This PDF is a selection from an out-of-print volume from the National Bureau of Economic Research

Volume Title: Frontiers in the Economics of Aging

Volume Author/Editor: David A. Wise, editor

Volume Publisher: University of Chicago Press

Volume ISBN: 0-226-90304-4

Volume URL: http://www.nber.org/books/wise98-1

Publication Date: January 1998

Chapter Title: Diagnosis and Medicare Expenditures at the End of Life

Chapter Author: Alan M. Garber, Thomas E. MaCurdy, Mark B. McClellan

Chapter URL: http://www.nber.org/chapters/c7302

Chapter pages in book: (p. 247 - 274)

5   Diagnosis and Medicare Expenditures at the End of Life

Alan M. Garber, Thomas MaCurdy, and Mark McClellan

5.1   Introduction

Expenditures for health care at the end of life (EOL) have been the object of considerable policy interest. To many observers, aggressive health care administered shortly before death is wasteful, at least in retrospect, and there is no doubt that elderly Americans use health care heavily before they die. In 1990, the 6.6 percent of Medicare recipients who died accounted for 22 percent of program expenditures (Lubitz and Riley 1993). Some question the benefits of such care, especially because severe morbidity and disability may compromise any years of life potentially gained from such treatments in the very old (Verbrugge 1984). The increasing use at advanced ages of costly and aggressive health interventions, whose impact on both the quality and length of life is often unknown, exacerbates these concerns. For example, the use of radical prostatectomy for invasive prostate cancer increased threefold between 1983 and 1989 (Lu-Yao and Greenberg 1994), and the rate at which both new and old major operations are performed in the elderly increased dramatically from 1972 to 1981 (Valvona and Sloan 1985) and 1984 to 1991 (McClellan and Skinner 1994). These phenomena have helped to stimulate a growing literature on the significance and policy implications of EOL health care utilization and expenditures (Bayer et al. 1983; Lubitz and Prihoda 1984; Scitovsky 1984,

1988, 1994; Lubitz and Riley 1993; Schneiderman and Jecker 1993; Emanuel and Emanuel 1994). Because nearly all the elderly are insured by Medicare, federal funds pay for most EOL medical costs.

Despite the provocative findings of this literature, the policy significance of EOL care is uncertain. Although they consume a large share of health dollars, patients nearing death are not the main source of large Medicare payments. Most high-cost elderly patients are survivors, not decedents. In 1990, for example, the 8 percent of Medicare enrollees with over $10,000 in Medicare costs accounted for 65 percent of all Medicare expenditures. Even if every enrollee who died that year generated more than $10,000 in payments, they could have been responsible for at most one-third of this total (Helbing 1993). In addition, some studies suggest that the elderly who are most likely to die are not responsible for the greatest expenditures; for the very old, for example, the ratio of spending for decedents to that for survivors narrows, and more of the excess costs are for nursing home care, which presumably is an unavoidable expense (Scitovsky 1988).

An even more important limitation of an exclusive focus on EOL expenditures is its implicitly retrospective nature. If health care providers knew ex ante which patients would die despite their interventions, expenditures on dying patients could potentially be reduced. Yet often it is impossible, even with detailed clinical records, to predict *individual* patient mortality with sufficient specificity to influence medical decision making. Even after days of detailed intensive care unit (ICU) measurements, systems such as APACHE can reliably predict death in only a small minority of ICU patients (Atkinson et al. 1994), and such systems have not been shown to lead to more cost-effective decisions than expert physicians would otherwise make. Furthermore, specific policies designed to reduce EOL expenditures, such as advance directives and "do not resuscitate" orders, seem to have had only a modest impact on overall expenditures. As a result, some analysts have recently argued that attempts to limit EOL expenditures through both of these methods are unlikely to reduce health expenditures substantially (Emanuel and Emanuel 1994). Simpler rationing rules, such as age-based rationing of costly operations or ICU admissions, are even less likely to lead to selective reductions in "futile" care, since there are no simple characteristics such as age or disease that clearly predict whether interventions are likely to be worthwhile.

Moreover, such rationing rules would have large effects on expenditures only if implemented at ages when life expectancy remains substantial, such as below age 70 (Garber and Fuchs 1992). Finally, some of the expenditures at the end of life are for treatments designed to provide comfort rather than to prevent death. Refinements in methods to predict death and avoid inappropriately aggressive care would not reduce these expenditures.

Although there is growing disenchantment with policies designed to identify and avert "futile care" at the *individual* patient level, the consequences of population-level policies merit further exploration. Little is known about the

impact on the cost and outcomes of elderly populations with major illnesses of policies that would lead to a generally more parsimonious approach to health care delivery. Would efforts designed to limit major operations, aggressive diagnostic approaches, or care delivered in ICUs lead to an increase in mortality rates, health complications, and other adverse outcomes in the populations with major illness? Would substantial cost savings result from associated reductions in technology use? Further analysis of alternative patterns of care for severe illness might also reveal why policies designed to reduce EOL expenditures have had such disappointing results. Perhaps decedents consume substantial care because it is not clear until very late in the course of their illnesses that they will die. Even if they are known to suffer from illnesses that are nearly always fatal, it may be neither feasible nor desirable to reduce expenditures for their health care. For example, advance directives may not save money because they induce the substitution of one set of services (such as nursing home or hospice care) for another (hospital care), because high-intensity care at the end of life does not prolong life for long enough to generate large increases in expenditures, or because intensive spending is already concentrated on treatments that have a significant chance of improving outcomes.

As a first step toward addressing these questions, we sought to explore the basic characteristics of Medicare recipients during the time approaching their deaths. The magnitude of health expenditures for Medicare enrollees with major illnesses and uncertainty about their impact on costs and outcomes underscores the need for basic information about the prevalence, causes, and concomitants of the conditions that commonly lead to death among the U.S. elderly. What characteristics of patients are associated with high-cost care and high probability of death? Can these characteristics be used to identify individuals and populations with major illnesses prospectively, to guide policies on the use of intensive treatments? What is the distribution of costs and survival across high-risk illnesses, and across individuals with a given illness, and how are they correlated? In this study, we report the results of analyses of expenditures patterns for Medicare decedents, investigating in particular the diseases and demographic characteristics of decedents and the associated Medicare expenditures.

5.2   Analytic Data Files

Our analysis builds from linked Medicare Part A (hospital) and Part B (physician and other services) claims files. These files include information regarding all covered services (inpatient, hospital outpatient, ambulatory and physician care, durable medical equipment, home care, hospice care, and skilled nursing and rehabilitation care), key discharge information (discharge destination and condition), and demographic information (including residence information at the zip code level). Demographic information is updated annually.

Failure to meet deductible or out-of-pocket limits for the year will rarely lead to omission of significant utilization data in the major illness population that we study. EOL Medicare expenditures and disease incidence figures are calculated from patients in the Medicare 5 percent beneficiary sample (obtained from the Health Care Financing Administration [HCFA]) who died between 1986 and 1990 and who also received inpatient treatment for cancer, cardiovascular, cerebrovascular, "fatal," or "frailty" disorders during the last year of their lives. The specific diagnostic groupings are based on an aggregation scheme developed by McClellan to map primary diagnosis codes into one of 155 disease groupings. In this approach, a "cancer patient" is someone who, at any point during the last year of life, was admitted to a hospital with a primary diagnosis of oropharyngeal, upper gastrointestinal, colorectal, intra-abdominal, upper respiratory tract, lung, thoracic, bone/connective tissue, skin, breast, genital, prostate, central nervous system, or other primary solid cancers; secondary solid cancer/metastasis; leukemia/lymphoma; or malignancies of the bladders, kidneys, or urinary tract. Similarly, anyone with a primary diagnosis of acute myocardial infarction, old myocardial infarction, ischemic heart disease, cardiac valve disorders, cardiac conduction defects, cardiac arrhythmia, ventricular arrhythmia, supraventric/unspecified arrythmia, atrial fibrillation, or heart failure is a "cardiovascular patient." "Cerebrovascular patients" are those with a primary diagnosis of hemorrhagic stroke, occlusive stroke, transient cerebral ischemia, or chronic cerebrovascular deficits. "Fatal" disorders are colorectal cancer, lung cancer, breast cancer, prostate cancer, acute myocardial infarction, ischemic heart disease, ventricular arrhythmia, heart failure, occlusive stroke, chronic obstructive pulmonary disease (which includes chronic bronchitis, emphysema, and some forms of asthma), and hip fracture. Finally, the "frailty" conditions we consider are septicemia, endocrine/metabolic disorders (except diabetes), pneumonia, pyelonephritis, cystitis/lower urinary tract infections, and failure to thrive/malnutrition. (For each of tables 5.11 through 5.13, below, the percentage in the upper left-hand corner indicates the percentage of those who died who fall into these diagnosis groupings.)

We merge the Part A (MEDPAR), Part B (BMAD), and outpatient (OUTPAT) files to calculate total Medicare reimbursements for each patient during the indicated periods. For Part A and outpatient claims, we use the HCFA reported reimbursement amounts. For a Part B claim, reimbursed amounts are calculated as 0.8 times allowed charges. All claims are deflated to 1990 dollars by the CPI. We sum these three components to calculate total reimbursements for each person during the period. The "Percentage of Total Medicare Expenditures" sums total reimbursements for the group and expresses this sum as a fraction of total reimbursements for all patients in the HCFA 5 percent sample from 1986–90. Thus the cost figures reported are based on reimbursements and do not include the patient's out-of-pocket expenditures for noncovered services, copayments, or deductibles.

To calculate disease incidence among the group in any time period, we count by disease type all primary diagnoses of beneficiaries in the specified sub-sample during that time period, rank the diseases, and report the 14 most prevalent as percentages. In other words, the 28.1 percent number reported in table 5.12 for heart failure during the last year of life for cardiovascular patients means: of all the hospital admissions for cardiovascular patients during the last year of life, 28.1 percent of the admissions had a primary diagnosis of heart failure.

Sample selection is based on gender and age during the year that the patient dies. As a means of summarizing the presentation efficiently, we allocate age at death into three categories: 65–74, 75–84, and 85–99. It bears repeating that there are a few sample restrictions that we place on every analysis we do. To be in *any* of our tables, patients must be between the ages of 65 and 99. We also exclude all prior or current HMO members.

5.3 Results

Table 5.1 shows basic characteristics of Medicare beneficiaries who die. Approximately 15 percent of all Medicare beneficiaries will die in a five-year period. As the age and sex distribution of decedents shows, women tend to be

Table 5.1   Characteristics of Medicare Beneficiaries Who Die, 1986–90

Characteristic	Percentage
Age and Sex Distribution (% Male/% Female)	
65–69	7.9/5.4
70–74	9.7/7.1
75–79	10.4/9.11
80–84	9.0/10.3
80–84	9.0/10.3
85–89	6.2/10.1
90–100	4.2/10.6
Racial Distribution (%)	
White	89.0
Black	8.2
Asian	1.1
Percentage of Beneficiaries Who Die Each Year	
1986	4.59
1987	4.58
1988	4.67
1989	4.61
1990	4.54
1986–90	15

somewhat older when they die than men, and deaths are distributed fairly evenly over the five-year age intervals. Approximately 90 percent of all decedents are white, the rest being predominantly black. A high percentage—roughly 5 percent—of all Medicare beneficiaries die each year, greatly exceeding the annual mortality rates for other segments of the population.

Table 5.2, which reports overall Medicare expenditures before death, shows that the vast majority of Medicare recipients have claims in the year before they die. Only about 4 percent do not have claims. The mean expenditures in the last year of life over the 1986–90 period total about $13,000, more than half of which occurred in the last three months of life. The 50th percentile, however, is only about $8,000 in the last year of life, reflecting the influence of the upper tail of the distribution of expenditures, which can reach very large amounts. Reimbursements of $8,000 can easily be incurred in a single hospitalization.

Panel B of table 5.2 shows the percentage of deaths associated with several of the most common diagnoses. These are expressed in three ways. The column labeled "first" gives the percentage of times the given diagnosis was listed as the primary diagnosis during the first hospital admission of the year of death. "Last" refers to the same figure, except for the final admission during the year, rather than the first. To the extent that patients have a single hospital admission during the last year of life, these figures should be similar. The columns labeled "all year" and "all period" refer to the percentage of times the given diagnosis was the principal diagnosis during any admission during the corresponding time period.

For most diagnoses, it does not matter which of these definitions of prevalence is used. Among the exceptions to this general observation are conditions that cause death in elderly women who are already chronically ill with one or more other diseases. For example, in the last year of life, the prevalence of pneumonia as a diagnosis rises from 5.61 percent as initial diagnosis to 7.07 percent if the final diagnosis is the basis for the prevalence estimate. Similarly, the percentage of deaths attributable to septicemia nearly doubles if the final admission is the basis for the diagnosis. Some other diagnoses, such as hip fracture, are more common as first than as last diagnoses. The shifts in rankings reflect the characteristics of these disorders. Septicemia, which refers to disseminated bloodstream infection, ordinarily causes death in the setting of one or more other chronic diseases and would more often be the final blow that fells a severely ill man or woman than a deadly disease occurring in isolation. Pneumonia is another condition that frequently causes death when associated with multiple other chronic diseases or a general state of debilitation. This is particularly true of aspiration pneumonia, which is caused by inability to swallow and cough appropriately. It is often the final cause of death in individuals suffering from stroke, Alzheimer's disease, prolonged mechanical ventilation, and numerous other conditions that depress neurological or respiratory function. Pneumonia, septicemia, and related conditions can indeed cause death,

Table 5.2   Medicare Expenditures and Diagnoses for the Elderly during Periods before Death, 1986–90

	A. Expenditures before Death		
	Last Year of Life	Last Six Months	Last Three Months
Fraction without			
expenditures (%)	3.68	4.70	6.19
Expenditures within group (1990 $)			
10th Percentile	350.03	147.06	56.34
25th Percentile	3,161.21	1,570.99	617.50
50th Percentile	8,386.09	6,103.53	4,724.39
75th Percentile	17,418.53	13,358.85	10,244.88
90th Percentile	29,744.18	23,109.15	18,146.77
Mean	12,833.99	9,857.08	7,709.81
Percentage of total			
Medicare expenditures			
due to category	24	18	14

(continued)

Table 5.2   (continued)

Primary Diagnosis	B. Percentages of Deaths Associated with Most Prevalent Diagnoses[a]								
	Last Year of Life			Last Six Months			Last Three Months		
	First	All Year	Last	First	All Period	Last	First	All Period	Last
Heart failure	6.57	6.66	6.62	6.38	6.33	6.23	6.01	6.02	6.38
Pneumonia	5.61	6.18	7.07	5.65	6.11	6.73	5.72	6.02	6.38
Acute myocardial infarction	4.48	4.56	4.91	4.56	4.60	4.79	4.52	4.57	4.70
Occlusive stroke	4.46	4.36	4.52	4.25	4.20	4.30	4.00	3.99	4.06
Secondary solid cancer/ metastasis	2.85	3.28	3.91	3.21	3.44	3.78	3.32	3.43	3.57
Metabolic disorders	2.39	2.80	3.10	2.45	2.75	2.93	2.50	2.64	2.72
Lung cancer	2.31	2.13	2.23	2.14	2.06	2.14	1.96	1.96	2.03
Ischemic heart disease	2.19	1.90	1.43	1.80	1.60	1.30	1.47	1.35	1.18
Hip fracture	2.12	1.86	1.62	1.83	1.62	1.43	1.57	1.42	1.27
Septicemia	1.28	1.78	2.48	1.45	1.86	2.39	1.62	1.93	2.30
Acute respiratory failure	1.36	1.71	2.27	1.49	1.80	2.22	1.62	1.86	2.16
Cystitis/lower urinary tract infection	1.43	1.57	1.57	1.40	1.44	1.42	1.30	1.30	1.27
Intestinal diseases	1.52	1.55	1.55	1.45	1.46	1.44	1.37	1.36	1.33
Colorectal cancers	1.43	1.22	1.12	1.17	1.07	1.01	0.99	0.95	0.93

[a] "First" ("last") refers to the primary diagnosis associated with the first (last) hospital admission reported in the specified period, and "all year" (or "all period") refers to the average number of times the diagnosis is reported as the primary diagnosis for all hospital visits during period.

yet prevention or successful treatment of these conditions, because they so frequently occur as complications of other severe illnesses, might not prolong survival substantially.

No single condition stands out as a dominant cause of death among Medicare recipients. Only two diagnostic categories account for more than 6 percent of the deaths in any of the time periods, and the single most common diagnosis for any of the time periods before death is pneumonia, which only reaches a prevalence of 7.07 percent as the last listed diagnosis in the last year of life. Congestive heart failure, the most prevalent diagnosis in the last year of life under most definitions, is a disorder of highly variable severity. Under some circumstances, it can be rapidly fatal, but more often, it is a chronic disease with a moderately high mortality rate. It often occurs in association with acute myocardial infarction, or with a diagnosis of coronary artery disease. But its frequency as a cause of death may reflect the high prevalence of the disorder rather than a very high mortality rate.

Tables 5.3 through 5.10 present similar figures for the following groups: all women, all men, women in three different age groups, and men in three different age groups. These tables demonstrate that women have causes of death that are broadly similar to those of men, with an upward shift in the age distribution. Of course, there are obvious exceptions, such as some of the cancers. There are also distinct age trends in the prevalence of differing causes of death.

As tables 5.3 (women) and 5.4 (men) demonstrate, overall Medicare expenditures in the periods before death are similar for men and women. About half of the expenditures are for Part A, and median expenditures in the last year of life are somewhat higher than $8,000 for both men and women. Similarly, mean expenditures are between $12,000 and $13,000. The two genders display similar trends of increasing use of resources as death approaches, as can be seen in the shorter intervals before death represented as one moves to the right on each of these tables. The prevalences of specific causes of death are also similar. However, men are much more likely to die of lung cancer, reflecting the greater prevalence of this disease in current cohorts of the elderly, while hip fracture is much more common among women.

Some of the differences in the prevalences of disorders may also reflect differences in the distribution of age at death. Because women survive longer than men, disorders that are common in far advanced age, such as hip fracture, are more likely to be a cause of death in women. Some hints of this phenomenon can be seen in the results stratified by age, which appear in tables 5.5 through 5.10. Tables 5.5, 5.6, and 5.7 give EOL expenditures and diagnoses for women in the 65–74, 75–84, and 85–99 age ranges, respectively. Tables 5.8, 5.9, and 5.10 give results for men in the same age categories. A comparison of the tables for women shows that median Medicare expenditures in the last year of life, and in the shorter intervals before death, decline substantially with advancing age, from about $11,000 for ages 65–74 to less than $6,000 for ages

Table 5.3   **End-of-Life Medicare Expenditures and Diagnoses for All Women Aged 65–99, 1986–90**

	A. Expenditures before Death			
	Last Year of Life	Last Six Months	Last Three Months	Last One Month
Fraction without expenditures (%)	2.5	3.3	4.1	9.0
Expenditures within group (1990 $)				
10th Percentile	401.11	175.85	97.09	13.61
25th Percentile	3,185.39	1,666.49	810.72	139.65
50th Percentile	8,022.81	5,947.50	4,814.41	3,328.49
75th Percentile	16,445.12	12,784.59	10,141.22	6,480.02
90th Percentile	28,087.96	22,034.09	17,799.71	12,644.80
Mean	12,241.14	9,498.38	7,689.52	5,247.92
Percentage of total Medicare expenditures due to category	12.0	9.3	7.5	5.1
Percentage hospitalized	77.8	72.7	67.6	59.0

	B. Percentages of Deaths Associated with Most Prevalent Diagnoses[a]			
Primary Diagnosis	All Year	All Period	All Period	All Period
Heart failure	8.8	9.1	9.1	9.1
Pneumonia	7.1	7.7	8.1	8.7
Acute myocardial infarction	5.4	6.2	6.6	7.4
Occlusive stroke	6.1	6.5	6.6	6.8
Secondary solid cancer/metastasis	4.0	4.8	5.2	5.2
Metabolic disorders	3.9	4.1	4.2	4.2
Lung cancer	1.8	1.9	1.9	1.9
Ischemic heart disease	2.4	2.0	1.8	1.6
Hip fracture	3.3	2.9	2.6	2.3
Septicemia	2.4	2.8	3.2	3.7
Acute respiratory failure	2.0	2.4	2.7	3.1
Cystitis/lower urinary tract infection	2.4	2.4	2.3	2.1
Intestinal diseases	2.4	2.4	2.4	2.4
Colorectal cancers	1.7	1.5	1.4	1.3

[a]See table 5.2 note.

Table 5.4   **End-of-Life Medicare Expenditures and Diagnoses for All Men Aged 65–99, 1986–90**

A. Expenditures before Death				
	Last Year of Life	Last Six Months	Last Three Months	Last One Month
Fraction without expenditures (%)	5.5	6.7	7.9	13.0
Expenditures within group (1990 $)				
10th Percentile	226.34	94.73	43.44	0
25th Percentile	2,927.27	1,434.64	757.66	157.21
50th Percentile	8,334.66	6,164.09	4,944.61	3,395.49
75th Percentile	17,659.02	13,740.51	10,872.33	6,892.18
90th Percentile	30,183.92	23,775.41	19,187.10	13,666.71
Mean	12,888.78	10,064.74	8,168.33	5,618.38
Percentage of total Medicare expenditures due to category	11.4	8.9	7.2	5.0
Percentage hospitalized	76.6	71.9	67.1	59.2

B. Percentages of Deaths Associated with Most Prevalent Diagnoses[a]				
Primary Diagnosis	All Year	All Period	All Period	All Period
Heart failure	8.1	8.4	8.3	8.2
Pneumonia	8.5	9.3	9.8	10.6
Acute myocardial infarction	5.9	6.5	6.9	7.6
Occlusive stroke	4.9	5.0	5.1	5.2
Secondary solid cancer/metastasis	3.8	4.7	5.0	5.0
Metabolic disorders	3.0	3.4	3.6	3.6
Lung cancer	3.6	3.9	4.0	4.1
Ischemic heart disease	2.9	2.5	2.2	2.0
Hip fracture	1.6	1.5	1.5	1.4
Septicemia	1.9	2.3	2.5	2.9
Acute respiratory failure	2.1	2.5	2.8	3.2
Cystitis/lower urinary tract infection	1.6	1.5	1.5	1.4
Intestinal diseases	1.6	1.6	1.6	1.6
Colorectal cancers	1.6	1.4	1.4	1.3

[a]See table 5.2 note.

Table 5.5   End-of-Life Medicare Expenditures and Diagnoses for Women Aged 65–74, 1986–90

	A. Expenditures before Death			
	Last Year of Life	Last Six Months	Last Three Months	Last One Month
Fraction without expenditures (%)	4.7	5.5	6.3	10.8
Expenditures within group (1990 $)				
10th Percentile	431.77	183.23	92.47	0
25th Percentile	4,504.67	3,178.22	1,821.63	324.16
50th Percentile	11,453.55	8,431.85	6,305.00	4,124.64
75th Percentile	22,387.00	17,226.08	13,378.95	8,171.44
90th Percentile	36,636.28	28,422.45	22,905.77	16,128.67
Mean	16,354.99	12,654.92	10,141.49	6,855.78
Percentage of total Medicare expenditures due to category	3.8	2.9	2.4	1.6
Percentage hospitalized	81.1	77.1	72.5	64.2

B. Percentages of Deaths Associated with Most Prevalent Diagnoses[a]				
Primary Diagnosis	All Year	All Period	All Period	All Period
Heart failure	6.8	6.9	6.9	6.6
Pneumonia	4.5	4.8	5.1	5.4
Acute myocardial infarction	5.7	6.4	6.9	7.7
Occlusive stroke	4.0	4.1	4.2	4.5
Secondary solid cancer/metastasis	7.6	8.9	9.4	9.4
Metabolic disorders	3.2	3.6	3.7	3.9
Lung cancer	3.7	3.9	3.9	3.9
Ischemic heart disease	3.0	2.6	2.4	2.3
Hip fracture	1.0	0.8	0.8	0.7
Septicemia	1.8	2.1	2.4	2.8
Acute respiratory failure	2.8	3.3	3.6	4.1
Cystitis/lower urinary tract infection	1.1	1.1	1.1	1.0
Intestinal diseases	1.9	2.0	2.0	2.0
Colorectal cancers	1.9	1.5	1.4	1.3

[a]See table 5.2 note.

Table 5.6   **End-of-Life Medicare Expenditures and Diagnoses for Women Aged 75–84, 1986–90**

A. Expenditures before Death				
	Last Year of Life	Last Six Months	Last Three Months	Last One Month
Fraction without expenditures (%)	1.8	2.6	3.3	8.1
Expenditures within group (1990 $)				
10th Percentile	615.44	262.96	137.26	18.47
25th Percentile	3,970.87	2,690.80	1,442.65	223.77
50th Percentile	9,134.01	6,666.91	5,333.75	3,689.92
75th Percentile	17,626.68	13,729.12	10,928.20	6,905.76
90th Percentile	29,344.14	23,065.35	18,599.56	13,262.79
Mean	13,175.82	10,201.44	8,260.60	5,610.56
Percentage of total Medicare expenditures due to category	4.8	3.7	3.0	2.0
Percentage hospitalized	81.2	76.2	71.2	62.3

B. Percentages of Deaths Associated with Most Prevalent Diagnoses[a]				
Primary Diagnosis	All Year	All Period	All Period	All Period
Heart failure	8.7	9.0	9.1	9.0
Pneumonia	6.3	6.8	7.3	7.8
Acute myocardial infarction	6.2	7.1	7.6	8.5
Occlusive stroke	6.2	6.6	6.7	7.0
Secondary solid cancer/metastasis	4.0	4.9	5.2	5.1
Metabolic disorders	3.6	3.8	3.8	3.8
Lung cancer	1.8	1.9	2.0	2.0
Ischemic heart disease	2.6	2.2	2.0	1.7
Hip fracture	2.7	2.4	2.2	2.0
Septicemia	2.2	2.6	3.0	3.5
Acute respiratory failure	2.1	2.5	2.8	3.3
Cystitis/lower urinary tract infection	2.2	2.2	2.2	2.0
Intestinal diseases	2.4	2.4	2.4	2.4
Colorectal cancers	1.9	1.7	2.0	1.6

[a]See table 5.2 note.

Table 5.7   End-of-Life Medicare Expenditures and Diagnoses for Women Aged 85–99, 1986–90

A. Expenditures before Death				
	Last Year of Life	Last Six Months	Last Three Months	Last One Month
Fraction without expenditures (%)	1.8	2.6	3.4	8.7
Expenditures within group (1990 $)				
10th Percentile	307.03	140.25	79.62	13.32
25th Percentile	1,798.76	667.94	390.78	80.00
50th Percentile	5,857.67	4,463.64	3,715.98	2,334.00
75th Percentile	12,172.60	9,582.33	7,709.30	5,284.47
90th Percentile	20,463.42	16,330.76	13,574.97	9,933.94
Mean	8,874.33	6,928.36	5,669.62	3,934.56
Percentage of total Medicare expenditures due to category	3.4	2.7	2.2	1.5
Percentage hospitalized	72.5	66.7	61.3	52.8

B. Percentages of Deaths Associated with Most Prevalent Diagnoses[a]				
Primary Diagnosis	All Year	All Period	All Period	All Period
Heart failure	10.1	10.6	10.8	11.0
Pneumonia	9.7	10.6	11.1	12.0
Acute myocardial infarction	4.4	5.1	5.5	6.1
Occlusive stroke	7.3	8.0	8.2	8.4
Secondary solid cancer/metastasis	1.5	1.9	2.1	2.1
Metabolic disorders	4.7	4.9	5.0	4.9
Lung cancer	0.4	0.5	0.5	0.4
Ischemic heart disease	1.7	1.3	1.1	1.0
Hip fracture	5.5	4.7	4.4	3.8
Septicemia	3.0	3.5	3.9	4.6
Acute respiratory failure	1.4	1.7	1.9	2.3
Cystitis/lower urinary tract infection	3.5	3.5	3.4	3.1
Intestinal diseases	2.8	2.7	2.6	2.6
Colorectal cancers	1.4	1.3	1.2	1.1

[a]See table 5.2 note.

Table 5.8   **End-of-Life Medicare Expenditures and Diagnoses for Men Aged 65–74, 1986–90**

A. Expenditures before Death				
	Last Year of Life	Last Six Months	Last Three Months	Last One Month
Fraction without expenditures (%)	9.5	11.1	12.5	17.9
Expenditures within group (1990 $)				
10th Percentile	25.44	0	0	0
25th Percentile	1,609.77	756.13	474.95	105.76
50th Percentile	8,707.63	6,389.96	4,975.84	3,224.83
75th Percentile	19,775.05	15,418.45	12,042.93	7,319.49
90th Percentile	34,208.76	26,970.12	21,359.53	15,016.63
Mean	14,035.75	10,951.27	8,797.96	6,000.79
Percentage of total Medicare expenditures due to category	4.6	3.6	2.9	2.0
Percentage hospitalized	72.4	68.1	63.7	56.5

B. Percentages of Deaths Associated with Most Prevalent Diagnoses[a]				
Primary Diagnosis	All Year	All Period	All Period	All Period
Heart failure	7.3	7.4	7.4	7.3
Pneumonia	5.9	6.4	6.8	7.3
Acute myocardial infarction	6.4	7.0	7.4	8.1
Occlusive stroke	4.1	4.1	4.2	4.3
Secondary solid cancer/metastasis	5.5	6.6	7.1	7.3
Metabolic disorders	2.4	2.8	3.0	3.2
Lung cancer	5.6	6.0	6.0	6.3
Ischemic heart disease	3.7	3.2	2.9	2.6
Hip fracture	0.6	0.5	0.5	0.5
Septicemia	1.5	1.8	2.1	2.4
Acute respiratory failure	2.4	2.8	3.1	3.6
Cystitis/lower urinary tract infection	0.8	0.8	0.8	0.7
Intestinal diseases	1.4	1.4	1.5	1.5
Colorectal cancers	1.6	1.4	1.4	1.3

[a]See table 5.2 note.

Table 5.9   **End-of-Life Medicare Expenditures and Diagnoses for Men Aged 75–84, 1986–90**

	A. Expenditures before Death			
	Last Year of Life	Last Six Months	Last Three Months	Last One Month
Fraction without expenditures (%)	3.4	4.4	5.4	10.4
Expenditures within group (1990 $)				
10th Percentile	455.60	201.80	102.81	0
25th Percentile	3,701.15	2,432.73	1,186.08	245.34
50th Percentile	9,090.48	6,667.19	5,298.82	3,665.82
75th Percentile	18,091.57	14,026.89	11,213.21	7,156.25
90th Percentile	30,197.42	23,889.06	19,361.26	13,925.42
Mean	13,370.19	10,419.25	8,495.22	5,853.86
Percentage of total Medicare expenditures due to category	4.8	3.8	3.1	2.1
Percentage hospitalized	79.8	75.0	70.1	61.9

	B. Percentages of Deaths Associated with Most Prevalent Diagnoses[a]			
Primary Diagnosis	All Year	All Period	All Period	All Period
Heart failure	8.3	8.6	8.5	8.4
Pneumonia	8.6	9.4	9.9	10.7
Acute myocardial infarction	6.1	6.8	7.2	8.0
Occlusive stroke	5.1	5.3	5.4	5.5
Secondary solid cancer/metastasis	3.6	4.4	4.6	4.5
Metabolic disorders	2.9	3.3	3.4	3.4
Lung cancer	3.3	3.6	3.7	3.7
Ischemic heart disease	2.8	2.4	2.2	2.0
Hip fracture	1.5	1.4	1.4	1.3
Septicemia	1.8	2.2	2.5	2.9
Acute respiratory failure	2.2	2.7	3.0	3.4
Cystitis/lower urinary tract infection	1.6	1.5	1.5	1.3
Intestinal diseases	1.7	1.6	1.6	1.6
Colorectal cancers	1.7	1.5	1.4	1.4

[a]See table 5.2 note.

Table 5.10   End-of-Life Medicare Expenditures and Diagnoses for Men Aged 85–99, 1986–90

A. Expenditures before Death				
	Last Year of Life	Last Six Months	Last Three Months	Last One Month
Fraction without expenditures (%)	2.9	3.9	4.8	9.8
Expenditures within group (1990 $)				
10th Percentile	351.14	155.77	84.68	7.57
25th Percentile	2,908.81	1,447.23	719.24	125.18
50th Percentile	6,816.93	5,219.88	4,346.01	3,100.67
75th Percentile	13,637.80	10,715.21	8,695.29	5,938.30
90th Percentile	22,748.42	18,461.93	15,359.66	11,019.81
Mean	10,061.70	7,912.15	6,500.39	4,536.90
Percentage of total Medicare expenditures due to category	2.0	1.5	1.3	0.9
Percentage hospitalized	77.7	72.3	67.3	58.9

B. Percentages of Deaths Associated with Most Prevalent Diagnoses[a]				
Primary Diagnosis	All Year	All Period	All Period	All Period
Heart failure	8.9	9.4	9.5	9.5
Pneumonia	12.4	13.8	14.5	15.6
Acute myocardial infarction	4.6	5.1	5.4	6.0
Occlusive stroke	5.7	6.0	6.1	6.2
Secondary solid cancer/metastasis	1.8	2.3	2.3	2.3
Metabolic disorders	4.3	4.6	4.7	4.7
Lung cancer	1.1	1.2	1.2	1.2
Ischemic heart disease	1.8	1.5	1.3	1.1
Hip fracture	3.5	3.4	3.2	2.9
Septicemia	2.6	3.1	3.4	3.7
Acute respiratory failure	1.3	1.7	1.9	2.4
Cystitis/lower urinary tract infection	2.7	2.7	2.5	2.4
Intestinal diseases	1.8	1.7	1.7	1.7
Colorectal cancers	1.4	1.3	1.3	1.3

[a]See table 5.2 note.

85–99. Mean expenditures also drop, from $16,000 to $9,000. Similar declines with age are seen using different time periods—the last six months, the last three months, and the last one month—instead of the last year of life.

The diagnoses associated with death also show a distinct age trend. Heart failure becomes an increasingly common cause of death as age advances, and the same is true of pneumonia and occlusive stroke. Secondary solid cancer/metastasis and lung cancer become less common with advancing age as causes of death, as does acute respiratory failure.

Mean Medicare expenditures in the last year of life do not decline as much for men as for women, and median expenditures in the last year of life decline from about $9,000 in men aged 65–74 to $7,000 in men aged 85–99, a less dramatic decline than for women. A higher fraction of men aged 65–74 than women of the same ages die without having Medicare reimbursements in the last year of life, possibly reflecting the influence of sudden and unexpected deaths that are more likely at the earlier ages than at far advanced ages. The prevalence of congestive heart failure as a cause of death does not rise as rapidly for men as for women, but pneumonia and septicemia do become considerably more common at the most far advanced ages, while lung cancer and other cancers decline in prevalence as causes of death at the far advanced ages. The most dramatic age-related increase in prevalence is for hip fracture, rising from 0.6 percent in the last year of life for men aged 65–74 to 3.5 percent for men aged 85–99.

These figures provide few surprises about the causes of death, but they demonstrate that the most common causes of death are the most prevalent chronic diseases among the elderly, rather than diseases that have intrinsically very high mortality rates. Furthermore, it appears likely that some of the causes that are acute, such as pneumonia and septicemia, cannot always be anticipated, and at the time of onset of these conditions, dramatic reductions in expenditures may not be possible, because the time until death is fairly short.

Further evidence about EOL expenditures for individuals with specific diseases appears in tables 5.11 through 5.13. Table 5.11 presents findings similar to those of the previous tables, except that only men and women with a principal diagnosis of a common cancer during the last year of life are included. The fraction of decedents who did not have Medicare expenditures in the last year of life appears in the first row, which shows that it is a rare phenomenon. However, more than 5 percent have no expenditures in the last month, perhaps because many were not hospitalized and received little medical care during the terminal phases of their illnesses. Mean expenditures in the last year of life for cancer decedents approach $20,000, a fairly high number, but expenses tend to be lower in the last month of life than for many other conditions.

Panel B of table 5.11 shows the prevalence of different diagnoses listed during hospital admissions of enrollees with cancer during the last year of their lives. Not surprisingly, most of the diagnoses are of cancers. But other common conditions also appear in the list of leading diagnoses, such as pneumonia and

Table 5.11   **Medicare Expenditures and Diagnoses for Patients Admitted with Cancer in Last Year of Life, 1986–90**

A. Expenditures before Death				
17.1% of Deaths	Last Year of Life	Last Six Months	Last Three Months	Last One Month
Fraction without expenditures (%)	0.1	0.4	0.9	5.1
Expenditures within group (1990 $)				
10th Percentile	5,732.81	3,914.83	2,059.53	71.33
25th Percentile	9,799.36	6,753.64	4,776.79	2,095.94
50th Percentile	16,086.52	12,037.71	8,874.29	4,865.29
75th Percentile	24,920.66	19,082.74	14,711.08	8,961.63
90th Percentile	36,127.09	28,012.59	21,943.31	19,291.27
Mean	19,349.31	14,635.81	11,138.30	6,767.55
Percentage of total Medicare expenditures due to category	6.2	4.7	3.6	2.2

B. Percentages of Deaths Associated with Most Prevalent Diagnoses[a]				
Primary Diagnosis	All Year	All Period	All Period	All Period
Secondary solid cancer/ metastasis	15.9	18.2	20.2	21.9
Lung cancer	9.8	10.6	11.6	13.1
Cancer therapy	8.6	6.8	4.4	2.0
Colorectal cancers	5.0	4.9	5.0	5.5
Leukemia/ lymphoma	4.6	5.1	5.7	6.7
Intra-abdominal cancers	3.8	4.3	4.8	5.5
Pneumonia	3.3	3.5	3.7	4.0
Metabolic disorders	3.2	3.7	4.0	4.1
Prostate cancer	2.6	2.2	2.1	2.1
Upper gastrointestinal cancers	2.4	2.6	2.8	3.0
Heart failure	1.9	1.8	1.8	1.6
Genital cancers	1.8	1.7	1.7	1.8
Bladder cancer	1.8	1.5	1.3	1.1
Intestinal diseases	1.7	1.7	1.6	1.4

Note: "Cancer" includes admissions with the following principal diagnoses: oropharyngeal cancer, upper gastrointestinal cancer, colorectal cancer, intra-abdominal cancer, upper respiratory tract cancer, lung cancer, other respiratory tract cancer, thoracic cancer, bone/connective tissue cancer, skin cancer, breast cancer, genital cancer, prostate cancer, central nervous system cancer, bladder cancer, kidney cancer, urinary tract cancer, leukemia/lymphoma, and secondary solid cancer/metastasis.

[a]See table 5.2 note.

metabolic disorders, which can be complications of cancer, and heart failure, which is less frequently a complication. Because heart failure is so common at advanced ages, it may have been an unrelated coexisting disorder in many of the Medicare recipients who had cancer. Thus just under 60 percent of the diagnoses in the last year of life were of a common form of cancer. The remaining 40 percent were a combination of complications, coexisting conditions that may have been unrelated, and less common cancers.

Table 5.12 reports analogous findings for decedents with cardiovascular diseases. These diseases as a group were somewhat less expensive than the cancers. The diagnoses listed as most prevalent are primarily subsets of cardiovascular diseases. However, other common acute and chronic conditions (e.g., pneumonia, metabolic disorders, chronic obstructive pulmonary disease, intestinal diseases, cystitis, and septicemia) listed as leading diagnoses during the last year of life are not cardiovascular diseases and may only be related insofar as the cardiovascular diseases can be debilitating. For example, a patient who suffers a stroke—which is a form of cardiovascular disease—may develop a partial paralysis, which can subsequently lead to skin breakdown, wound infection, and septicemia. Thus a cardiovascular disorder can lead to debilitation, which in turn predisposes the patient to an "unrelated" infectious condition.

Septicemia is one of the chronic disorders that we refer to as "frailty diseases" (see table 5.13). This is a loosely grouped set of diagnoses that can be considered markers for debility or, in the case of malnutrition and failure to thrive, debilitating conditions in their own right. Most often the elderly Medicare enrollees who are admitted to hospitals with one of these diagnoses have multiple chronic health problems. All of these patients have at least one hospital admission during the last year of life, and mean Medicare expenditures for their care is similar to the mean for cancers and cardiovascular diseases. Pneumonia is the most prevalent diagnosis in this group, presumably because it is one of the most common of the frailty diseases and because it often coexists with other frailty diseases.

All of the preceding tables describe characteristics of decedents. Table 5.14 presents information about the importance of decedents within the population of high-cost Medicare enrollees. Several categories of high-cost users are listed in the column headings—those who have the highest 2 percent of expenditures in a given year, the top decile, and the top two deciles over varying periods. Note that about 20 percent of all beneficiaries in a five-year period will be in the top decile during one year. Note also that a relatively high fraction of the high-cost users die during the relevant time period, and that those who are most consistently high-cost users (top 2 percent during a year, top decile in any year, top two deciles in any two years) have mortality rates approaching one-third, but that all of the high-cost users have high mortality rates. Mean expenditures are highest for those in the top 2 percent, at more than $33,000 per year, but the top decile has mean expenditures of more than $17,000. This figure is similar to the mean expenditures for the decedents, even though most

**Table 5.12   Medicare Expenditures and Diagnoses for Patients Admitted with
                        Cardiovascular Diseases in Last Year of Life, 1986–90**

A. Expenditures before Death

22.1% of Deaths	Last Year of Life	Last Six Months	Last Three Months	Last One Month
Fraction without expenditures (%)	0.1	0.3	0.7	2.7
Expenditures within group (1990 $)				
10th Percentile	4,254.72	3,199.37	2,195.08	206.57
25th Percentile	6,624.80	5,037.50	4,175.30	2,913.64
50th Percentile	12,361.06	9,056.24	6,987.58	4,847.17
75th Percentile	22,403.30	16,830.47	12,980.01	8,178.35
90th Percentile	36,519.65	28,488.52	22,781.68	15,574.22
Mean	17,458.70	13,397.50	10,733.55	7,427.60
Percentage of total Medicare expenditures due to category	7.2	5.5	4.4	3.1

B. Percentages of Deaths Associated with Most Prevalent Diagnoses[a]

Primary Diagnosis	All Year	All Period	All Period	All Period
Heart failure	28.1	28.5	28.4	27.4
Acute myocardial infarction	12.9	15.1	17.7	22.3
Ischemic heart disease	8.6	7.9	7.3	6.6
Pneumonia	4.0	4.1	4.1	4.2
Occlusive stroke	2.5	2.5	2.5	2.7
Atrial fibrillation	2.3	2.2	2.0	1.7
Metabolic disorders	2.2	2.2	2.2	1.9
Cardiac conduction defects	2.1	2.0	1.8	1.7
Acute respiratory failure	1.6	1.7	1.8	1.9
Chronic obstructive pulmonary disease	1.1	1.0	0.9	0.7
Intestinal diseases	1.0	0.9	0.8	0.7
Cystitis/lower urinary tract infection	1.0	0.9	0.9	0.7
Acute upper respiratory disease	1.0	0.8	0.7	0.4
Septicemia	0.9	1.0	1.1	1.3

Note: "Cardiovascular diseases" includes admissions with the following principal diagnoses: acute myo-
cardial infarction, old myocardial infarction, ischemic heart disease, cardiac valve disorders, cardiac con-
duction defects, supraventric/unspecified arrhythmia, atrial fibrillation, cardiac arrhythmia, ventricular
arrhythmia, and heart failure.

[a]See table 5.2 note.

Table 5.13 **Medicare Expenditures and Diagnoses for Patients Admitted with "Frailty" Diseases in Last Year of Life, 1986–90**

A. Expenditures before Death

21.7% of Deaths	Last Year of Life	Last Six Months	Last Three Months	Last One Month
Fraction without expenditures (%)	0	0.2	0.6	2.8
Expenditures within group (1990 $)				
10th Percentile	4,549.24	3,261.04	2,057.93	122.30
25th Percentile	7,692.76	5,465.55	4,256.39	2,627.57
50th Percentile	13,825.57	10,229.51	7,692.10	4,761.35
75th Percentile	23,459.67	17,639.38	13,450.94	8,225.17
90th Percentile	36,502.35	27,604.00	21,229.83	13,851.48
Mean	18,263.36	13,714.02	10,596.77	6,693.77
Percentage of total Medicare expenditures due to category	7.4	5.6	4.3	2.7

B. Percentages of Deaths Associated with Most Prevalent Diagnoses[a]

Primary Diagnosis	All Year	All Period	All Period	All Period
Pneumonia	21.0	23.0	25.7	30.3
Metabolic disorders	10.5	11.6	12.4	12.9
Septicemia	6.3	7.3	8.5	10.6
Cystitis/lower urinary tract infection	6.1	6.1	6.1	5.7
Heart failure	5.7	5.4	5.0	4.5
Occlusive stroke	2.6	2.4	2.3	2.1
Cancer therapy	2.6	2.0	1.2	0.4
Metastatic cancers	2.2	2.4	2.4	2.1
Lung cancer	1.6	1.7	1.7	1.6
Ischemic heart disease	1.4	1.1	0.8	0.6
Acute upper respiratory disease	1.4	1.2	1.0	0.7
Chronic obstructive pulmonary disease	1.4	1.2	1.1	1.0
Acute respiratory failure	1.4	1.6	1.8	2.1
Intestinal diseases	1.4	1.3	1.2	1.0

Note: "Frailty" includes admissions with the following principal diagnoses: septicemia, endocrine/metabolic disorders, pneumonia, pyelonephritis, cystitis/lower urinary tract infections, and failure to thrive/malnutrition.

[a]See table 5.2 note.

Table 5.14 **High-Cost Users of Medicare and Their Share of Reimbursements**

	Intensity and Duration of Utilization					
	Top 2% in Any Year	Top Decile in Any Year	Top Decile in Only One Year	Top 2 Deciles in Any Two Years[a]	Top 2 Deciles in Any Three Years[a]	Top 2 Deciles in Any Four Years[a]
Percentage of all beneficiaries	7.3	30.01	20.97	16.51	7.13	2.47
Percentage who die at end of period	29.8	27.8	25.03	33.2	31.6	28.59
Age and Sex Distribution (% Male/% Female)						
65–69	4.7/3.6	6.1/6.0	6.9/6.6	4.4/4.7	3.2/3.8	2.3/3.3
70–74	11.4/9.2	11.2/11.3	11.1/11.1	10.9/11.6	10.7/12.2	10.5/13.7
75–79	10.9/9.6	10.9/12.2	10.6/11.9	11.4/12.9	11.7/14.0	11.7/15.3
80–84	7.1/7.8	8.1/11.1	7.9/10.8	8.6/12.1	8.8/12.9	8.5/13.3
85–89	3.7/5.2	4.8/8.4	4.8/8.4	5.0/9.0	5.0/9.3	4.7/9.2
90–100	12.6/14.2	2.8/6.9	2.87/7.18	2.7/6.6	2.5/6.1	2.2/5.3
Racial Distribution (%)						
White	87.1	88.3	88.9	88.9	88.8	88.3
Black	9.1	7.8	7.3	7.8	8.1	8.8
Other	1.6	1.5	1.4	1.3	1.2	1.2
Expenditures before Death						
Expenditures within group (1990 $)						
10th Percentile	21,989.94	7,604.16	7,338.59	6,403.11	6,070.53	4,844.91
25th Percentile	24,152.80	9,369.49	8,661.23	7,872.77	7,528.66	6,097.30
50th Percentile	28,804.05	13,204.98	11,682.84	10,972.00	10,407.46	8,334.82
75th Percentile	36,924.66	20,398.70	17,472.55	16,389.00	15,118.08	11,920.88
90th Percentile	49,040.28	31,018.88	26,947.36	23,797.24	21,521.56	16,890.92
Mean	33,340.62	17,080.72	15,046.58	13,613.08	12,580.79	12,429.15

(continued)

Table 5.14 (continued)

	Intensity and Duration of Utilization					
	Top 2% in Any Year	Top Decile in Any Year	Top Decile in Only One Year	Top 2 Deciles in Any Two Years[a]	Top 2 Deciles in Any Three Years[a]	Top 2 Deciles in Any Four Years[a]
Percentage of total Medicare expenditures due to category	25	52.79	32.42	46.19	27.63	15.78
Percentage of Deaths Associated with Most Prevalent Diagnoses						
Heart failure	4.94	4.41	4.05	5.39	6.00	6.38
Ischemic heart disease	13.63	6.19	6.00	5.72	6.00	6.57
Pneumonia	3.56	4.21	4.12	4.67	4.84	4.88
Occlusive strike	3.09	4.08	4.40	3.87	3.38	2.76
Chronic obstructive pulmonary disease	1.62	1.58	1.33	2.02	2.53	3.30
Acute myocardial infarction	4.48	3.88	4.26	3.01	2.42	1.96
Intestinal diseases	2.36	2.37	2.23	2.32	2.40	2.47
Hip fracture	1.99	4.81	5.31	3.08	2.20	1.58
Endocrine/metabolic disorders	1.66	1.78	1.68	2.05	2.14	2.09
Acute pulmonary	2.49	2.04	1.89	1.75	1.70	1.69
Cystitis/lower urinary tract infection	1.06	1.12	1.05	1.46	1.64	1.66
Acute upper respiratory disease	0.74	0.86	0.70	1.22	1.61	2.09
Colorectal cancers	2.17	2.77	2.93	1.69	1.18	0.82
Secondary solid cancer/metastasis	2.08	1.78	1.75	1.56	1.13	0.80

[a]10th Decile ≥ 1 year.

of the high-cost users did not die. The distribution of prevalent diagnoses is broadly similar to the distribution for decedents, except that ischemic heart disease is responsible for a disproportionate share of expenditures among the top 2 percent.

5.4 Conclusions

The results reported here are among the preliminary findings from a study of Medicare expenditures for the care of the severely ill elderly. The limitations of Medicare claims files, which constitute the primary data source for this research effort, are well known: the reliability of some of the diagnostic coding is uncertain, there is little clinical detail, there is no information about noncovered services (such as outpatient pharmacy use and many forms of long-term care), and detailed socioeconomic characteristics (such as income, occupational or educational history, and living arrangements) are not recorded. But the claims files have many advantages for descriptive analyses of health expenditures and other phenomena at the end of life. They include a representative sample of all elderly Americans, the diagnostic codes are likely to be reasonably accurate guides to the overall prevalence of various health conditions at death, and they include information about virtually all hospitalizations and office visits among Medicare recipients.

Because the data analyzed here are from the late 1980s, few Medicare patients were enrolled in HMOs or covered by capitated contracts. Thus our analysis does not address current concerns that incentives to limit costs and utilization under managed care might lead to undertreatment of Medicare recipients. Our planned analyses of more Medicare data from the 1990s will investigate these issues, which are of particular concern for the most vulnerable Medicare recipients—those with chronic or severe illnesses. Under Medicare's traditional fee-for-service reimbursement arrangements, such patients generated a high level of utilization, which often meant substantial revenues for physicians and possibly for hospitals (Medicare's Prospective Payment System, which reimburses hospitals a fixed amount per admission, makes hospital incentives ambiguous). Under capitation, such patients are undesirable. Because the altered incentives may have their most prominent manifestations in care administered near the end of life, comparisons of care for decedents between managed care and fee-for-service based on recent data may be illuminating.

Like previous investigators, we found that Medicare expenditures for decedents decline with advancing age. Health expenditures not covered by Medicare, such as nursing home expenses, tend to rise with age for both decedents and "survivors." Scitovsky, who examined nursing home as well as typical Medicare-covered services, reported that the decline with age in decedent expenses for Medicare was largely offset by increases in expenses for noncovered services (Scitovsky 1988). Recent changes in Medicare reimbursement policy appear to have increased substantially the expenditures for home health,

hospice, and other nonhospital services; these may alter the pattern of expenditures for decedents in ways that were not apparent during the late 1980s. Such expenses may vary by diagnosis, a possibility that we will be able to explore with more recent claims files.

Overall, our results confirm that decedents have disproportionately high Medicare expenses. But a comparison with high-cost users suggests that many of the characteristics of decedents are similar to those of high-cost Medicare enrollees who do not die during a given period. This suggests that, at least based on the information available in Medicare claims files, it will be difficult to formulate policies to limit expenditures for individuals in the last year of life without simultaneously limiting health care delivered to sick Medicare recipients who have the potential to survive. A detailed study of sophisticated mortality prediction models in the severely ill elderly (SUPPORT; Murphy and Cluff 1990) implies that more comprehensive clinical information is unlikely to change this conclusion.

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Comment   David M. Cutler

Garber, MaCurdy, and McClellan have written an interesting paper on medical care expenditures at the end of life. It is well known that a lot of medical care resources (up to one-third of Medicare dollars) are spent in the last year of life. It has also long been suspected that not all of this care is truly necessary. Thus, it seems natural to search for cost savings by eliminating unnecessary medical expenditures at the end of life.

Garber et al. cast doubt on the possibility of large savings in end-of-life care. They note that the diagnoses associated with large end-of-life care expenditures are similar to the diagnoses associated with high spending in general. For example, much care at the end of life is provided to patients with pneumonia; but pneumonia is not a particularly good indicator that a patient is about to die. Thus, it would make little sense to ration care to patients with pneumonia as a way of limiting unnecessary end-of-life medical expenses.

Garber et al. point out valuable facts about end-of-life expenditures. The ease of deciding to save money through reduced end-of-life care is surely overstated. But the paper is too quick to dismiss potential end-of-life care savings. I say this for two reasons.

The first reason is statistical. While Garber et al. look at medical spending by diagnosis, they do not relate medical spending to the underlying disease of the patient. Consider a simple observation: a person with severe heart failure is more likely to catch pneumonia than a person with a well-functioning heart. Garber et al. note that most pneumonia diagnoses are not for people with very severe heart failure; therefore, it makes little sense to ration care to patients with pneumonia as a way of saving money for those with severe heart failure. But suppose we instead associate the spending on pneumonia for the patient with severe heart failure with heart failure itself, rather than with pneumonia. Then we might be able to ration care to patients with severe heart failure and save money.

The key issue is whether we want to group spending by immediate diagnosis or underlying medical condition. Garber et al. group spending by immediate diagnosis. It seems more fruitful, and technically possible, to group spending by the underlying condition of the patient. Such a grouping could change views about end-of-life care dramatically.

David M. Cutler is professor of economics at Harvard University and a faculty research fellow of the National Bureau of Economic Research.

The second issue concerns the information that is available to care providers versus researchers. Garber et al. find little difference in observable characteristics between those who are about to die and those farther away from death. My impression from talking with physicians is that with more information one can do a better job of forecasting death. This is probably not true for all patients: for a vast majority of patients, ultimate survival is not known with any certainty. But for some patients, physicians are reasonably sure that the patient will die.

Many of these patients, however, wind up spending a lot of money: they are in an ICU for many months, they get intensive surgeries, and they receive many diagnostic tests. Often, this care is provided because there is no coordination mechanism for dealing with the patient. The patient is not alerted to nonhospital alternatives, or physicians who know the wishes of the patient are not present when these decisions are made. Thus, among physicians I have spoken to there is a strong sense that substantial resources could be saved for a small number of patients who are near death but still receiving intensive treatments. This does not mean that we can save a lot of money for the average patient; Garber et al. show that this is not the case. But for many patients, medical care is overprovided and society could spend much less without a great deal of loss. Eliminating this care could save substantial resources.