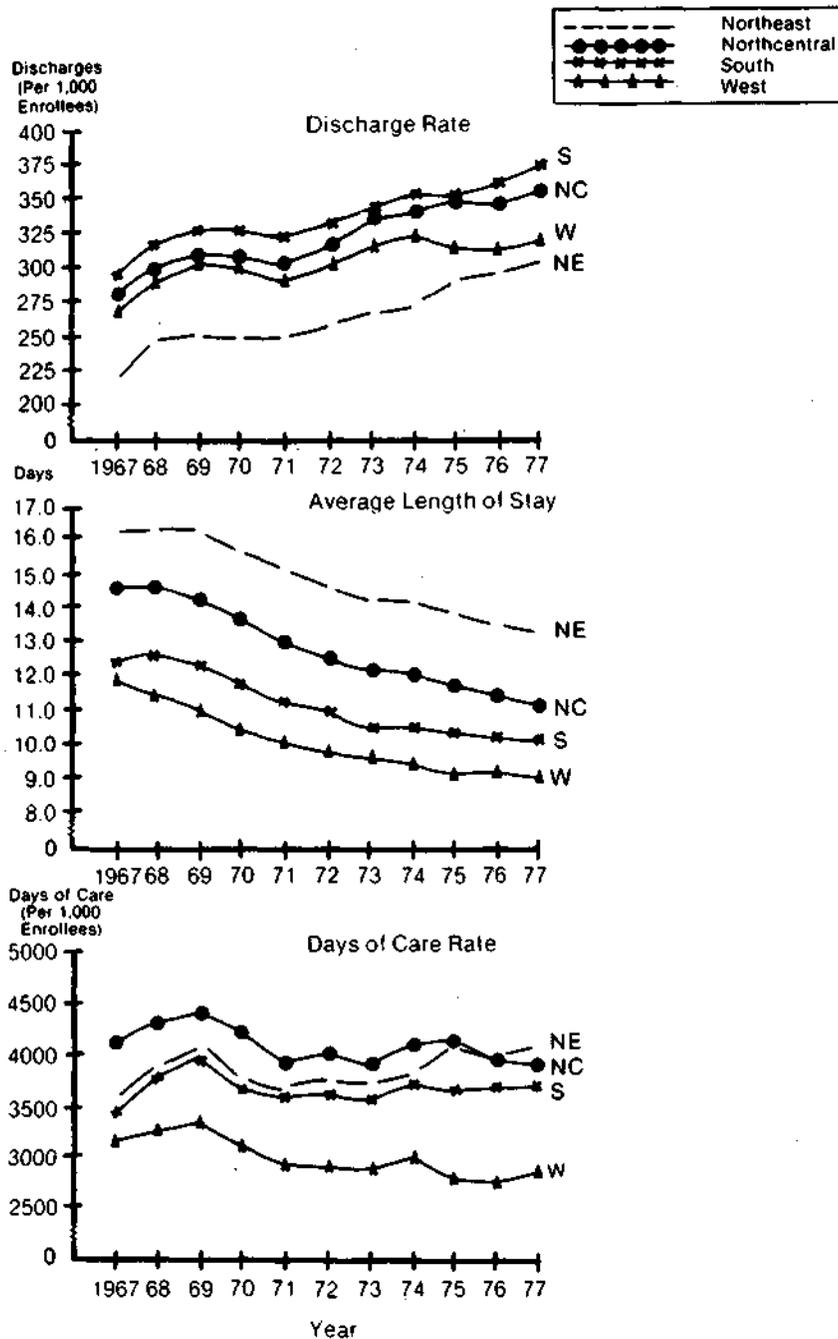
Regional variations in the discharge rate, in average length of stay, and in days of care raise questions about the population-at-risk in the regions. Are the populations in the regions sufficiently different by age, sex, or race to explain regional differences in hospital use? The particularly wide variation in average length of stay raises a series of questions: Does case mix differ sufficiently by region to help explain regional differences in average length of stay? How does length of stay vary by region at specified percentiles? Do the regional variations in average length of stay that occur for the Medicare population also occur for the population under age 65? These questions are discussed next.

TABLE 10
Short-Stay Hospital Use: Discharge Rate, Average Length of Stay, and Days of Care Rate for Medicare Enrollees Aged 65 Years and Over, by U.S. Census Region, 1967 and 1977

Region	Discharges Per 1,000 Enrollees				Average Length of Stay				Days of Care Per 1,000 Enrollees			
	1967		1977		1967		1977		1967		1977	
	Number	Ratio: Region to U.S.	Number	Ratio: Region to U.S.	Number	Ratio: Region to U.S.	Number	Ratio: Region to U.S.	Number	Ratio: Region to U.S.	Number	Ratio: Region to U.S.
United States	262	1.00	339	1.00	13.8	1.00	10.9	1.00	3607	1.00	3696	1.00
Northeast	217	.83	301	.89	16.1	1.17	13.3	1.22	3501	.97	4017	1.09
North Central	277	1.06	354	1.04	14.6	1.06	11.1	1.02	4052	1.12	3946	1.07
South	283	1.08	368	1.09	12.3	.89	10.0	.92	3474	.96	3692	1.00
West	268	1.02	317	.94	11.8	.86	8.9	.82	3151	.87	2816	.76
Percent Difference Between Highest and Lowest Region	30		22		36		49		29		43	

Source: Medicare Statistical System.

FIGURE 3
Short Stay Hospital Use: Discharge Rate, Average Length of Stay and Days of Care Rate for Medicare Beneficiaries Aged 65 Years and Over, by Census Region, 1967-77



Age, Sex, and Race Differences by Region

The distribution of the Medicare population by age, sex, and race varies somewhat by region (Table 11). The most notable difference is by race, with the South having approximately 55 percent of all non-white persons enrolled in the Medicare program in 1977.

To determine what impact differences in the demographic characteristics of the population have on the discharge rate and average length of stay, these variables were standardized. For each region, the expected value was computed using age-sex-race specific rates in 1977 for all areas combined and the region's own population composition (that is, the indirect method of standardization). Except for the South, the expected value for the discharge rate was very nearly that for the total

population. In the South the expected value of the discharge rate was a little lower, reflecting the fact that non-white persons (proportionately higher in the South) have lower discharge rates than white persons. Consequently, the adjusted or standardized discharge rate in the Northeast, North Central and West is very nearly the same as its actual value while in the South the adjusted value rises a little from 367.7 to 373.4. Standardizing the length of stay had only the smallest effect, raising the average length of stay only 0.1 days in the Northeast and North Central regions, decreasing it 0.1 days in the West, and in the South there was no change (Table 12). On the basis of these calculations it appears that age, sex, and race differences in the composition of the population in the four U.S. census regions play only a minimal role in the observed regional variations.

TABLE 11
Short-Stay Hospital Use: Distribution of Medicare Enrollees Aged 65 Years and Over by Age, Sex, and Race, and U.S. Census Regions, 1977

Region	Number of Part A Enrollees (in millions)	Total	Percent Distribution						
			Age		Sex		Race		
			Under 75 Years	75+	Men	Women	White	All Other Races	Unknown
All Areas	23.5	100.0	59.6	40.4	40.6	59.4	88.9	8.4	2.7
Northeast	5.7	100.0	58.9	41.1	39.2	60.8	92.2	5.2	2.6
North Central	6.3	100.0	58.3	41.7	40.5	59.5	92.2	5.1	2.7
South	7.3	100.0	61.1	38.9	40.9	59.1	82.9	14.4	2.7
West	3.7	100.0	60.1	39.9	41.9	58.1	90.9	6.4	2.7

Source: Medicare Statistical System.

TABLE 12
Short-Stay Hospital Use: Actual and Adjusted
Discharge Rate and Average Length of Stay for
Medicare Enrollees Aged 65 Years and Over, by U.S.
Census Region, 1977¹

Region	Number of Discharges per 1,000 Enrollees	
	Actual	Adjusted
All Areas	335.1	—
Northeast	301.3	299.2
North Central	354.0	349.0
South	367.7	373.4
West	317.3	315.4

Region	Average Length of Stay	
	Actual	Adjusted
All Areas	10.9	—
Northeast	13.3	13.4
North Central	11.1	11.2
South	10.0	10.0
West	8.9	8.8

¹ Discharge rate and ALOS were adjusted for age, sex, and race to the entire enrolled population using the indirect adjustment method.

Source: Medicare Statistical System.

Regional Differences in Case Mix

Tests have been made to determine whether the large differences in average length of stay observed by census region and by State reflect differences in case mix. In one test we focused on Medicare hospital discharge data from two extremely different States: California and New York. In 1972 the average length of stay for Medicare patients in California was 10 days while in New York the average stay was 16 days. New York's average length of stay was adjusted by using the same diagnostic case mix as experienced in California along with New York's actual length of stay for each specific condition. The adjustment had an insignificant effect, lowering New York's average length of stay by only 0.1 days. On the basis of this test and similar tests for other areas it appears that differences in case mix have little effect (if any) in the regional differences in length of stay. Rather, the data indicate that average length of stay varies by region because of actual differences in length of stay for the same type of case, as discussed next.

Table 13 shows the mean length of stay for three common diagnoses—pneumonia, cataract and fracture of neck of femur, closed—for three age groups, and according to whether there was a single or multiple diagnoses. It can be observed that for each condition average length of stay is longer in the age group 75-84 compared to 65-74, although sometimes shorter for the age group 85 and over—perhaps reflecting (for pneumonia) a higher proportion of stays ending by death. As shown, average length of stay is greater if there are multiple diagnoses also. In nearly every case, however, the average length of stay is longest in the Northeast, shortest in the West with the other two regions occupying their usual position in between. Tabulations for many other conditions and for other years show the same results, that is, length of stay is generally longest in the Northeast, followed by the North Central region, the South, and the West.

TABLE 13
Short-Stay Hospital Use: Average Length of Stay for Medicare Enrollees Aged 65 Years and Over, by Age, Number of Diagnoses, for Selected Conditions, by U.S. Census Region, 1972

Region	Average Length of Stay (Days)					
	Age				Number of Diagnoses	
	Total	65-74	75-84	85 +	Single	Multiple
Pneumonia (ICDA-8:480-486)						
United States	12.5	11.9	12.9	13.0	10.2	13.5
Northeast	14.9	14.0	15.4	15.8	12.4	15.9
North Central	13.0	12.5	13.3	13.5	10.5	13.9
South	11.6	11.1	12.1	12.0	9.5	12.7
West	10.4	10.1	10.8	10.4	8.3	11.1
Cataract (ICDA-8:374)						
United States	6.9	6.7	7.0	7.4	6.5	7.8
Northeast	7.3	7.1	7.4	8.0	7.0	8.2
North Central	7.4	7.3	7.5	7.9	7.0	8.4
South	6.7	6.5	6.9	7.5	6.5	7.8
West	5.5	5.3	5.6	6.0	5.3	6.3
Fracture of Neck of Femur, closed (ICDA-8:820.4)						
United States	22.5	21.7	23.2	22.0	20.8	25.1
Northeast	26.6	25.7	28.0	25.1	24.6	29.9
North Central	23.7	23.2	23.9	23.7	21.6	26.4
South	20.2	19.3	20.7	19.9	18.5	23.1
West	18.2	17.8	19.0	17.1	17.6	19.0

Source: Medicare Statistical System

Regional Differences in Length of Stay at Selected Percentiles

To shed some light on regional differences in length of stay it is helpful to examine length of stay at different percentiles for specific conditions by region. Table 14 shows the mean length of stay and the length of stay at specific percentiles, by region, for the same conditions and surgeries shown for the U.S. in Table 8. For nearly every condition and surgery, average length of stay was longest in the Northeast, followed by the North Central region, the South and the West. Length of stay at the 75th and the 90th percentiles was nearly always longest in the Northeast region, shortest in the West with the other two regions in positions in between. This indicates that long staying cases are more frequent in the Northeast and North Central regions. But length of stay at the 25th and 50th percentiles also varies by region and in the same pattern as shown at the 75th and 90th percentiles. Thus, the data indicate that length of stay varies regionally because of differences in long staying cases and because there is also a general shortening of the duration of the hospital stay for all patients in the West and the South.

Regional Differences in Average Length of Stay for the Population Under Age 65

Data collected by NCHS for the entire population indicate that the length of stay has been longer for all age groups in the Northeast region followed by the North Central region, the South and the West. In 1977 for example, the average length of stay for the group under 15 years of age was 4.5 days in the Northeast, 4.3 days in the North Central region, 4.1 days in the South and 3.7 days in the West. For the group 15-44 years of age the figures were 5.8 days, 5.7, 5.0, and 4.6 for the same regions; and for the age group 45-64 years of age the figures were 9.9 days, 8.9, 8.0 and 6.8 in that order. These relationships by region and by age group held true in 1967 and in 1972.

On the basis of the data thus far it appears that there are factors in the regions other than the characteristics of the population (or their medical conditions) that influence regional variations in hospital use. This subject is examined next, using a multi-variate approach.

TABLE 14
Short-Stay Hospital Use: Average Length of Stay and Length of Stay at Specified Percentiles for Medicare Enrollees Aged 65 Years and Over for Selected Conditions and Surgeries, U.S. Census Regions, 1972

ICDA-8 Code	Diagnostic Category	Average Length of Stay (Days)	Length of Stay (in days) At Specified Percentile				
			10th	25th	50th	75th	90th
174	Malignant Neoplasm of Breast						
	Northeast	16.1	4	8	12	18	29
	North Central	15.1	4	7	11	17	28
	South	13.7	4	7	10	16	25
	West	11.1	3	5	8	12	20
250	Diabetes Mellitus						
	Northeast	15.7	4	7	11	18	30
	North Central	13.2	3	6	9	16	25
	South	11.4	3	5	8	13	21
	West	10.0	2	4	7	12	19
374	Cataract						
	Northeast	7.3	3	4	6	7	11
	North Central	7.4	3	4	6	8	12
	South	6.7	3	4	5	7	11
	West	5.5	3	3	4	6	8
410	Acute Myocardial Infarction						
	Northeast	17.8	2	8	17	23	31
	North Central	16.6	1	7	15	22	30
	South	15.0	1	6	14	20	27
	West	13.5	1	6	13	18	24
480-486	Pneumonia						
	Northeast	14.9	3	7	11	17	28
	North Central	13.0	3	6	10	16	24
	South	11.6	3	5	9	14	21
	West	10.4	3	5	8	13	19
550	Inguinal Hernia						
	Northeast	10.0	4	6	8	11	16
	North Central	9.0	4	5	7	10	14
	South	8.4	4	5	7	9	13
	West	6.4	3	4	5	7	10
600	Hyperplasia of Prostate						
	Northeast	15.2	5	8	12	18	27
	North Central	13.0	4	7	10	16	23
	South	11.6	3	6	9	14	20
	West	9.2	3	5	7	11	16
CPT-1 Code	Surgical Category						
0470	(Radical Mastectomy)						
	Northeast	14.5	7	9	12	16	22
	North Central	14.0	7	9	11	15	22
	South	13.1	7	8	11	15	20
	West	9.9	5	7	8	11	14
1150	(Reconstruction of Hip)						
	Northeast	27.3	13	17	23	32	45
	North Central	25.2	12	17	22	29	39
	South	22.2	10	14	19	26	36
	West	20.2	10	14	18	23	30
3375	(Hemorrhoidectomy)						
	Northeast	9.9	4	5	8	11	16
	North Central	10.6	4	6	8	12	19
	South	9.7	4	6	8	11	16
	West	7.9	3	5	6	9	12

Source: Medicare Statistical System

Multi-Variate Analysis of Regional Variations in Hospital Use⁹

Multiple regression is a useful technique for addressing a problem in which there are many possible factors influencing a selected variable under study. In this case, hospital utilization, as measured by average length of stay or the discharge rate, is viewed as a function of the characteristics of the population-at-risk (that is, demand) in the regions, and other factors, including the supply of medical resources in an area and the physical or structural setting in which the population resides. Regression analysis is used here to test for the effect of certain independent variables on utilization and to test for the effect of "region" on utilization, independent of demand, supply, and structural characteristics.¹⁰

Certain aspects of regression analysis make comparisons with the findings from previous regression studies difficult. First, the unit of analysis varies among studies. Regression studies can be done on individuals, hospitals, and geographic areas (HSAs, PSROs, States, etc). It is important to note that the unit of analysis can affect the expected relationship among the variables. For example, age in years may be an important determinant of use for individuals but age as an aggregate measure (median age or percent aged 75 and over) may not be predictive of hospital use in defined areas. The appropriateness of certain variables also varies by unit of analysis. Hospital size can be important when examining differences among hospitals but may become less useful when examining regional variations in use.

Second, the dependent variables are often defined somewhat differently among studies. This analysis is concerned with hospital utilization by aged Medicare beneficiaries. Many other studies have examined use by the entire population or by other age subgroups. For some variables this does not affect the hypothesized relationships. It is expected, for example, that increases in bed supply will be associated with increases in Medicare utilization, a relationship found in studies of the general population. Other variables are not appropriate for an analysis of Medicare utilization. Hospital insurance coverage, for example, would not be predictive since there is near universal Medicare coverage.

A third area involves data and measurements of the variables. The validity and reliability of the data varies from study to study. The measurement of variables also is not constant among studies. Socio-economic status can be measured as per capita income, percent of households below the poverty level, percent unemployed or percent of adults with a high school or college education, to name a few. Beds can be defined in different ways such as all short-term hospital beds or beds in general hospitals.

⁹ The author wishes to acknowledge her appreciation to Paul W. Eggers, Office of Research, Health Care Financing Administration, who designed this multi-variate analysis and wrote the text for this section.

¹⁰ This analysis uses an ordinary least squares estimation technique. Alternate models have been postulated to explain utilization behavior. (See Anderson, 1980, for an example of a two-stage least squares estimation procedure.)

Fourth, model specification will vary from study to study. The decision to include or exclude variables is determined not only by the predictive value of the variables but availability of the data and by the intent of the study. For example, in the evaluation of the PSRO program a base year utilization rate was included as an independent variable in the regression to assess the change in utilization over time rather than the variation in utilization at a point in time (HCFA, 1980). In the analysis presented here regional "dummy" variables are included to test for a regional effect after controlling for other relevant variables. Many studies will not include regional dummy variables because they have no explanatory relevance per se.

Model

Two models were specified in this analysis. The first relates the average length of stay for Medicare beneficiaries in 1979 to a number of demographic and other variables. The second relates the discharge rate for Medicare beneficiaries in that year to these same variables. The unit of analysis is the Professional Standards Review Organization area.¹¹

The demographic variables known to impact on average length of stay and the discharge rate are age, sex and race. Specifically, given historical patterns discussed earlier in this chapter, it is expected that an increase in the percent of Medicare enrollees who are 75 years of age and over will increase both average length of stay and the discharge rate; an increase in the percent of Medicare enrollees who are female will increase average length of stay, but decrease the discharge rate; and an increase in the percent of non-white Medicare enrollees will increase average length of stay, but decrease the discharge rate.

The supply and structural variables expected to affect Medicare utilization are the short-stay hospital bed supply, nursing home bed supply, physician supply, population density and occupancy rate. The hypothesized relationships are as listed below.

(1) An increase in the short-stay bed supply will increase both average length of stay and the discharge rate. This is a test of the Roemer effect (that is, the existence of available beds creates a demand to fill those beds).

(2) An increase in the nursing home bed supply will decrease average length of stay in short-stay hospitals but have no effect on the discharge rate. This hypothesis is predicated on the assumption that there is an insufficient supply of nursing home beds for Medicare beneficiaries in some areas and, thus, there will be an extension in length of stay for some patients waiting for beds in nursing homes.

¹¹ The PSRO area was selected as the unit of analysis because of an existing file containing variables of interest by PSRO area. In 1979 there were 195 PSRO areas in the United States. Eight Los Angeles PSRO areas were combined into one PSRO area and five Massachusetts PSRO areas were combined into one PSRO area in order to calculate rates. Rates used in this analysis are provider-based and take into account the flow of patients in and out of the PSRO area for services. (For a description of the methodology used to create provider-based rates see Deacon, *et al*, 1979).

(3) An increase in the supply of physicians will increase the discharge rate but not the average length of stay. Physicians largely determine the care that patients receive, particularly the decision to hospitalize. Therefore, all other things being equal, it is hypothesized that where there are more physicians there will be more decisions to hospitalize patients.

(4) An increase in population density will increase average length of stay and decrease the discharge rate. This is based on observed utilization differences by Medicare beneficiaries in Standard Metropolitan Statistical Areas (SMSA) and non-SMSA areas.

(5) Finally, it is expected that an increase in the occupancy rate will increase both average length of stay and the discharge rate. To a great extent, hospital revenues are dependent upon maintaining a sufficiently high occupancy rate. It is expected, therefore, that hospitals will encourage longer lengths of stay and/or increased admissions as necessary to maintain a desired occupancy rate and that physicians will be responsive to these pressures.

It could be argued that using occupancy to predict average lengths of stay and discharge rates represents a tautology. After all, occupancy is another utilization measure and it would seem that, by definition, average length of stay and discharges would have to rise with increases in occupancy. However, Medicare patients represent only one-third of all hospital discharges. Medicare use could actually be lower in areas with high occupancy rates if a larger than average share of resources were allocated to other patients. Further, total days (that is, occupancy) are the product of discharges and average length of stay. It is an empirical question as to whether average length of stay or discharges are more directly affected by the occupancy rate. The specific independent variables selected were:

Variable	Measure
Age	Percent of Medicare enrollees aged 75 and over
Sex	Percent of Medicare enrollees who are female
Race	Percent of Medicare enrollees who are non-white
Short-stay hospital beds	Short-stay hospital beds/1,000 Medicare enrollees
Nursing home beds	Nursing home (SNF and Intermediate Care) beds/1,000 Medicare enrollees
Physicians	Total physicians/1,000 Medicare enrollees
Density	Percent of total population living in Standard Metropolitan Statistical Areas
Occupancy	Percent occupancy in short-stay hospitals

In addition, three dummy variables which take a value of zero or 1 were added to model the regional differences. The West serves as the comparison area. Therefore, each dummy variable measures the difference between one of the three remaining regions and the West, as will be shown later.

The two models developed for this analysis were tested using the discharge rate and average length of stay for Medicare enrollees aged 65 years of age and over, by PSRO area, in 1979. Medicare data were also used for the demographic variables. The supply and structural variables data were obtained from the Area Resource File¹² using data for the latest available year.

Table 15 shows the mean value in each census region and the range of values of the independent variables in the PSRO areas. The percent of Medicare enrollees who were 75 years of age and over did not vary greatly across census regions (39.1 percent to 41.9 percent).

At the PSRO level, the range was from 31.1 percent to 46.7 percent. Similarly, at the regional level the percent of Medicare enrollees who were female was relatively constant, with all regions having approximately 60 percent female. Across PSRO areas, the range was from 48.4 percent to 64.1 percent. Race varied significantly across census regions and PSRO areas. Fourteen percent of aged Medicare beneficiaries in the South were non-white, whereas only 5 to 7 percent were non-white in the other three census regions. Across PSRO areas the range was quite large, with a low in some areas of less than one percent non-white to a high of nearly 71 percent non-white.

The supply of short-stay hospital beds was lowest in the Northeast (40.1 beds per 1,000 Medicare enrollees) and highest in the North Central region (48.5 beds per 1,000 Medicare enrollees). The nursing home bed supply was also lowest in the Northeast (40.7 beds per 1,000 Medicare enrollees) and highest in the North Central region (57.3 beds per 1,000 Medicare enrollees). Physician ratios were lowest in the North Central and South regions (12.1 physicians per 1,000 Medicare enrollees, and highest in the West (17.4 physicians per 1,000 Medicare enrollees). Occupancy rates vary substantially across regions as well. Occupancy rates were about 81 percent in the Northeast, 74 percent and 72 percent in the North Central and South regions, respectively, and lowest in the West at 67 percent. Across PSRO areas the range in occupancy was from 55 percent to 88 percent. Finally, population density (as measured by the percent of the total population living in SMSAs) was highest in the Northeast and West regions (84.4 percent and 80.8 percent, respectively) and lowest in the South (64.4 percent). In each census region population density by PSRO ranged from completely rural (no SMSAs in PSRO area) to completely urban (100 percent living in SMSAs).

¹² Maintained by the Bureau of Health Manpower, Public Health Service, the Area Resource File contains economic, demographic, and health resource data by county.

TABLE 15
Independent Variables Used in the Regression Analyses: Mean Value in U.S. Census Region and Range in PSRO Areas

Variable	Mean	Standard Deviation	Highest PSRO area	Lowest PSRO area	Variable	Mean	Standard Deviation	Highest PSRO area	Lowest PSRO area
Age (Medicare enrollees: percent 75 years and over)					Short-stay beds (per 1,000 Medicare enrollees)				
Northeast	41.3	1.8	46.7	36.9	Northeast	40.1	7.6	61.2	24.7
North Central	41.9	2.1	45.6	36.6	North Central	48.5	6.7	64.0	32.3
South	39.1	2.3	44.4	33.0	South	45.7	12.8	79.4	17.8
West	40.3	2.9	45.1	31.1	West	41.6	23.3	164.0	26.2
Sex (Medicare enrollees: percent female)					Occupancy in short-stay hospitals (percent)				
Northeast	60.9	1.2	63.2	57.9	Northeast	80.8	4.7	88.3	68.6
North Central	59.7	1.6	62.6	54.9	North Central	73.7	5.2	82.4	60.9
South	59.2	2.3	64.1	53.2	South	72.4	4.7	85.5	65.5
West	58.2	3.1	62.3	48.4	West	67.0	4.6	75.6	54.5
Race (Medicare enrollees: percent non-white)					Physicians (per 1,000 Medicare enrollees)				
Northeast	5.5	5.2	22.3	.3	Northeast	15.5	5.0	27.4	6.8
North Central	5.3	4.5	23.4	.2	North Central	12.1	4.4	24.8	5.0
South	14.2	11.0	51.8	2.6	South	12.1	8.8	49.3	4.8
West	6.8	12.1	70.9	.6	West	17.4	6.6	41.5	10.0
Density (Percent of total population living in SMSAs)					Nursing home beds (per 1,000 Medicare enrollees)				
Northeast	84.4	29.2	100.0	.0	Northeast	40.7	17.7	84.0	8.8
North Central	70.3	29.3	100.0	.0	North Central	57.3	17.4	106.2	19.2
South	64.4	29.4	100.0	.0	South	40.8	17.6	85.1	9.4
West	80.8	32.9	100.0	.0	West	49.9	17.8	105.0	12.3

Source: Medicare Statistical System: Age, Sex, Race, (1979)
Area Resource File: Short-stay beds, physicians, and occupancy, (1978); Density, (1977); Nursing home beds, (1976)

Table 16 shows the mean value of the dependent variables in the census regions and the range of values in the PSRO areas in 1979. Length of stay in the Northeast averaged 13.1 days or 51 percent greater than in the West. The discharge rate averaged 381 discharges per 1,000 Medicare enrollees in the South or 20 percent greater than in the Northeast. These regional variations are consistent with the trends shown in Table 10, that is, regional differences in average length of stay are widening while regional differences in the discharge rate are declining.

It is important to observe that the discharge rate and average length of stay vary considerably within regions. Table 16 shows the highest and lowest values in the PSRO areas within each region. The Table also shows the semi-interquartile range which gives the value of these variables at the 75th and 25th percentiles when PSRO areas are ordered from highest to lowest on these variables.

Figures 4-6 show regional variations, and within region variations in the discharge rate, average length of stay and the days of care rate in 1974 and 1979. These Figures also illustrate the trends over time in these variables.

Results

The results of the regression analysis are summarized in Table 17. The correlation matrix is shown in Table 18. The regression coefficients for all independent variables are presented for both the average length of stay and the discharge rate equations. T-values are in parentheses; in a sample of this size values greater than 1.98 are significant at the .05 confidence level. The R² values for the average length of stay and discharge rate regressions were .83 and .60, respectively, indicating that the models were fairly

good in explaining utilization rates. Most of the relationships postulated in the model specification were supported by the empirical data. There were, however, two notable exceptions. Occupancy, while strongly associated with increased average length of stay (ALOS), was negatively associated with the discharge rate. It would appear then that where overall occupancy levels are high, fewer Medicare patients are admitted, although the length of stay for those who are admitted tends to be longer. The second unexpected finding was the negative relationship between the physician-population ratio and the discharge rate. It was hypothesized that since physicians are largely responsible for most admissions, increases in physicians would be associated with higher discharge rates. Just the opposite was shown. It could be that this is an example of a substitution effect. That is by providing outpatient services, physicians represent an alternative to hospitalization and thus the discharge rate is lower where there are greater numbers of physicians.

The dummy variable coefficients show that even controlling for various demographic, supply, and structural variables, part of the regional variation still exists. The coefficient for the Northeast dummy variable in the equation for average length of stay was 1.9. Because this variable takes on the value of zero or one, the coefficient can be interpreted as the difference in the average length of stay between the Northeast and West regions, controlling for all other variables. Thus, there is a 1.9 day difference in average length of stay between the two regions which is attributed to the variable "region." Table 16 shows that the absolute difference in ALOS between the Northeast and West regions was 4.4 days (13.1 days and 8.7 days, respectively). Similarly, the observed difference in the discharge rate between the South and West regions was 50 discharges/1,000 Medicare enrollees. The

TABLE 16
Dependent Variables Used in the Regression Analysis: Mean Value in U.S. Census Region and Range in PSRO Areas, for Medicare Enrollees Aged 65 Years and Over, 1979

Variable	Mean (Days)	Standard Deviation	Range		Percent Difference	Semi-Interquartile Range		
			Highest PSRO area	Lowest PSRO area		PSRO Area at 75th Percentile	PSRO Area at 25th Percentile	Percent Difference
Average Length of Stay								
Northeast	13.1	1.7	16.6	9.9	68	14.0	11.6	21
North Central	10.8	1.1	13.7	8.7	57	11.4	9.8	16
South	9.8	1.4	14.3	8.0	79	11.3	9.2	23
West	8.7	.9	10.6	6.6	61	9.1	7.8	17
Number of Discharges per 1,000 Enrollees								
Northeast	317.0	28.8	391.4	279.8	40	342	296	16
North Central	370.2	35.1	458.2	316.2	45	394	345	14
South	381.0	46.6	458.0	278.0	65	402	321	25
West	331.1	32.2	396.4	249.8	59	349	306	14

Source: Medicare Statistical System

FIGURE 4
Short Stay Hospital Use: Discharge Rate for Medicare Beneficiaries Aged 65 Years and Over, by Census Region, 1974 and 1979

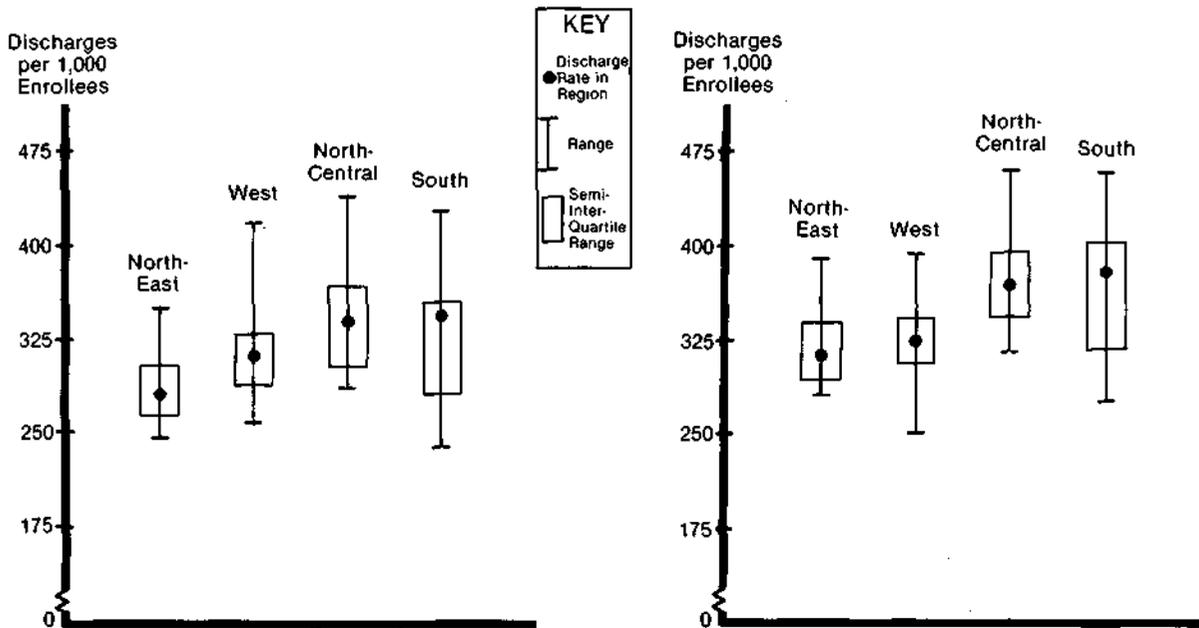


FIGURE 5
Short Stay Hospital Use: Average Length of Stay for Medicare Beneficiaries Aged 65 Years and Over, by Census Region, 1974 and 1979

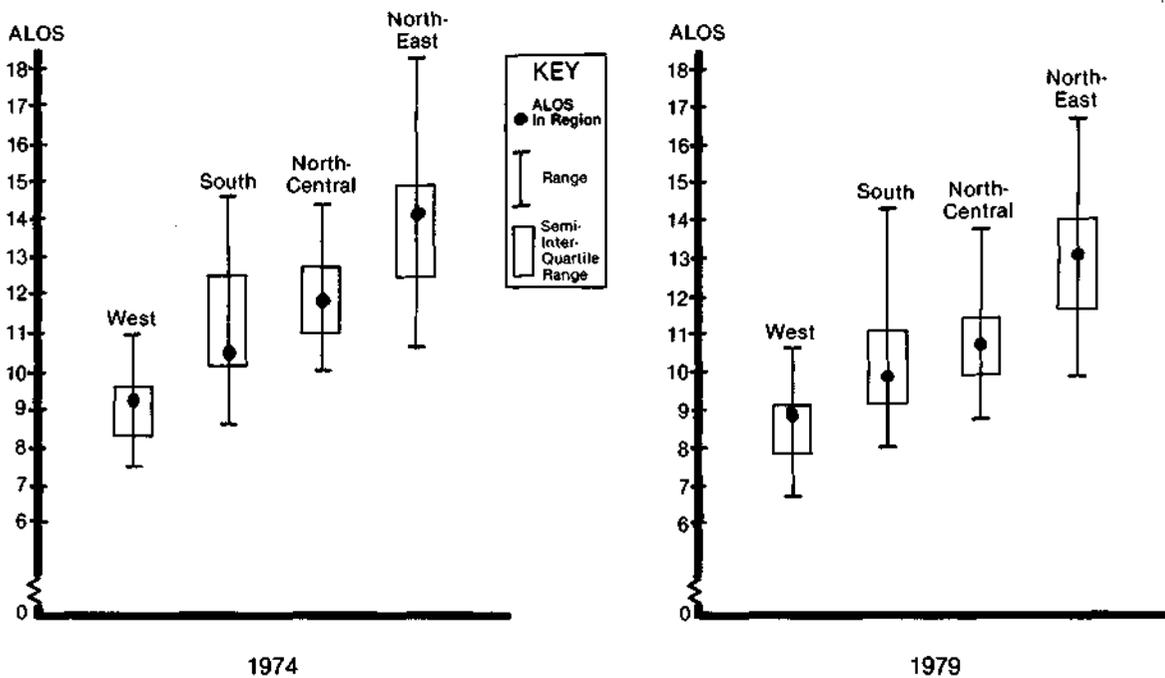
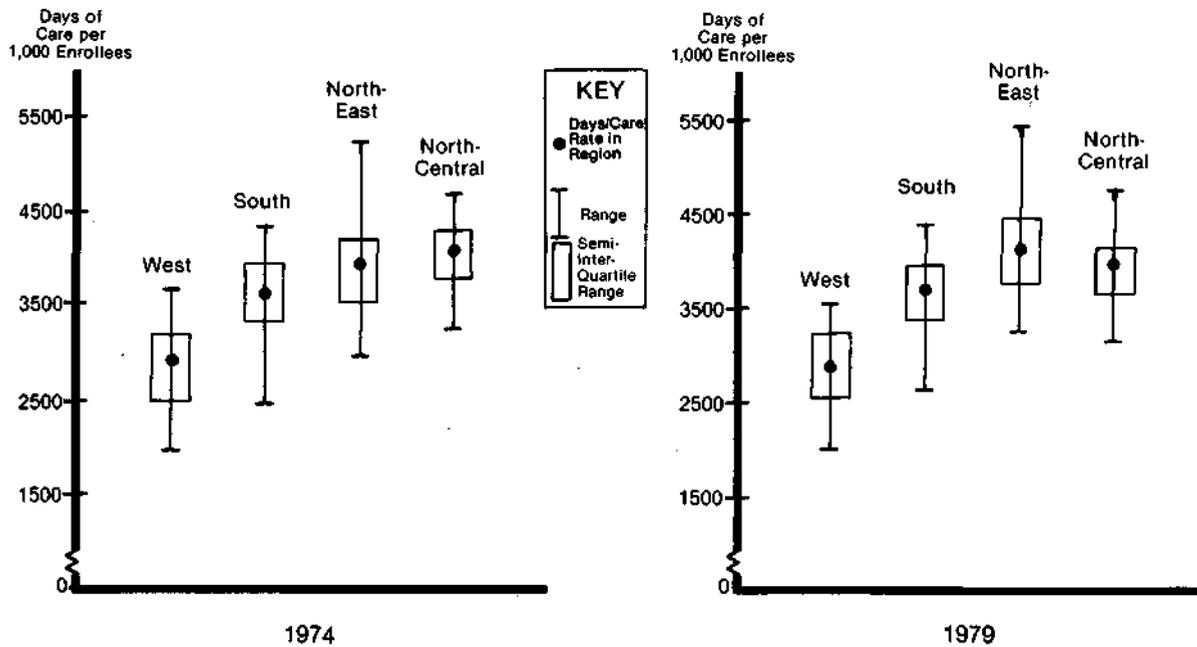


FIGURE 6
Short Stay Hospital Use: Days of Care Per 1,000 Medicare
Beneficiaries Aged 65 Years and Over, by Census Region,
1974 and 1979



regression equation shows that there was an unexplained difference of 34 discharges/1,000 between the two regions (controlling for other variables) and that this difference is statistically significant.

The regression analysis, therefore, is partially successful in explaining interregional differences in Medicare Utilization rates. That is, demographic, supply, and

structural characteristics vary by region and these differences are associated with varying rates of use. Nevertheless, some part of the regional differences persist. Generally, these are referred to as differences in "practice patterns." The nature of these practice patterns and their implications have yet to be determined.

TABLE 17
Regression Results: Unstandardized Regression
Coefficients and (t-values)

Variable	Average Length of Stay	Discharge/ 1,000 enrollees
Occupancy (percent)	15.5577 (9.19)	-136.4622 (-2.48)
Short-stay beds per 1,000 Medicare enrollees	.0207 (3.14)	1.2696 (5.90)
Percent of total population living in SMSAs	.5310 (2.00)	-21.6807 (-2.51)
Physicians per 1,000 Medicare enrollees	-.0008 (-.05)	-2.9451 (-6.07)
Nursing home beds per 1,000 Medicare enrollees	-.0090 (-2.33)	.0265 (.21)
Age (Medicare enrollees percent 75 years and over)	4.5855 (1.35)	330.6028 (2.99)
Sex (Medicare enrollees percent female)	8.6728 (2.12)	125.5360 (.94)
Race (Medicare enrollees percent non-white)	1.7850 (2.05)	-40.3763 (-1.43)
Northeast Region (dummy)	1.9296 (5.99)	1.8146 (.17)
North Central Region (dummy)	.9318 (3.21)	18.9226 (2.00)
South Region (dummy)	.2419 (.93)	34.2453 (4.05)
Constant	-9.6500	227.7246
R ²	.83	.60
F-value	76.9	23.6

TABLE 18
Correlation Matrix for Variables Used in the Regression Analyses¹

	ALOS 79	DISC 79	Density	Age	Sex	Race	SS Beds	NH Beds	MDS	Occ	NE	NC	S
ALOS 79	1.0	-.34091	.38540	.27308	.59333	.10016	.04708	-.14117	.23707	.84956	.63836	-.02838	-.11588
DISC 79		1.0	-.49394	.10233	-.09543	-.02821	.20785	.20740	-.46320	-.36090	-.35173	.36697	.18527
Density			1.0	.06249	.32315	.10130	.02952	-.15534	.49773	.38541	.18733	-.15019	-.09405
Age				1.0	.50382	-.15098	-.08367	.32599	.04558	.15513	.19823	.30931	-.33520
Sex					1.0	.03595	-.01589	.03920	.26873	.54824	.33627	.04025	.05363
Race						1.0	.36151	-.24756	.28349	.10360	-.20944	-.24861	.48717
SS Beds							1.0	.19672	.42529	-.10193	-.18283	.13901	.04352
NH Beds								1.0	-.00036	-.20769	-.06622	.41617	-.34982
MDS									1.0	.22146	.06352	-.26704	.02004
Occ										1.0	.55889	-.06680	.00368
NE											1.0	-.36782	-.35301
NC												1.0	-.38389
S													1.0

¹ For definition of variables, see tables 15 and 16.

Regional Variations in Medicare Reimbursements

The final line of inquiry that this chapter will pursue is the examination of Medicare reimbursements by region. Table 19 shows Medicare reimbursements per enrollee in 1967 and 1977 by region for the Part A program, the Part B program, and the two programs combined. The ratio of the amount reimbursed per enrollee in the region to the average reimbursement in the U.S. is also given.

Nationally, in 1967 inpatient hospital reimbursements averaged \$138 per enrollee or 63 percent of the Part A and Part B combined reimbursement of \$220.

Correspondingly, in 1977, inpatient hospital reimbursements averaged \$547 or 71 percent of the total of \$771.

Regional comparisons show that in both 1967 and 1977 combined Part A and Part B reimbursements per enrollee were greater in the Northeast and West than they were in the South and North Central regions. This was true during the entire period 1967-77.

It is important to observe that regional variations in reimbursements per enrollee for inpatient care do not correspond to the regional variations found in days of care

per 1,000 enrollees. According to the data shown in Table 10, in 1977, the Northeast and West are the extremes in the use of days of care per 1,000 enrollees, with the rate of days of care in the Northeast (4,017 days) registering 43 percent greater than the rate in the West (2,816 days). As shown in Table 19, Medicare reimbursements per enrollee for inpatient care were much closer in these two regions. Reimbursements in 1977 in the Northeast averaged \$615 or only 8 percent greater than in the West (\$568). Since reimbursements in the West for Part B are greater than in the Northeast, total reimbursements (Part A and Part B combined) per enrollee are even closer—\$874 in the Northeast or only 3 percent greater than in the West (\$848).

Another disparity between the data in Tables 10 and 19 is that the North Central region—which has been distinguished as having a high rate of days of care—falls close to the national average in inpatient reimbursements and in total reimbursements. It is also interesting to observe that differences between the highest and lowest regions in reimbursements for inpatient hospital care (31 percent) is considerably less than the difference found in the rate of days of care (43 percent) and that although the Northeast region ranks highest in both these measures, the region that ranks lowest in days of care (the West) is not

TABLE 19
Medicare Reimbursements per Enrollee: Average Reimbursements for Medicare Enrollees Aged 65 Years and Over, Type of Program and U.S. Census Region, 1967 and 1977¹

Region	Part A & Part B		Part A					Part B	
	Total Amount	Ratio: Region to U.S.	Total Amount	Ratio: Region to U.S.	Inpatient Hosp.	Nursing Home	Home Health	Total Amount	Ratio: Region to U.S.
1967									
United States	\$220	1.00	\$154	1.00	\$138	\$14	\$ 1	\$ 71	1.00
Northeast	233	1.06	162	1.05	145	14	2	75	1.06
North Central	211	.96	156	1.01	142	12	1	60	.85
South	186	.85	128	.83	117	10	1	64	.90
West	282	1.28	190	1.23	160	28	2	98	1.38
Percent Difference Between Highest and Lowest Region	70	—	48	—	37	—	—	25	—
1977									
United States	\$771	1.00	\$570	1.00	\$547	\$13	\$10	\$215	1.00
Northeast	874	1.13	645	1.13	615	17	14	242	1.13
North Central	757	.98	588	1.03	568	13	7	179	.83
South	666	.86	486	.85	468	8	10	196	.91
West	848	1.10	594	1.04	568	16	11	270	1.26
Percent Difference Between Highest and Lowest Region	32	—	33	—	31	—	—	51	—

¹ Part A and Part B amounts do not add to "Part A & Part B total" column because the enrollment in Part B is not identical to that of Part A.

Source: Medicare Statistical System

the same as the region that ranks lowest in reimbursements for inpatient hospital care (the South). The explanation for the reversals in regional standing between hospital utilization and reimbursements is no doubt connected to many of the complex factors involved in the costs of hospital care: wage and price levels, the use of ancillary services, the spread of medical technology and other factors.

Table 20 illustrates further that the relationship between Medicare reimbursements and hospital utilization—in particular, days of care per 1,000 enrollees—is very complex. The table provides hospital utilization data for those States where the combined Part A and Part B reimbursements in 1977 were 10 percent or more above the U.S. average and those States where combined reimbursements were 20 percent or more below the U.S. average.

Many of the States with the lowest Medicare reimbursements had higher than average rates of days of care: West Virginia, Mississippi, Kentucky, Arkansas, Tennessee, Louisiana, South Dakota, and Alabama. Conversely, many of the States and the District of Columbia with the highest Medicare reimbursements, had lower than average rates of days of care: Alaska, District of Columbia, California, Maryland, and Nevada.

New York and California provide a striking contrast. In 1977, the rate of days of care in New York (4,308 per 1,000) was 53 percent greater than in California (2,810 per 1,000). On the other hand, the two States were very close in average reimbursements per enrollee—\$974 in California and \$972 in New York—no doubt explained, in part, by the differences in average per diem hospital charges, as shown in the last column of Table 20.

TABLE 20
Hospital Utilization in States with the Highest and Lowest Medicare Reimbursements for Enrollees Aged 65 Years and Over, 1977¹

	Reimbursements per Enrollee				Hospital Utilization				
	Part A & Part B Combined		Hospital Inpatient		Discharges per 1,000	Average Length of Stay	Days of Care per 1,000	Ratio: State to U.S.	Average Charge Per Day
	Average	Ratio: State to U.S.	Average	Ratio: State to U.S.					
Highest Reimbursements									
Alaska	\$1,050	1.36	\$734	1.34	303.3	7.9	2,407	0.65	\$305
District of Columbia	1,028	1.33	725	1.33	259.1	14.2	3,677	0.99	228
Massachusetts	1,016	1.32	749	1.37	323.1	13.1	4,224	1.14	214
California	974	1.26	647	1.18	309.6	9.1	2,810	0.76	291
New York	972	1.26	683	1.25	289.3	14.9	4,308	1.17	224
Michigan	883	1.15	651	1.19	337.3	11.7	3,936	1.06	218
Nevada	879	1.14	588	1.07	355.8	8.8	3,145	0.85	268
Maryland	859	1.11	628	1.15	281.6	12.9	3,635	0.98	203
Illinois	852	1.11	653	1.19	352.1	11.9	4,189	1.13	210
Lowest Reimbursements									
Utah	\$ 498	.65	\$325	.59	269.5	7.9	2,141	0.58	\$200
South Carolina	511	.66	377	.69	326.1	10.4	3,375	0.91	149
Wyoming	517	.67	369	.67	393.9	8.5	3,351	0.91	154
West Virginia	542	.70	423	.77	381.0	10.6	4,031	1.09	154
North Carolina	557	.72	403	.74	328.4	11.2	3,674	0.99	137
Mississippi	558	.72	402	.73	441.5	10.0	4,407	1.19	137
Kentucky	558	.72	426	.78	381.8	10.1	3,845	1.04	144
Arkansas	563	.73	391	.71	436.2	8.9	3,861	1.04	147
Montana	581	.75	398	.73	414.7	8.2	3,412	0.92	166
Georgia	582	.75	410	.75	368.5	8.9	3,296	0.89	170
Tennessee	576	.75	424	.78	378.6	10.2	3,867	1.05	168
Louisiana	585	.76	419	.77	391.8	9.5	3,739	1.01	165
South Dakota	594	.77	466	.85	423.6	9.1	3,873	1.05	147
Alabama	598	.78	442	.81	393.4	9.7	3,811	1.03	179
U.S.	771	1.00	547	1.00	339.2	10.9	3,696	1.00	197

¹ Interim Reimbursements are shown. See footnote, Table 2.
Source: Medicare Statistical System

Conclusions

The most significant fact Medicare data show is that the discharge rate has risen substantially for the aged population since Medicare began and continues to rise. The increasing discharge rate raises the question as to why the aged (more so than younger persons) are experiencing an increased rate of hospitalization.

Perhaps the greater increase in hospitalization among the aged population compared with younger age groups reflects their higher morbidity and, hence, a greater opportunity to intervene with the many recent technological innovations such as insertion of pacemakers, lens implantation following surgery for cataract patients, and radiologic therapies for cancer patients. This factor, coupled with the near universal insurance coverage of the aged compared to a lesser level of coverage for other age groups, may underlie the observed trends in the rate of hospitalization. Clearly, the rising medical and surgical rates for the aged need to be examined in-depth to determine their appropriateness and their impact not only on mortality but on morbidity and quality of life. To do this, more precise data is needed about specific conditions and procedures to study the risks and benefits of hospital treatment.

Another very important fact Medicare data illustrate is that no one utilization statistic is adequate for supplying information for the many current policy issues. If the concern is the event of hospitalization itself, that is, hospitalization for medical or surgical intervention, then the discharge rate is the issue on which to focus. As the data presented here show, the length of stay or the rate of days of care can decline over time or be relatively low in one region compared to other regions while admission rates move independently.

Medicare data show also that there are relatively large differences in hospital discharge rates, in length of stay and in days of care between census regions and within census regions. Very likely, differences between regions and within regions reflect some underlying factors that cannot change or that are not likely to change quickly such as population density. In densely populated areas there are alternatives to inpatient hospital care which may not exist in sparsely populated areas. Very likely, also, there are regional and local traditions or "style" in medical practice with regard to whether or not patients will be admitted or how long the patient should be hospitalized. International comparisons nearly always show that there are substantial differences in patterns of care. For example, average length of stay in France and Canada is longer than in the United States. There is no documentation thus far to determine which (if any) of these patterns are more appropriate.

The experience with Medicare hospital utilization also shows that while the number of days of care per capita can differ substantially the costs of care per capita can be nearly equal. This means that the average cost of a patient day can vary substantially. New York and California utilization data present an interesting case in point. In these two States the discharge rates for Medicare patients are similar, but length of stay in New York is substantially longer. Yet, total Medicare reimbursements are similar in both States. Evidently, there are variations in the unit costs of services or in the quantity or quality or style of care provided that affect the cost of a day of care. Perhaps one or more of these factors would explain the shorter hospital stay, but greater costs per patient day in California. Data need to be generated to study this question, and, more generally, whether there are regional patterns in a patient day of care with regard to the intensity of use of customary services, technology diffusion and the use of personnel.

Finally, these data indicate that if the concern is primarily monetary, perhaps regional variations in per capita reimbursements should be the issue on which to focus rather than the length of stay or days of care. By this measure disparities by State are substantial. In 1977, total Medicare reimbursements per enrollee were more than 25 percent above the U.S. average in Massachusetts, New York, the District of Columbia, Alaska and California and more than 25 percent below the U.S. average in North Carolina, South Carolina, West Virginia, Kentucky, Mississippi, Arkansas, Utah, and Wyoming.

Faced with scarce resources and the general concern to halt the growing proportion of the gross national product that health care expenditures consume, disparities by area in per capita spending for health care need to be examined more closely. Such disparities raise questions about whether these variations have an impact on health status and about equity in the use of resources.

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