Medicare Episodes of Illness: A Study of Hospital, Skilled Nursing Facility, and Home Health Agency Care

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This paper analyzes charges incurred under the Medicare program for inpatient hospital, skilled nursing facility (SNF), and home health agency (HHA) care for 1976. This research was made possible through the construction of a new data set which links a beneficiary's use of these three services. Summary highlights reveal that an overwhelming majority of the 7.5 million Medicare episodes of illness do not involve post-hospital SNF or HHA care. Those episodes of illness that use only hospital care are substantially (53%) cheaper than all other episodes. A large percentage of these charge differences reflect the greater number of hospital days of care associated with post-hospital care services. However, an analysis of the beneficiaries' demographic characteristics suggests that persons who use post-hospital care generally differ from those who receive only hospital care. We found that persons who use post-hospital SNF or HHA, or both types of care are likely to be female, to have cancer, diabetes, fractured bones or a central nervous or vascular system disease, and to be older than persons who do not use these types of care.

The data also show that a beneficiary's area of residence greatly influences the amount and types of care received. Persons who reside in the New England, Middle Atlantic, and Pacific Divisions are more likely to receive post-hospital care services than persons who live elsewhere in the United States. These persons also incur among the highest per capita institutional charges in the United States. Part of this variation in institutional charges per capita is explained by the high input price index found in these areas, and in some cases by the high quantity of services index.

Introduction

This paper analyzes charges[1] incurred under the Medicare program for inpatient hospital, SNF, and HHA care on an episode or per case basis. In this study, an episode of illness begins with admission to a hospital and ends with a discharge from a hospital, SNF, or HHA. Thus, we studied four types of episodes: (1) episodes involving only inpatient hospital care, (2) episodes involving hospital and SNF care, (3) episodes involving hospital and HHA care, and (4) episodes involving hospital, SNF, and HHA care. This research was made possible through the construction of a new data set, one which includes information on 20 percent of all aged and disabled persons who received Medicare Hospital Insurance (Part A) benefits in 1976. We adjusted the data in this report to reflect universe counts of the entire Medicare population.

This paper addresses four questions. First, what reimbursable services do Medicare beneficiaries receive for an episode of illness? What are the charges associated with these services? Second, do Medicare beneficiaries who use post-hospital SNF or HHA, or both types of benefits use fewer hospital care services? Third, what patient characteristics influence the utilization of these three services?

[1] Refer to Technical Note A for a description of the differences between charges and costs.

Fourth, does a beneficiary's census division of residence influence the probability of receiving post-hospital services?

The first section of this paper provides a framework for analysis and discusses the role of these three services under the Medicare program. The second section describes the data and methodological issues associated with this study. The third section presents the findings and their interpretation. The final section discusses limitations of the findings and directions for further research.

Background

There has been a plethora of research on factors influencing the utilization of health care services. Studies have generally been limited to one institutional setting, such as the hospital or nursing home, and have not considered the relationship between these health care services and the care provided in other settings. For example, certain patients may have shorter hospital stays merely because they were transferred to nursing homes for treatment of their conditions. These studies also generally analyze factors influencing the cost per unit of service or the length of stay. However, the cost to treat a patient for a condition is due to a combination of both of these factors. Thus, an analysis of health care costs should not only include several institutional providers but should also consider the trade-off between the length of stay and the cost per unit of service.

This episode of illness approach [2] is particularly important in the study of Medicare beneficiaries because these people often consume a variety of health care services that are not limited to one institutional setting for the treatment of medical problems. Furthermore, since current legislation is directed toward reducing expensive hospital stays by substituting less expensive care, it is imperative to know what services are presently being provided to measure the influence of new policies.

This study takes a retrospective approach to charge per episode of illness to analyze charges incurred under the Hospital Insurance (HI) program of Medicare. This program offers a controlled amount of inpatient hospital, SNF, and HHA benefits to its 27 million aged and disabled beneficiaries. This study examines the influence of demographic characteristics on the utilization and charges incurred for an episode of illness under the HI program in 1976. The demographic variables studied are: age, race, sex, mortality status, surgical indication, primary hospital discharge diagnosis, and census division of residence. The relative influence of the price and quantity of services provided in an area is used to explain the large variations found in the *per capita* episode charges.

This paper reflects the first analysis of health care use which includes a link of inpatient hospital, SNF, and HHA care. The utilization and the charges incurred for each type of service are compared to determine the influence of the demographic characteristics on the charge per case. An issue underlying these charge comparisons is one of substitution of post-hospital SNF and HHA care benefits for inpatient hospital care. This issue cannot be reasonably addressed in this paper because the Medicare program reimburses for only the skilled care that beneficiaries receive for an episode of illness, and it is likely that they also receive care under other payment sources. Furthermore, only 4 percent of the total $12.8 billion paid in reimbursements in 1976 under the HI program were made for SNF and HHA care, suggesting that only a small degree of substitution can actually be occurring under this program. Thus, the charge comparisons presented here should not be construed to suggest the relative cost-efficiency of certain program services.

An Episode of Illness Defined

The average charge per episode of illness [3] or average charge per case is the primary dependent variable. It consists of charges for inpatient hospital, SNF, and HHA care that a patient incurs for the treatment of an illness within certain time constraints. An episode of illness may include multiple hospitalizations, SNF stays, and HHA visits.

The definition of an episode of illness used here was refined to account for the health status of the Medicare population. Unlike the general population, Medicare beneficiaries often suffer from chronic conditions and multiple diseases. For example, a Medicare beneficiary with diabetes may also have several other conditions associated with old age, such as arthritis or heart disease. Therefore, stringent criteria were adopted to separate different incidents of a chronic illness as well as different illnesses that a beneficiary may have in a year's time.

The episode of illness definition used here is based upon Federal reimbursement regulations, with the implicit assumption that these regulations were appropriately adhered to in the provision and reimbursement of care. Three conditions required for Medicare Part A reimbursement were incorporated into this definition. First, a beneficiary of post-hospital SNF and HHA care must be receiving care for the same illness that was treated in the previous hospital stay. Second, these SNF or HHA services must be preceded by three or more days of hospitalization. Third, a maximum of 28 days may elapse between hospital or SNF discharge and appropriate placement in an SNF or HHA.

[2] Refer to Technical Note B for discussion of the approach.

[3] The charge per episode of illness and charge per case are used interchangeably.

Here are the decision rules that characterize an episode of illness:

1. Hospital stays separated by less than 15 days are part of the same hospital episode of illness. Stays separated by more than 14 days define different episodes.
2. Combinations of stays in hospitals, SNFs, and/or HHAs related to the same illness and separated by less than 29 days are treated as part of the same episode of illness. Stays separated by more than 28 days demarcate separate episodes.

These decision rules were chosen for several reasons. First, since Medicare beneficiaries often have chronic conditions, their disease state is unlikely to have changed for a majority of the cases if they require rehospitalization within two weeks time. Second, research performed by the Social Security Administration on Medicare services combining hospital and SNF stays used 14 days as the time period to separate multiple hospitalizations when constructing episodes. Third, we compared the hospital discharge diagnoses to the SNF and HHA admission diagnoses, and to other hospital discharge diagnoses for the same episode of illness. We found that a large majority of the cases had the same or related diagnostic conditions for the same episode of illness. Since a 1977 Institute of Medicine study found some discrepancies in the diagnostic coding when they reabstracted hospital bills, we considered the high association between diagnoses justification for this rule. Fourth, we evaluated the decision rules using different parameters, by comparing diagnoses and dates of services for a sample of 500 persons. It was found that the rules were not sensitive to minor changes in the decision rules.

In conclusion, we justify the episode of illness definition used in this study for several reasons. Most importantly, the definition relies on Federal reimbursement criteria which influenced the provision of the care received. This definition also accounts for the chronic disease conditions that Medicare beneficiaries may have by allowing multiple hospitalizations, SNF stays, and HHA visits to be included in the same episode. Likewise, the definition also recognizes that beneficiaries may have several medical problems related to the same illness. Finally, the definition reflects the Medicare program's emphasis on episodic care due to its limitation on benefits and requirements for skilled care. Thus the episode of illness, as defined here, incorporates factors that influence care provided and the health status of the beneficiaries.

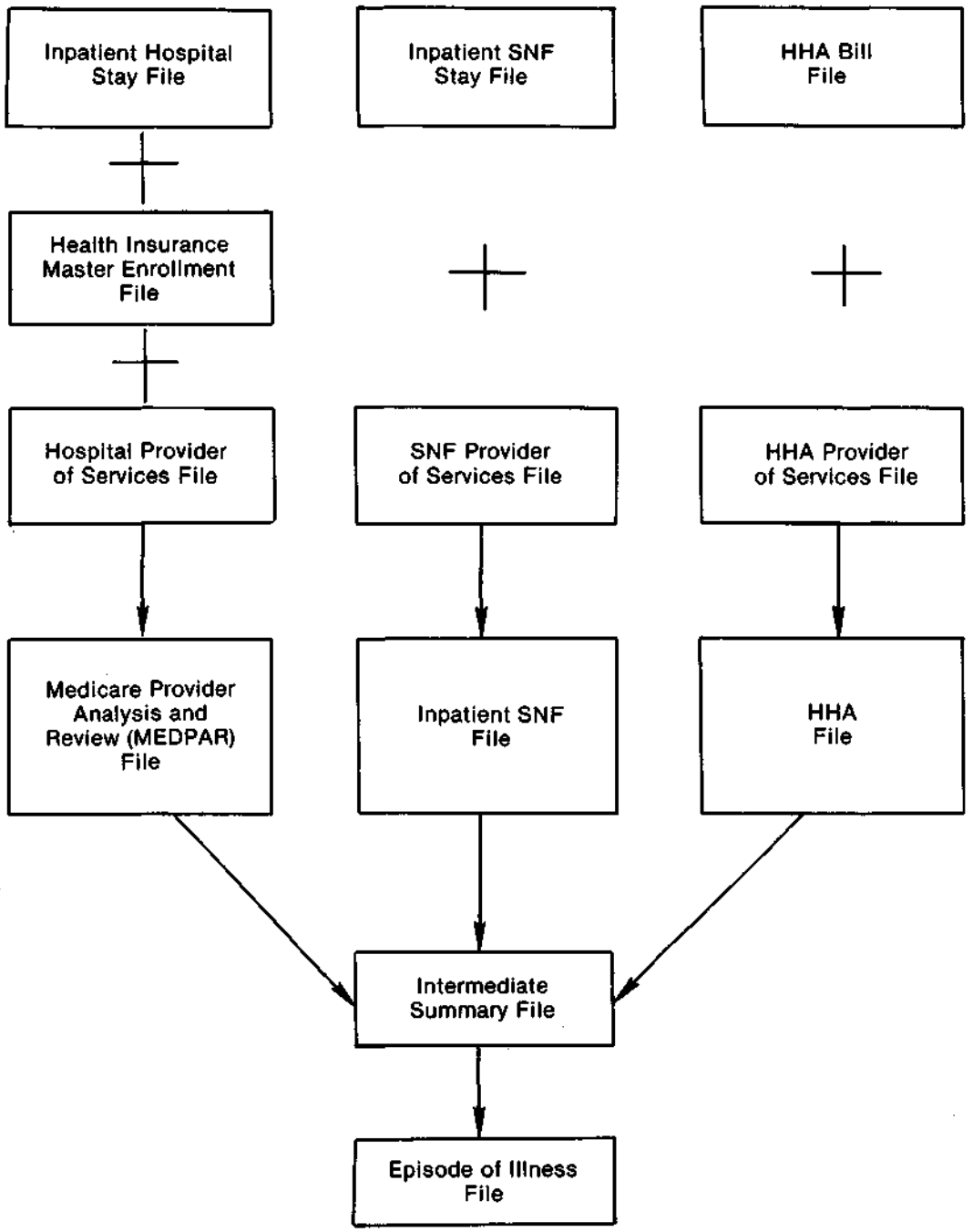
Sample Selection and Data Source

The data set used in this study was constructed from several Medicare statistical files that are maintained by the Health Care Financing Administration (HCFA). These files are generated for administrative purposes so that current information is available on bills submitted to the program for provided services and on the providers of these services. Many of these Medicare files are samples of the beneficiaries who received services. The same sample selection technique is used each year, which allows an analysis of time series relationships. We merged several files by the provider and beneficiary identification numbers to construct a 20 percent sample of all aged and disabled Medicare beneficiaries who received services in calendar year 1976. We also included SNF and HHA care data for 1977, so that episode data would be complete for hospital discharges that occurred late in 1976. We eliminated SNF and HHA data that were not associated with a hospital discharge for years 1976 and 1977 from the analysis. Since Part A of Medicare requires three or more days of hospitalization before admission to an SNF or HHA for reimbursement purposes, the number of the eliminated records was small. We also eliminated a small number of SNF and HHA records from the file because of one of the following circumstances: the beneficiary used only Medicare Part B home health benefits, which do not require hospitalization; the beneficiary was discharged from a hospital in 1975, began receiving SNF or HHA or both kinds of services in 1976, and thus had a 1975 episode of illness; the beneficiary was discharged from a hospital in 1977 and thus had a 1977 episode of illness. Most of the eliminated records fell into the last category.

The procedure for merging the data involved a three-stage process (Figure 1). First, we merged bill and provider data for each type of service. Second, we merged these newly combined files by the patient identification number, so that all the hospital, SNF, and HHA information for each beneficiary was together. Third, we created episode records, using the decision rules cited previously. We also created a subsidiary file from these data by randomly selecting a 1 percent sample of persons from the intermediary summary file and then combining these data on a person basis. We used this file to generate estimates on the number of persons who received care.

These HCFA files are subject to sampling and non-sampling errors. The sampling errors arise because a sample rather than the whole population was studied. Care was taken in our analysis and interpretation of the study results to consider this sampling variability and the potential errors in the presented estimates. The reliability of these estimates is presented in Technical Note C at the end of this article. The non-sampling errors occur because the Medicare files used to create the episode data set are only about 97 percent complete. As previously mentioned, episodes with incomplete data were eliminated from the file, so the missing information is unlikely to significantly influence the findings presented here.

FIGURE 1
Derivation of the Episode of Illness File



Findings

For purposes of clarity, we made the following designation of episodes:

Type I	hospital only care
Type II	hospital and SNF care
Type III	hospital and HHA care
Type IV	hospital, SNF, and HHA care

In 1976, 7.5 million episodes of illness were reimbursed under Medicare. Of the beneficiaries who received care, 76 percent had one episode of illness in a year's time (Table 1), 1.3 million beneficiaries had more than one episode, and 13 percent of these persons had different types of episodes. Almost 91 percent of the total episodes involved only hospital care (Episode Type I), 3.3 percent involved hospital and SNF care (Episode Type II), 5.2 percent involved hospital and HHA care (Episode Type III), and 0.7 percent involved all three types of care (Episode Type IV). Table 2 shows that episodes that involved post-hospital care were 60 to 76 percent more expensive, depending on the type of episode, than Type I episodes.

TABLE 1
Number of Persons and Percentage Distribution of Episodes in Year 1976

Episodes per year	Persons	Percentage Distribution
1	4,309,300	76.1%
2	1,013,800	17.9
3	248,800	4.4
4+	91,300	1.6
Total	5,663,200	100.0

Figure 2 depicts the distribution of charges by type of charge and by episode. Inpatient hospital charges account for the greatest percentage of charges by episode. Episodes involving post-hospital care have larger hospital charges than those that do not involve such care. This difference is greatest for Type IV episodes, where hospital charges are three times greater than for Type I episodes. It is possible that the great charges that accrue in Episode Type IV are, in part, because of the medical risks associated with changes in the patient's environment.

The large differences in hospital charges per episode reflect the greater number of hospital days of care per case received by beneficiaries who use post-hospital care. As shown in Table 2, the number of hospital days per episode is largest for persons who receive all three types of services, and lowest for those who use only hospital care. Persons with Types II and III episodes consume, on the average, more than twice as many hospital days of care per episode as those with Type I episodes (11.1 days). This finding is consistent with a Medicare study which showed that post-hospital SNF patients had longer lengths of stay while they were in the hospital than non-SNF users (Gornick, 1975).

SNF covered charges per episode also vary by type of episode. SNF care is involved in episodes Type II and Type IV. Table 2 shows that the SNF average covered charge for Type IV episodes is $1,581, over $400 greater than for Episode Type II. Likewise, Type II episodes use 23.9 SNF-covered days on the average, while Type IV episodes use 27.9 days. Thus, episodes that involve all three types of care use more SNF services than those episodes involving hospital and SNF care.

The HHA charges per episode follow the same pattern as seen with the SNF covered charges per episode. The average HHA charge per episode for Type III episodes is $597, $67 less than for Type IV episodes. Likewise, Type III users consume an average of 22.5 visits per episode, while Type IV users consume 27.9 visits on the average.

Therefore, on a per episode basis, episodes that involve post-hospital SNF and/or HHA care are more expensive than episodes that do not involve such care. Furthermore, episodes that involve all three types of care use more services of each type than all the other types of cases. This finding should not suggest that home health and skilled nursing facility care are not cost-efficient alternatives to hospitalization. Rather, it suggests that individuals who use post-hospital care are likely to require more services, and are likely to have more severe illnesses, on the average, than patients who do not use post-hospital care. However, it is also possible that some of the post-hospital care that is received is a complement instead of a substitute, to the inpatient hospital care used. Therefore, an analysis of the patient characteristics by type of episode must be made to determine if these groups are significantly different in terms of their expected demand for health care services. This type of analysis will follow in the next section.

Age Group by Type of Episode

The characteristics of persons who use the four different types of episodes vary by age group. Persons with Episode Type II have the highest median age, 80 years, while the median age for Type IV users is 77 years, 75 years for Type III users, and 71 years for Type I users. These differences in median age by episode are relevant in comparing charges by type of episode and are helpful in describing the charge variations previously shown. Numerous studies have documented that a correlation exists between age and the use of and expenditures for health care services (Fisher, 1980; Shannas and Maddox, 1976; Davis and Reynolds, 1975). This relationship is

TABLE 2
Summary Statistics by Type of Episode

Category	Type of Episode				
	Hospital Only Care	Hospital and SNF Care	Hospital and HHA Care	Hospital, SNF, and HHA Care	Total
Number of Episodes	6,862,130	250,470	390,250	49,600	7,552,450
Percent Distribution of Episodes	90.9%	3.3%	5.2%	0.7%	100.0%
Percent of Total Charges	78.4%	8.3%	11.0%	2.3%	100.0%
Average Charges/Episode	$1,871	$5,427	$4,610	$7,665	$2,170
Average Reimbursement/Episode	$1,389	$4,194	$3,668	$6,044	$1,631
Average Hospital Charge/Episode	$1,871	$4,261	$4,013	$5,421	$2,085
Average Hospital [1] Ancillary Charges/Episode	$1,126	$2,149	$2,192	$2,781	$1,226
Average SNF Covered Charges/ Episode	.....	$1,165	.....	$1,581	.....
Average HHA Charges/Episode	.....	.....	$597	$663	.....
Hospital Days/Episode	11.1	24.9	22.9	31.3	12.3
Hospital Stays/Episode	1.10	1.34	1.42	1.73	1.12
SNF Days/Episode	.....	23.9	.....	27.9	.....
SNF Stays/Episode	.....	1.2	.....	1.2	.....
HHA Visits/Episode	.....	.....	22.5	24.9	.....
Total Days and Visits per Episode	11.1	48.8	45.4	84.1	.....

[1] Hospital ancillary charges include intensive care and coronary care charges.

generally because of an increase in functional impairments (Wan, 1975) and disability (Berg *et al*, 1970) with age, and because older persons tend to have medical complications that require more complex treatment and longer recuperative time.

This study also shows that average total charges generally increase somewhat with age. Table 3 also shows, however, that average charges within an episode decrease with age. This paradox can partly be explained by the distribution of episodes by age group. Table 4 shows that with increasing age, there are relatively more expensive episodes or episodes involving post-hospital care. The average hospital

TABLE 3
Average Charges by Age Group and by Type of Episode

Age Group	Type of Episode				
	Hospital Only Care	Hospital and SNF Care	Hospital and HHA Care	Hospital, SNF, and HHA Care	Total
0-64	$1,997	$6,422	$5,775	$9,790	$2,187
65-69	1,883	6,485	5,397	9,137	2,099
70-74	1,876	6,004	4,913	8,379	2,155
75-79	1,864	5,585	4,439	7,762	2,207
80-84	1,824	5,167	4,059	6,931	2,222
85+	1,769	4,690	3,677	6,180	2,210
Total	1,871	5,427	4,610	7,665	2,170

FIGURE 2
Number and Percentage Distribution of Average Charges by Type of Service and by Type of Episode

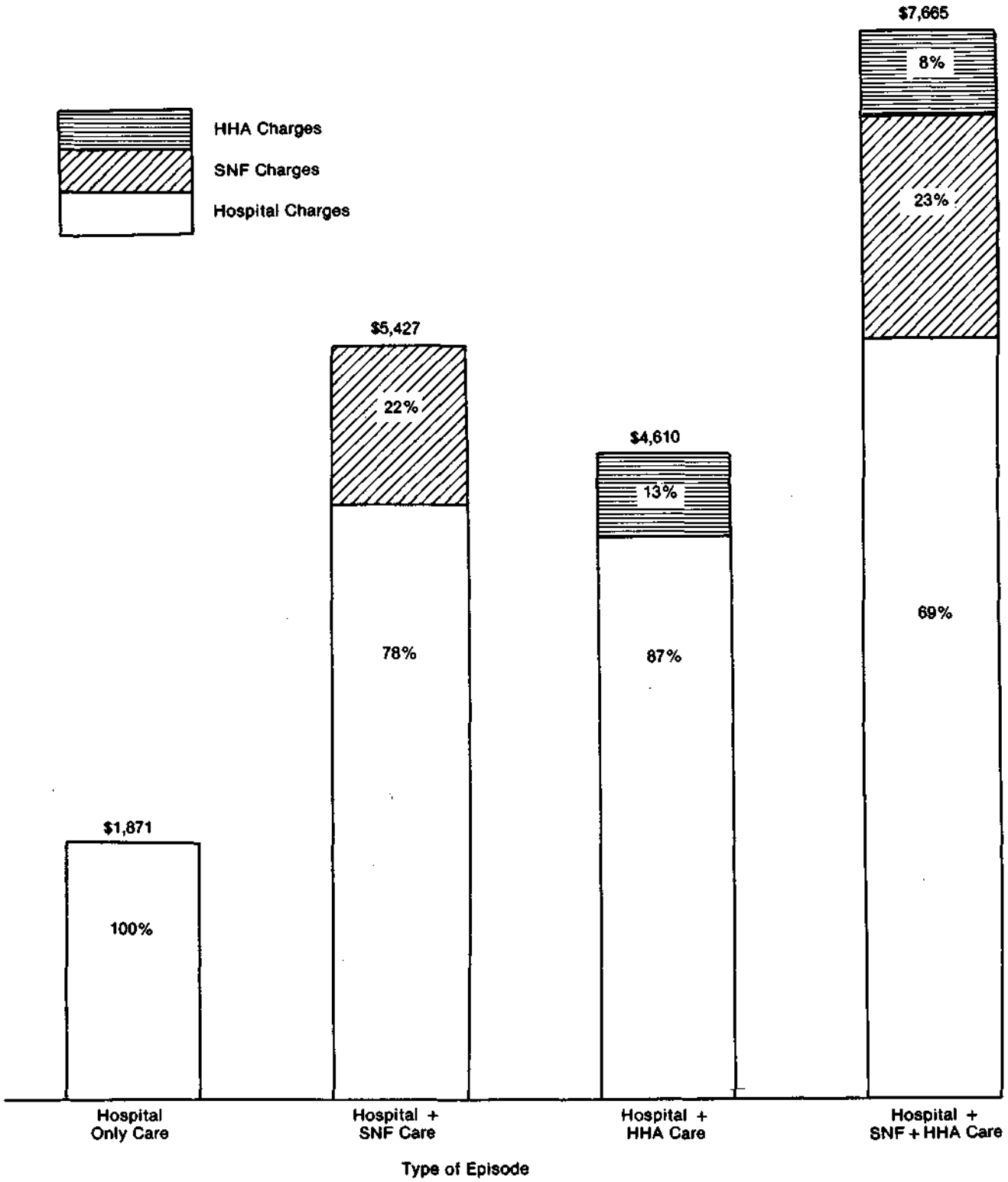


TABLE 4
Percentage Distribution of Episodes by Age Group and by Type of Episode

Age Group	Type of Episode				
	Hospital Only Care	Hospital and SNF Care	Hospital and HHA Care	Hospital, SNF, and HHA Care	Total
0-64	95.4%	1.0%	3.3%	0.3%	100.0%
65-69	94.6	1.4	3.7	0.3	100.0
70-74	92.3	2.3	4.9	0.6	100.0
75-79	89.4	3.7	6.0	0.8	100.0
80-84	86.3	5.7	7.0	1.0	100.0
85+	83.1	8.5	7.3	1.2	100.0
Total	90.9	3.3	5.2	0.7	100.0

covered charges and hospital ancillary charges also decrease slightly with age within an episode, while the number of hospital stays per episode do not significantly vary within an episode. These facts suggest that, within an episode, the quantity of services received decreases with age. Two possible characteristics of the aged population could explain this result. First, with increasing age, more persons are likely to be domiciled in nursing homes as private pay or Medicaid patients. These persons are likely to receive Medicare benefits only when they have an acute complication of a chronic illness that is being treated in the nursing home. Second, with increasing age, medical procedures that would be attempted on younger persons are not performed, due to the high risks associated with such treatments (for example, surgery). It is also possible that some medical procedures would not be attempted because the "treatment is not worth the cure" for persons of advanced age.

The average SNF covered charges and covered days of care per episode do decrease somewhat with age. This relationship is probably due to: the greater number of deaths with increasing age, resulting in shorter SNF stays; and the likelihood that with increasing age, persons are likely to be receiving only a portion of their nursing home benefits from Medicare, and are more likely to be private pay patients, Medicaid SNF beneficiaries, or intermediate care facility (ICF) beneficiaries.

The average HHA charges and number of visits per case do not significantly vary by age within an episode for the Medicare population. However, a 1979 study of HHA care episodes (Kurowski *et al*) showed that the use of HHA care increases with age. Although the two studies analyze different population groups, it is likely that the Medicare program, with its skilled care requirement, is paying for only a portion of the HHA care that is utilized by the aged population for an episode of illness.

Thus, the Medicare program's emphasis on skilled care probably results in fewer available benefits within an episode as age increases.

Race by Type of Episode

As shown in Table 5, average total charges per episode vary by race. This relationship is consistent when controls are also made by age, sex, and census division of residence. Whites generally have lower average charges per episode than all other races. Whites also have lower hospital covered charges, SNF covered charges, and HHA charges per episode than all other races. However, whites have more episodes *per capita* than all other races as seen in Table 6.

TABLE 5
Average Charges by Race of Beneficiary and by Type of Episode

Race	Type of Episode				
	Hospital Only Care	Hospital and SNF Care	Hospital and HHA Care	Hospital, SNF, and HHA Care	Total
White	$1,851	$5,375	$4,570	$7,623	$2,147
All Others [1]	2,123	6,416	4,969	8,313	2,443
Total	1,871	5,427	4,610	7,665	2,170

[1] All others includes race unknown.

TABLE 6
Episodes per 1,000 Beneficiaries by Race of the Beneficiary and by Type of Episode

Race	Type of Episode				
	Hospital Only Care	Hospital and SNF Care	Hospital and HHA Care	Hospital, SNF, and HHA Care	Total
White	283.7	10.7	15.7	2.1	312.0
All Others [1]	175.9	4.2	13.3	1.0	194.4
Total	271.1	9.9	15.4	2.0	298.4

[1] All others includes race unknown.

A number of factors could explain these charge differences. First, aged persons of all other races (nonwhites) received lower reimbursements under Medicare for physician services than whites received. In 1975, aged white persons were reimbursed an average of $135 per beneficiary for physician services, while aged nonwhite persons were reimbursed $98 per beneficiary (Gornick *et al, 1980*). This suggests that the high charges incurred by nonwhites for inpatient hospital, SNF, and HHA care are partially offset by reimbursements for physician services. Second, data from the Health Interview Survey (1976-1977) showed that nonwhites reported disabilities (as measured by Limitations in Major Activities) at a rate 9 to 12 percent greater than whites (Butler *et al*, 1980). This suggests that more persons of all other races may have more severe illnesses than whites have. Third, Medicare beneficiaries of all other races may have a lower access to care than whites (Davis, 1975), suggesting that nonwhites who receive care are apt to be more in need of services (Table 7).

Sex of Beneficiary by Type of Episode

The use of medical services differs with the sex of the beneficiary. Total charges for services are higher for women than men because there are more aged women than men in the United States. However, men have more episodes *per capita* and more episodes involving only hospital care than do women, as seen in Table 8. Men also have higher hospital covered charges and higher hospital ancillary charges than do women, yet receive fewer days of hospital care. This suggests that men have more intensive hospital stays than women. These differences in utilization by the sex of the beneficiary can be partially explained by nursing home utilization rates. Elderly women reside in nursing homes at nearly twice the rate of men, leaving a more healthy female noninstitutionalized population (Table 9).

Women, as expected, use more SNF and HHA care. Over 60 percent of the episodes that include post-hospital care involve women. Women also have higher SNF and HHA charges. Thus, men's episodes of illness (at all ages and for all census divisions) involve relatively more hospital care and less post-hospital care than women's. This relationship is probably due to family and community supports. Since women have a longer life expectancy than men, they are more apt to be widowed and living alone than their male counterparts (Butler *et al*, 1980). Elderly men who are not living alone, however, live with elderly wives. Although it is possible that when two elderly persons are living together, neither is capable of caring for

TABLE 7
Average Hospital Days of Care by Race of Beneficiary and by Type of Episode

Race	Type of Episode				
	Hospital Only Care	Hospital and SNF Care	Hospital and HHA Care	Hospital, SNF, and HHA Care	Total
White	11.0	24.7	22.7	31.2	12.2
All Others [1]	12.4	28.8	24.1	32.7	13.6
Total	11.1	24.9	22.9	31.3	12.3

[1] All others includes race unknown.

TABLE 8
Episodes per 1,000 Medicare Beneficiaries by Sex of Beneficiary and by Type of Episode

Sex	Type of Episode				
	Hospital Only Care	Hospital and SNF Care	Hospital and HHA Care	Hospital, SNF, and HHA Care	Total
Women	253.9	11.2	16.7	2.2	284.1
Men	294.0	8.1	13.7	1.6	317.4
Total	271.1	9.9	15.4	2.0	298.4

TABLE 9
Average Charges by Sex of Beneficiary and by Type of Episode

Sex	Type of Episode				
	Hospital Only Care	Hospital and SNF Care	Hospital and HHA Care	Hospital, SNF, and HHA Care	Total
Female	$1,784	$5,272	$4,359	$7,513	$2,118
Male	1,974	5,711	5,017	7,948	2,230
Total	1,871	5,427	4,610	7,665	2,170

the other (Senate Committee on Aging, 1977), women are less likely than men to have the family supports which would enable them to remain at home or recuperate in the home from their hospital stays (Butler *et al*, 1980). (See Table 10.)

Mortality Status by Type of Episode

A patient's mortality status was measured at the time of discharge from the hospital or SNF and we found that it varied by the type of episode of illness. Episodes that involved post-hospital care were more likely to terminate with death of the beneficiary than those involving only hospital care. Thirty-two percent of the Type II episodes ended in the death of the beneficiary, compared to 8 percent for all episodes. These data suggest that persons who use post-hospital care are likely to have more severe conditions, especially since they are generally older than persons who use only hospital care. (The mortality status from an HHA was not available, and there is likely to be a slight under-reporting of the number of deaths in Episode Types III and IV.) (See Table 11.)

TABLE 10
Distribution of Episodes by Sex of Beneficiary and by Type of Episode

Sex	Type of Episode				
	Hospital Only Care	Hospital and SNF Care	Hospital and HHA Care	Hospital, SNF, and HHA Care	Total
Female	53.6%	64.9%	61.9%	65.3%	54.4%
Male	46.4	35.1	38.1	34.7	45.6
Total	100.0	100.0	100.0	100.0	100.0

TABLE 11
Distribution of Episodes by Mortality Status of Beneficiary and by Type of Episode

Mortality Status	Type of Episode				
	Hospital Only Care	Hospital and SNF Care	Hospital and HHA Care	Hospital, SNF, and HHA Care	Total
Alive	92.6%	69.4%	91.7%	78.8%	91.6%
Dead	7.4	31.6	9.3	21.2	8.4
Total	100.0	100.0	100.0	100.0	100.0

The average charge per episode is also significantly greater for episodes that end in death. As Table 12 shows, episodes that terminate with the death of the beneficiary have average charges per episode that are 53 percent greater than for all other episodes. These larger average charges per episode are a result of a larger number of hospital days of care used, larger hospital charges, and larger hospital ancillary charges incurred. However, the average SNF and HHA charges per episode for these cases that end in death are lower than for those that do not. These facts suggest that persons whose medical conditions became life threatening were transferred from the HHA or SNF to a hospital and thereby have shorter post-hospital care stays and incur smaller SNF and HHA charges.

Surgical Indication by Type of Episode

A surgical procedure performed in the hospital is generally associated with higher charges. Table 13 shows that episodes that involve surgery result in charges that are generally over 40 percent greater than for those episodes that do not involve surgery. However, there is no significant difference in the distribution of surgical cases by type of episode. This suggests that the presence or absence of surgery in the hospital does not influence the probability of receiving post-hospital SNF or HHA care, although surgery does influence the charges for care.

Hospital Discharge Diagnosis by Type of Episode

We analyzed the most common primary hospital discharge diagnostic categories. These categories are from the diagnostic coding methodology developed by Yale University which was used to construct Diagnosis Related Groupings (DRGs). This measure uses the Eighth Revision of the International Classification of Diseases Coding (ICDA-8) for a patient's primary discharge diagnosis that is found on the Medicare enrollment files to partition patients into groups with similar attributes to explain variations in some dependent variable. The DRG system also uses other patient descriptors to classify patients, but we studied only the diagnostic groups that they developed.

We analyzed the diagnosis by type of episode to highlight the differences in utilization by type of episode. It is not an adequate case mix control, and we do not suggest that certain mixes of services are more cost-efficient than others. There are major problems associated with using diagnosis as a case mix measure. One is its lack of specificity in describing the extent and type of disability affecting the patient in his or her current status (CBO, 1977; Jones, 1974). The same diagnosis may also result in several functional levels and behavior patterns, depending on other patient characteristics (Linn, 1974). Long-term care studies have also suggested that functional status is more strongly correlated with the cost of health care

TABLE 12
Average Charges by Mortality Status of the Beneficiary and by Type of Episode

Mortality Status	Type of Episode				
	Hospital Only Care	Hospital and SNF Care	Hospital and HHA Care	Hospital, SNF, and HHA Care	Total
Alive	$1,752	$5,305	$4,511	$7,785	$2,015
Dead	3,302	5,691	5,568	7,220	3,792
Total	1,871	5,427	4,610	7,665	2,170

TABLE 13
Average Charge per Episode by Surgical Indication and by Type of Episode

Surgical Indication	Type of Episode				
	Hospital Only Care	Hospital and SNF Care	Hospital and HHA Care	Hospital, SNF, and HHA Care	Total
No Surgery	$1,542	$4,401	$3,649	$6,272	$1,764
Surgery	2,545	7,205	6,313	9,654	2,984
Total	1,871	5,427	4,610	7,665	2,170

than a patient's diagnosis (Maddox and Douglass, 1973; Piland, 1978). Furthermore, many patients in this study had multiple diagnoses, which further complicates the use of this measure. Thus, the discussion of hospital discharge diagnosis is presented here as a descriptive tool; a more vigorous case mix control which uses this variable in conjunction with others will appear in our follow-up study.

Despite these limitations, it should be noted that the utilization of post-hospital care varies by the hospital discharge diagnosis. As shown in Table 14, some diagnostic groups are associated with a low level of post-hospital care. These include most heart conditions, hernias, and gall bladder, bile duct, and prostate diseases.

Other diagnostic groups are associated with a relatively high utilization of post-hospital care. Included in this group are fractures, cancer, diabetes, and cerebrovascular ailments. Thus, a patient's diagnosis is one factor which influences the types of care used.

TABLE 14

Number and Percentage Distribution of Episodes for Selected Hospital Discharge Diagnostic Groups

Diagnostic Group	ICDA-8 Codes	Total Episodes (in Thousands)	Hospital Only Care	Hospital and SNF Care	Hospital and HHA Care	Hospital, SNF, and HHA Care	Total
			Low Post-Hospital Care Utilization				
Acute Myocardial Infarctions	4100-4109	187.2	93.2	2.0	4.5	0.4	100.0
Arrythmia and Slowed Conduction	3581, 4272-4279	84.4	92.8	2.3	4.5	0.4	100.0
Gall Bladder and Bile Duct Diseases	5740-5769	142.9	95.0	1.4	3.4	0.2	100.0
Hernia of Abdominal Cavity	5500-5539	175.4	97.2	1.0	1.7	0.1	100.0
Hypertensive Heart Diseases	4000-4040	92.8	93.8	1.7	4.1	0.4	100.0
Ischemic Heart Diseases	4110-4149	718.7	91.9	2.6	5.0	0.5	100.0
Prostate Diseases	6000-6020	145.5	96.0	1.2	2.6	0.2	100.0
			High Post-Hospital Care Utilization				
Central Nervous System Diseases	3200-3499	58.5	83.3	5.8	9.4	1.6	100.0
Cerebrovascular Diseases	4300-4389	412.9	82.5	7.6	8.3	1.6	100.0
Diabetes	2500-2509	181.1	86.8	2.9	9.5	0.8	100.0
Fractures	8000-8299	295.9	75.5	13.1	9.1	2.3	100.0
Malignant Neoplasms							
Breast	1740	56.1	88.3	3.9	7.1	0.8	100.0
Digestive System	1400-1590	143.7	84.5	4.7	9.7	1.1	100.0
Respiratory System	1600-1639	84.3	87.6	4.5	7.1	0.9	100.0
Vascular System Diseases	2891-2893 4400-4431 4438-4480 4520-4549	169.7	88.0	4.1	7.0	0.9	100.0
All Diseases	4560-4589	7,552.5	90.9	3.3	5.2	0.7	100.0

Census Division

The Medicare program was designed to operate throughout the nation with a uniform package of benefits. However, there are great area-wide differences in the use of services because of the availability of services and local provider practice patterns. Total hospital, SNF, and HHA charges *per capita* for all episodes of illness vary significantly by census division, reflecting substantial area-wide variations in utilization and charges. In 1976, these total charges *per capita* varied from a minimum of $543 in the West South Central Division, 16 percent below the national average, to a maximum of $798 in the Middle Atlantic Division, 23 percent above the national average.

The distribution of episodes also varies markedly by census division, as shown in Table 15. Type II episodes of illness account for a substantial percentage of the total *per capita* charges in the Pacific (14 percent), the New England (10 percent), and the Middle Atlantic (10 percent) divisions. Type III episodes of illness account for a substantial percentage of total *per capita* charges in the New England (17 percent) and the Middle Atlantic (14 percent) Divisions.

These variations in the total *per capita* charges are a function of both the number of episodes *per capita* and the average charges per episode of illness. Areas with a large number of episodes *per capita* tend to display both a low total charge *per capita* and fewer episodes involving post-hospital SNF and HHA care (Table 16). An inverse relationship ($r = -.75$) exists between the total *per capita* charges and the number of episodes *per capita* by census division. These facts suggest that large charges *per capita* occur because of large average charges per episode, rather than a high *per capita* episode rate.

As expected, average charges per episode of illness varied widely by census division. As shown in Table 17, the average charge per episode in the Middle Atlantic Division is $2,980, 94 percent greater than in the West South Central Division. One way to explain these large variations in average charges per episode is to analyze the variations in price and quantity of services provided.

TABLE 15

Average Charges per Capita and Percentage Distribution of Charges by Census Division and by Type of Episode

Census Division	Type of Episode				
	Hospital Only Care	Hospital and SNF Care	Hospital and HHA Care	Hospital, SNF, and HHA Care	Total
New England	$493.4	$70.7	$124.1	$36.6	$724.7
Middle Atlantic	589.7	76.9	113.3	19.8	797.7
East North Central	561.7	58.2	59.7	10.4	690.0
West North Central	496.2	36.1	39.0	8.5	579.8
South Atlantic	470.3	36.4	69.8	12.4	588.9
East South Central	461.9	28.4	55.8	8.0	554.2
West South Central	476.3	17.9	43.6	4.9	542.7
Mountain	447.9	39.8	55.1	14.7	557.4
Pacific	499.6	92.8	66.9	25.7	684.9
Total	507.4	53.7	71.1	15.0	647.2
	Percentage Distribution				
New England	68.1%	9.8%	17.1%	5.1%	100.0%
Middle Atlantic	73.9	9.6	14.2	2.5	100.0
East North Central	81.4	8.4	8.7	1.5	100.0
West North Central	85.6	6.2	6.7	1.5	100.0
South Atlantic	79.9	6.2	11.9	2.1	100.0
East South Central	83.3	5.1	10.1	1.4	100.0
West South Central	87.8	3.3	8.0	0.9	100.0
Mountain	86.4	7.1	9.9	2.6	100.0
Pacific	72.9	13.5	9.8	3.8	100.0
Total	78.4	8.3	11.0	2.3	100.0

TABLE 16
Episodes per 1,000 Medicare Beneficiaries by Census Division and by Type of Episode

Census Division	Type of Episode				
	Hospital Only Care	Hospital and SNF Care	Hospital and HHA Care	Hospital, SNF, and HHA Care	Total
New England	233.7	13.0	27.1	4.5	278.4
Middle Atlantic	233.2	11.6	20.5	2.4	267.7
East North Central	280.2	10.8	12.5	1.3	304.8
West North Central	324.8	7.2	10.2	1.1	343.3
South Atlantic	275.6	7.2	15.8	1.6	300.2
East South Central	319.6	6.9	15.0	1.3	343.6
West South Central	337.3	3.1	11.4	0.6	352.5
Mountain	275.7	8.8	14.0	2.1	300.6
Pacific	239.3	18.6	14.2	3.5	275.6
Total	271.1	9.9	15.4	2.0	298.4

TABLE 17
Average Charges by Census Division and by Type of Episode

Census Division	Type of Episode				
	Hospital Only Care	Hospital and SNF Care	Hospital and HHA Care	Hospital, SNF, and HHA Care	Total
New England	$2,111	$5,423	$4,574	$8,066	$2,603
Middle Atlantic	2,529	6,631	5,414	8,275	2,980
East North Central	2,005	5,377	4,792	7,779	2,264
West North Central	1,528	5,000	3,819	7,776	1,689
South Atlantic	1,707	5,077	4,415	7,437	1,962
East South Central	1,445	4,150	3,723	6,275	1,617
West South Central	1,412	5,730	3,813	7,747	1,540
Mountain	1,625	4,543	3,927	6,906	1,854
Pacific	2,088	4,987	4,703	7,249	2,485
Total	1,872	5,427	4,610	7,666	2,169

Variations in the Price of Services

Although it is widely acknowledged that the price of institutional medical care services varies significantly by area, no comprehensive index of price variations is available to measure these differences. However, a crude input price adjustment can be made by comparing payroll costs per full-time equivalent worker (excluding fringe benefits) within an area to the national average. Since payroll costs account for a large percentage of institutional care prices—approximately 50 (or more) percent for hospital and SNF care and approximately 80 percent for HHA care—a price adjustment for these differences would control a large degree of the geographic variation in price. This input price adjustment is made by dividing total payroll costs by the number of full-time-equivalent employees in community hospitals and comparing this value to the national average. This price index assumes that average salaries in SNFs and HHAs parallel, on a relative basis, those for community hospitals in the same area. It also assumes that the price of non-wage inputs varies in the same relative manner as the wage inputs in a census division and that output prices are a function of input prices. As shown in Table 17 and Table 18, differences in the area input price index tend to parallel differences in charges per episode. This indicates that at least a portion of the variations in charge per episode is due to differences in input prices or wages. For example, the input price of medical care services in the Middle Atlantic Division is approximately 40 percent greater than in the East and West South Central Divisions. Thus, input price factors are significant in comparing average charges per episode.

TABLE 18

Average Salary per Community Hospital Worker by Census Division, 1976

Census Division	Average Salary	Index
New England	$10,432	1.117
Middle Atlantic	10,560	1.131
East North Central	9,671	1.036
West North Central	8,379	.897
South Atlantic	8,482	.909
East South Central	7,492	.802
West South Central	7,692	.824
Mountain	8,632	.925
Pacific	10,417	1.116
Total	9,336	1.000

Source: Hospital Statistics, American Hospital Association, 1977

Variations in the Quantities of Services

The quantity of services provided also varies by census division. Since it was not possible to directly measure the quantity of services provided, we developed a table of indices of the quantity of services per episode. These indices are the residuals of the average charges after the input price index has been applied. They are based on charges so that the relative price differences between the three different studied services are accounted for. Thus, hospital care receives a higher weight than SNF and HHA care.

This quantity index reflects both the volume of contacts with beneficiaries and the intensity of service of these contacts; it cannot separate the relative influence of these two factors. Thus, although a region may display a low level of beneficiary contacts, the quantity index may be high, due to the high intensity level of the services provided. Table 19 shows that the indices of quantity of services vary by census division and by type of episode. The quantity of service level is greater for episodes that involve all three types of care and lowest for episodes that involve only hospital care. By census division, New England, Middle Atlantic, East North Central, and Pacific Divisions show the highest levels of quantity of services provided (Table 20).

TABLE 19

Indices of Quantity of Services per Episode of Illness

Census Division	Type of Episode				
	Hospital Only Care	Hospital and SNF Care	Hospital and HHA Care	Hospital, SNF, and HHA Care	Total
New England	.871	2.238	1.888	3.329	1.074
Middle Atlantic	1.031	2.703	2.207	3.372	1.214
East North Central	.892	2.393	2.132	3.462	1.007
West North Central	.785	2.570	1.962	3.996	.868
South Atlantic	.866	2.575	2.240	3.772	.995
East South Central	.831	2.386	2.140	3.607	.929
West South Central	.790	3.206	2.133	4.334	.862
Mountain	.810	2.264	1.957	3.442	.924
Pacific	.863	2.060	1.943	3.113	1.027
Total	.863	2.502	2.125	3.534	1.000

TABLE 20

Average Hospital Days of Care by Census Division and by Type of Episode

Census Division	Type of Episode				
	Hospital Only Care	Hospital and SNF Care	Hospital and HHA Care	Hospital, SNF, and HHA Care	Total
New England	11.4	25.0	22.8	32.2	13.5
Middle Atlantic	13.2	29.5	26.7	35.7	15.2
East North Central	11.9	26.4	24.5	34.3	13.0
West North Central	11.1	25.7	22.9	37.3	11.8
South Atlantic	11.0	26.2	21.3	31.9	12.0
East South Central	10.5	23.7	21.8	28.4	11.4
West South Central	10.2	26.8	20.9	31.9	10.7
Mountain	9.5	22.0	20.4	29.8	10.5
Pacific	8.8	18.8	17.7	23.7	10.1
Total	11.1	24.9	22.9	31.3	12.3

In conclusion, the *per capita* charges per episode vary significantly by census division. The determinants of such variations are the number of episodes per population group, the average input price of medical care services in the area, and the variation in the quantity of services provided for an episode of illness. A division by division summary follows which highlights some of these factors:

The New England Division is characterized by relatively high prices and quantities of services per episode but an episode rate below the national average. A large proportion of New England episodes involves some post-hospital care (16 percent), especially home health agency visits (11 percent) compared to the respective national averages of 9 percent and 6 percent.

The Middle Atlantic Division has the highest prices, highest quantity indices, and the lowest episode rate of all divisions. These factors combine to give this division the highest *per capita* charge per episode which is primarily because of the high quantity index. The division is also characterized by a relatively high incidence of post-hospital care episodes (13 percent) and home health agency care episodes (9 percent).

The East North Central Division has an episode rate, quantity index, and price index that slightly exceed the national average. These factors yield a *per capita* institutional charge amount which is higher than the national average. Post-hospital care comprises about 8 percent of all episodes, slightly below the national average.

The West North Central Division shows a very high episode rate which is offset by low prices and quantities resulting in *per capita* expenditures well below the national average. This area also has post-hospital care use rates (5 percent) that are well below the national average.

The South Atlantic Division has an episode rate and quantity index that are the same as the national average. However, its input price index is below the national average, which accounts for its lower *per capita* institutional charges. Its post-hospital episode rate is somewhat smaller than the national average, although its home health care episode rate is about the same.

The East South Central and West South Central Divisions are characterized by very high episode rates but low quantity indices and very low input prices. The latter two factors offset the high episode rate and result in the lowest *per capita* charge rates of all divisions. These areas also have low rates of post-hospital care utilization.

The Mountain Division has episode rates equivalent to the national average, but input price and quantity indices are somewhat lower, resulting in *per capita* charge rates below the national average. The post-hospital episode rates for both SNF and HHA care are slightly below the national average.

The Pacific Division shows episode rates below the nation's, but the quantity index is slightly higher and the price index is much higher. The latter two factors combine to yield a *per capita* charge rate that exceeds the nation's. The area is characterized by a very high SNF episode rate (8 percent of all episodes) compared to the national average (4 percent) and a relatively high HHA episode rate (6.4 percent) compared to the nation (5.8 percent).

For more detailed information on the area-wide variation in average charges, refer to Table 21, which presents estimates on a State basis.

Summary of Findings

This study found that a majority (76 percent) of the users of Medicare Hospital Insurance benefits had one episode of illness in 1976. An overwhelming majority (90.9 percent) of these 7.5 million episodes did not involve Medicare post-hospital SNF and/or HHA care. Those episodes of illness that did include post-hospital care were substantially (53 percent) more expensive than episodes involving only hospital care. A large percentage of this charge differential by episode is due to a longer length of hospital stay and more frequent hospitalizations by users of post-hospital care. We also found that beneficiaries who used a combination of all three services—hospital, SNF, and HHA care—for an episode of illness consumed more of each type of service than all other beneficiaries. However, an analysis of the beneficiaries' demographic characteristics suggests that persons who use post-hospital care generally differ, on the average, from those who use only hospital care. We found that persons who use post-hospital SNF or HHA care are likely to be female, to have cancer, diabetes, fractured bones or a central nervous system or vascular system disease, and to be older than those who use only hospital care. We also found that the average charge per case decreases as age increases within an episode, suggesting that with increasing age persons are more likely to receive care under other payment sources due to Medicare's skilled care requirement. In addition, we found that episodes involving post-hospital care were more likely to end in the death of the beneficiary. The greatest percentage (32 percent) of deaths were associated with Episode Type II.

The data also show that a beneficiary's area of residence greatly influences the amount and type of care received. Persons who are domiciled in the New England, Middle Atlantic, and Pacific Census Divisions are more likely to receive post-hospital care than persons who live elsewhere in the United States. These persons also incur among the highest *per capita* institutional charges in the United States because of the higher average charges found in these areas. Part of this variation in institutional charges *per capita* is explained by the high input price index (estimated by the level of wages in an area) found in these areas, and in some cases by the high quantity of services index. The quantity index was derived as the residual of the charges after the input price index was applied. We found that the quantities of provided

TABLE 21

Average Charges by State of Residence and by Type of Episode

State of Residence	Type of Episode				
	Hospital Only Care	Hospital and SNF Care	Hospital and HHA Care	Hospital, SNF, and HHA Care	Total
Alabama	$1,531	$3,825	$3,698	$6,228	$1,711
Alaska	2,463	8,599	6,925	.....	2,693
Arizona	1,852	5,208	4,623	7,583	2,131
Arkansas	1,235	5,617	2,981	6,730	1,276
California	2,281	5,200	5,038	7,656	2,707
Colorado	1,746	4,533	4,254	6,986	2,011
Connecticut	2,090	4,703	4,457	6,758	2,645
Delaware	2,092	4,411	4,682	5,330	2,346
District of Columbia	2,688	6,837	5,791	12,376	3,118
Florida	1,867	5,404	4,790	7,944	2,269
Georgia	1,415	4,231	3,422	6,044	1,518
Hawaii	1,748	4,474	3,746	5,226	2,116
Idaho	1,301	3,226	3,300	4,357	1,493
Illinois	2,181	5,447	5,296	8,421	2,430
Indiana	1,622	4,272	4,297	7,263	1,798
Iowa	1,382	4,580	3,056	6,438	1,494
Kansas	1,463	4,894	3,484	7,164	1,561
Kentucky	1,320	3,923	3,068	5,829	1,490
Louisiana	1,372	5,331	4,002	8,161	1,574
Maine	1,585	5,346	3,683	7,612	1,983
Maryland	2,416	5,733	5,446	8,219	2,731
Massachusetts	2,392	6,963	5,181	10,316	2,893
Michigan	2,256	6,006	5,795	8,538	2,590
Minnesota	1,581	4,980	4,073	7,348	1,776
Mississippi	1,283	5,049	3,799	7,366	1,456
Missouri	1,689	5,465	4,081	8,611	1,929
Montana	1,200	3,914	2,856	5,455	1,337
Nebraska	1,473	4,741	3,092	5,437	1,597
Nevada	2,195	5,082	4,883	7,489	2,475
New Hampshire	1,453	4,340	3,072	5,644	1,858
New Jersey	2,393	5,935	5,080	8,533	2,834
New Mexico	1,532	6,645	3,514	8,742	1,730
New York	2,892	7,495	6,461	9,311	3,383
North Carolina	1,379	4,578	2,884	5,191	1,534
North Dakota	1,473	5,185	4,284	7,146	1,532
Ohio	1,935	5,428	4,139	7,354	2,230
Oklahoma	1,463	5,671	3,784	7,276	1,550
Oregon	1,577	4,360	4,015	6,669	1,894
Pennsylvania	2,099	5,471	4,608	7,336	2,512
Rhode Island	2,011	4,664	4,460	6,872	2,545
South Carolina	1,336	3,764	3,227	4,326	1,526
South Dakota	1,231	4,895	3,104	4,489	1,303
Tennessee	1,574	5,086	4,116	6,627	1,740
Texas	1,456	5,852	3,795	7,718	1,595
Utah	1,409	3,975	2,875	5,672	1,578
Vermont	1,408	3,860	3,389	6,194	1,889
Virginia	1,769	6,264	4,354	8,799	1,898
Washington	1,447	3,891	3,249	5,616	1,718
West Virginia	1,445	4,448	3,382	5,936	1,556
Wisconsin	1,733	4,895	3,946	6,989	1,900
Wyoming	1,269	3,362	3,383	9,958	1,397
Total	1,871	5,427	4,610	7,665	2,170

services were greatest in the New England, Middle Atlantic, East North Central, and Pacific Census Divisions.

Despite these findings that associate high charges with post-hospital care episodes by demographic characteristics, an adequate case mix control was not applied here and no definitive statement can reasonably be made concerning the financial feasibility of substituting post-hospital SNF and HHA care for inpatient hospital care. The next phase of this study will apply more vigorous case mix measures to make charge comparisons between the four different types of episodes within the limitation of the data set.

Discussion

In this paper, we presented a descriptive analysis of the charges incurred under the Medicare HI program in 1976 for an episode of illness. Although our data are national in scope and can provide base-line data for other studies, great limitations in this data set severely restricted the analysis and interpretation of the findings presented here. Most importantly, the Medicare episode charges are only a portion of the costs incurred to treat program beneficiaries.

Episodes of illness are also likely to include services not reimbursed by Medicare and services not studied here, such as physician and outpatient hospital services. Thus, beneficiaries are likely to make private expenditures for health care services and receive benefits under other Federal programs such as Title III (Older Americans Act), Title XVIII (Supplementary Medical Insurance Program of Medicare), Title XIX (Medicaid), and Title XX (Social Services). This omission is particularly crucial in episodes that involve nursing home care because the Medicaid program pays for a considerable amount of this type of care in skilled nursing and intermediate care facilities.

It is generally believed that some Medicare SNF beneficiaries may remain in nursing homes as private pay patients or as Medicaid recipients. Thus, the presented data represent only the highly skilled care that beneficiaries receive for an episode of illness. Although Medicare HI benefits are likely to represent a large part of the services received during an episode of illness, we cannot reach conclusions concerning the cost-efficiency of the three services studied. For example, the finding which showed that episodes involving only hospital care are least expensive could, in part, be due to the presence of other funding sources which permitted the provision of care.

This study was also limited because of the absence of variables in the data set which are expected to influence the utilization and cost of health care. Previous studies have documented that factors such as income (Newhouse and Phelps, 1973a), educational attainment (Grossman, 1972), private health insurance coverage, (Newhouse and Phelps, 1973b), and the level of family or community support (Butler et al, 1980), influence the type and cost of care used. Furthermore, because of the direct relationship between the severity of the case mix and the cost of care, measures of functional status (Katz et al, 1976), psychosocial status (Pfeiffer, 1975; Eisdorfer, 1977), or multilevel patient assesment tools (Jones *et al*, 1974; Denson and Jones, 1976) would also have been useful in making cost comparisons. Unfortunately, these variables are not available in the data set used here, which limits the study to a descriptive account of charges and utilization under the Medicare program.

Despite the limitations of the available data, the study findings show that the services used under Medicare for an episode of illness vary dramatically. This area clearly requires further study to determine if the expenditures made for these services are appropriate. Most importantly, the ability of post-hospital care service to substitute for inpatient hospital care needs to be examined in light of current legislative initiatives. The study findings cannot make a conclusive statement on this issue, yet they suggest factors which influence the utilization of inpatient hospital, SNF, and HHA care.

In conclusion, an increase in the number of aged persons requiring medical care services can be predicted from demographic trends. Since concomitant public expenditures for these services can also be anticipated, research to better understand the relationship between the different types of services that persons receive for an illness is required to enhance the formulation of public policies. On the basis of our research, three general areas for further study appear to be particularly important. First, theoretical models of the use of medical care that include several institutional providers and payment sources (especially Medicaid) need to be developed. These models should incorporate refined notions of the interrelationship of case mix, quality, and cost of care. Empirical testing of such models should naturally follow.

Second, an analysis of the decision-making factors that influence the selection of services for an episode need to be developed.

Third, a comparative study of costs incurred on a per case basis should be conducted. It should include costs of food and housing, and the opportunity costs for family caretakers. Our analysis of Medicare episodes of illness showed that episodes involving post-hospital SNF or HHA services were associated with higher reimbursable charges, but other information is needed to determine the total cost for an episode of illness and the factors influencing the need and demand for these services.

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Technical Note A
Medicare Charges

The dollar values presented in this paper represent charges that providers bill for services. These charges include deductible and coinsurance payments and fees for non-covered services that the beneficiary must assume and interim reimbursements paid by the Medicare program. Some of these charges may be disqualified for payment of any kind if the charges exceed the cost of supplying the service. This determination is made on a reasonable cost basis by the fiscal intermediary who also approves the interim reimbursements. At the end of the provider's fiscal year, these interim reimbursements are adjusted to compute the costs of the provided services. The final costs to the Medicare program are generally greater than the interim reimbursements and less than the submitted charges. For hospital and skilled nursing facility care, interim reimbursements are usually adjusted upward within 3 to 5 percent to reflect retroactive payments resulting from final cost settlements. This adjustment generally varies between 5 to 10 percent for HHA care, depending on the type of HHA. These adjustments to the charge and reimbursement information are inherent in all the data presented in this paper and do not significantly alter the findings and conclusions made.

Technical Note B

The concept of an episode of illness as developed in this study has some definite advantages in making charge comparisons between three different types of health care services. First, it recognizes the trade-off between the length of stay and the cost per unit of service. Thus, we can make a reasonable cost comparison between a hospital stay of two days costing $200 per day and an SNF stay of four days costing $50 per day. Second, it links a patient's utilization of services across different types of institutional providers and shows the different types of services received for a particular illness. This allows a comparison of cases involving hospital and HHA care versus cases involving hospital and SNF care.

Third, an episode of illness allows a comparison of episodes that involve the same types of services but different numbers of each type. For example, a comparison could be made between an episode that involves three days of hospital care and 10 days of SNF care and one that involves five days each of hospital and SNF care.

Fourth, an episode of illness can detect the shift in service utilization characterized by different groups. Thus, it would be possible to distinguish between groups with similar demographic characteristics that differ in their use of post-hospital care. For example, if all people over 85 years old had the same hospital length of stay but some used post-hospital care while others didn't, an episode of illness could detect this difference in population subgroups.

In conclusion, the concept of an episode of illness can demonstrate the many interactions between different services in the provision of care that individual cost per service studies have been unable to relate.

The concept also has some disadvantages for analyzing health care cost and utilization. First, unless the same definition of the episode is used, it would be difficult to compare the results presented here with findings from possible future studies. Second, many of the long-term care services provided to the aged population are not designed as "cures" for an illness but are rather intended to maintain a level of functional ability. Third, the analysis and interpretation of the results on a per case basis are difficult because of the many factors influencing the pattern of health care delivery in the United States. However, the advantages of a per case analysis of Medicare charges clearly outweigh the disadvantages, leading us to adopt the episode concept.

Technical Note C
Reliability of Estimates [1]

The data used in this paper are estimates based on a 20 percent sample of the enrolled population and hence are subject to sampling variability. Tables A through F will enable the reader to obtain approximate standard errors for the estimates in this paper. The standard error is primarily a measure of sampling variability—that is, of the variation that occurs by chance because a sample rather than the whole population is used. To calculate the standard errors at a reasonable cost for the wide variety of estimates in this paper, it was necessary to use approximate methods. Thus, these tables should be used only as indicators of the order of magnitude of the standard errors for specific estimates.

The sample estimate and an estimate of its standard error permit us to construct interval estimates with prescribed confidence that the interval includes the average result of all possible samples (for a given samoling rate).

To illustrate, if all possible samples were selected, each of these were surveyed under essentially the same conditions *and an estimate and its estimated standard error were calculated from each sample,* then:

- Approximately 2/3 of the intervals from one standard error below the estimate to one standard error above the estimate would include the average value of all possible samples. We call an interval from one standard error below the estimate to one standard error above the estimate a 2/3 confidence interval.

[1] Prepared by James C. Beebe, Statistical and Research Services Branch, Office of Research.

- Approximately 9/10 of the intervals from 1.6 standard errors below the estimate to 1.6 standard errors above the estimate would include the average value of all possible samples. We call an interval from 1.6 standard errors below the estimate to 1.6 standard errors above the estimate a 90 percent confidence interval.
- Approximately 19/20 of the intervals from two standard errors below the estimate to two standard errors above the estimate would include the average value of all possible samples. We call an interval from two standard errors below the estimate to two standard errors above the estimate a 95 percent confidence interval.
- Almost all intervals from three standard errors below the sample estimate to three standard errors above the sample estimate would include the average value of all possible samples.

The average value of all possible samples may or may not be contained in any particular computed interval. But for a *particular* sample, one can say *with specified confidence* that the average of all possible samples is included in the constructed interval.

The relative standard error is defined as the standard error of the estimate divided by the value being estimated. In general, small estimates, estimates for small subgroups, and percentages or means with small bases tend to be relatively unreliable. The reader should be aware that some of the estimates in this paper may have high relative standard errors.

TABLE A
Standard Error of Estimated Charges or Reimbursements per Episode
Episodes or Stays in Base (1,000s)

Ratio	.2	.3	.5	.7	1	2	3	5	7	10	20	30
300	150	120	95	81	69	50	41	33	28	24	17	14
500	190	150	120	100	88	63	53	41	35	30	22	18
700	220	180	140	120	100	75	62	49	42	35	25	21
1,000	260	220	170	150	120	89	73	58	49	42	30	25
2,000	390	320	250	210	180	130	110	84	72	60	43	36
3,000	520	430	330	280	240	170	140	110	92	78	56	46
5,000	790	640	500	420	350	250	210	160	140	110	81	66
7,000	1,100	880	680	570	480	340	280	210	180	150	110	87
10,000	1,500	1,200	960	810	680	480	390	300	250	210	150	120
15,000	2,300	1,900	1,500	1,200	1,000	720	580	450	380	320	220	180
20,000	3,100	2,500	2,000	1,700	1,400	970	780	600	510	420	300	240

TABLE A—Continued
Standard Error of Estimated Charges or Reimbursements per Episode
Episodes or Stays in Base (1,000s)

Ratio	50	70	100	200	300	500	700	1,000	2,000	3,000	5,000	7,000
300	11	9.5	8.1	5.8	4.8	3.8	3.2	2.8	2.0	1.6	1.3	1.1
500	14	12	10	7.4	6.1	4.8	4.1	3.5	2.5	2.1	1.7	1.4
700	17	14	12	8.7	7.2	5.7	4.8	4.1	3.0	2.5	1.9	1.7
1,000	20	17	14	10	8.5	6.7	5.7	4.9	3.5	2.9	2.3	2.0
2,000	28	24	20	15	12	9.5	8.1	6.9	4.9	4.1	3.2	2.7
3,000	36	31	26	18	15	12	10	8.6	6.2	5.1	4.0	3.4
5,000	51	44	37	26	21	17	14	12	8.5	7.0	5.5	4.7
7,000	68	57	48	34	28	22	18	15	11	9.0	7.0	5.9
10,000	94	79	66	47	38	30	25	21	15	12	9.4	7.9
15,000	140	120	98	69	56	43	37	31	21	18	14	11
20,000	190	160	130	92	75	58	49	41	29	23	18	15

TABLE B
Standard Errors of Estimated Stays Per Episode
Episodes in Base (1,000s)

Ratio	.2	.3	.5	.7	1	2	3	5	7	10	20	30
1.0	.16	.13	.10	.086	.072	.051	.041	.032	.027	.022	.016	.013
1.5	.25	.20	.15	.13	.11	.076	.062	.048	.040	.034	.024	.019
2.0	.33	.27	.21	.17	.14	.10	.082	.064	.054	.045	.031	.026
2.5	.41	.33	.26	.22	.18	.13	.10	.079	.067	.056	.039	.032
3.0	.49	.40	.31	.26	.22	.15	.12	.095	.080	.067	.047	.038

TABLE B—Continued
Standard Errors of Estimated Stays Per Episode
Episodes or Stays in Base (1,000s)

Ratio	50	70	100	200	300	500	700	1,000	2,000	3,000	5,000	7,000
1.0	.010	.0083	.0070	.0049	.0040	.0031	.0026	.0021	.0015	.0012	.00089	.00074
1.5	.015	.013	.010	.0073	.0060	.0046	.0039	.0032	.0022	.0018	.0013	.0011
2.0	.020	.017	.014	.0098	.0080	.0061	.0052	.0043	.0030	.0024	.0018	.0015
2.5	.025	.021	.017	.012	.010	.0077	.0064	.0054	.0037	.0030	.0022	.0018
3.0	.030	.025	.021	.015	.012	.0092	.0077	.0064	.0044	.0036	.0027	.0022

TABLE C
Standard Errors of Estimated Hospital Days per Episode or per Stay
Episodes or Stays in Base (1,000s)

Ratio	.2	.3	.5	.7	1	2	3	5	7	10	20	30
5	1.2	1.1	.86	.74	.64	.47	.40	.32	.28	.24	.18	.15
7	1.5	1.3	1.0	.88	.76	.56	.47	.38	.33	.28	.21	.18
10	1.9	1.6	1.2	1.1	.91	.68	.57	.45	.39	.34	.25	.21
20	3.0	2.5	2.0	1.7	1.4	1.0	.86	.68	.58	.50	.37	.31
30	4.3	3.5	2.7	2.3	2.0	1.4	1.2	.91	.77	.65	.48	.39
50	7.0	5.7	4.4	3.7	3.1	2.2	1.8	1.4	1.2	.99	.71	.58

TABLE C—Continued
Standard Errors of Estimated Hospital Days per Episode or per Stay
Episodes or Stays in Base (1,000s)

Ratio	50	70	100	200	300	500	700	1,000	2,000	3,000	5,000	7,000
5	.12	.10	.090	.067	.056	.045	.039	.034	.025	.021	.017	.015
7	.14	.12	.11	.079	.066	.053	.046	.040	.030	.025	.020	.017
10	.17	.15	.13	.094	.079	.063	.055	.047	.035	.030	.024	.021
20	.24	.21	.18	.13	.11	.090	.077	.066	.049	.042	.033	.029
30	.31	.27	.23	.17	.14	.11	.096	.082	.061	.051	.041	.035
50	.45	.39	.33	.24	.20	.16	.13	.11	.082	.069	.055	.047

TABLE D
Standard Errors of Estimated SNF Days per Episode
Episodes or Stays in Base (1,000s)

Ratio	.2	.3	.5	.7	1	2	3	5	7	10	20	30
10	1.5	1.3	1.2	1.1	1.0	.91	.86	.81	.77	.73	.57	.47
20	2.9	2.5	2.1	1.9	1.8	1.6	1.5	1.4	1.3	1.1	.77	.63
30	4.3	3.6	3.0	2.7	2.5	2.2	2.0	1.8	1.5	1.3	.92	.76
50	7.0	5.8	4.7	4.2	3.8	3.2	2.9	2.2	1.9	1.6	1.2	.95

TABLE D—Continued
Standard Errors of Estimated SNF Days per Episode
Episodes or Stays in Base (1,000s)

Ratio	50	70	100	200	300	500	700	1,000	2,000	3,000	5,000	7,000
10	.37	.31	.26	.19	.16	.12	.10	.088	.063	.052	.041	.035
20	.50	.42	.36	.26	.21	.17	.14	.12	.086	.071	.056	.048
30	.59	.50	.43	.31	.25	.20	.17	.14	.10	.085	.066	.057
50	.74	.63	.54	.38	.32	.25	.21	.18	.13	.11	.083	.071

TABLE E
Standard Errors of HHA Visits per Episode
Episodes or Stays in Base (1,000s)

Ratio	.2	.3	.5	.7	1	2	3	5	7	10	20	30
1	.79	.66	.52	.45	.38	.28	.23	.18	.15	.13	.095	.079
2	1.2	1.0	.77	.66	.56	.40	.33	.26	.23	.19	.14	.12
3	1.5	1.2	.96	.83	.70	.51	.42	.33	.28	.24	.18	.15
5	2.0	1.7	1.3	1.1	.94	.68	.57	.45	.38	.32	.23	.19
7	2.5	2.0	1.6	1.4	1.2	.84	.69	.55	.47	.40	.29	.24
10	3.1	2.6	2.0	1.7	1.5	1.1	.87	.68	.58	.49	.36	.30
20	5.1	4.2	3.3	2.8	2.4	1.7	1.4	1.1	.93	.79	.56	.47
30	7.0	5.8	4.5	3.8	3.2	2.3	1.9	1.5	1.3	1.1	.76	.62
50	11	8.8	6.9	5.8	4.9	3.5	2.8	2.2	1.9	1.6	1.1	.92
70	14	12	9.2	7.8	6.5	4.6	3.8	2.9	2.5	2.1	1.5	1.2

TABLE E—Continued
Standard Errors of HHA Visits per Episode
Episodes or Stays in Base (1,000s)

Ratio	50	70	100	200	300	500	700	1,000	2,000	3,000	5,000	7,000
1	.062	.054	.045	.033	.027	.022	.019	.016	.011	.0095	.0075	.0064
2	.091	.078	.066	.048	.040	.032	.027	.023	.017	.014	.011	.0094
3	.11	.098	.083	.060	.050	.039	.034	.029	.021	.017	.014	.012
5	.15	.13	.11	.080	.067	.053	.045	.038	.028	.023	.018	.016
7	.19	.16	.14	.098	.081	.064	.055	.046	.034	.028	.022	.019
10	.23	.20	.17	.12	.10	.079	.068	.057	.041	.034	.027	.023
20	.37	.31	.26	.19	.16	.12	.11	.088	.064	.053	.041	.035
30	.49	.41	.35	.25	.21	.16	.14	.12	.084	.069	.054	.046
50	.72	.61	.51	.37	.30	.24	.20	.17	.12	.099	.078	.066
70	.95	.80	.68	.48	.39	.31	.26	.22	.16	.13	.10	.085

TABLE F
Standard Errors of Total Episodes

Estimated Episode	Standard Error
50,000	580
70,000	680
100,000	820
200,000	1100
300,000	1400
500,000	1800
700,000	2100
1,000,000	2500
2,000,000	3600
3,000,000	4400
5,000,000	5600
7,000,000	6600

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