The Care of Patients with Severe Chronic Illness:

An Online Report on the Medicare Program by the Dartmouth Atlas Project

The Dartmouth Atlas of Health Care 2006

The Center for the Evaluative Clinical Sciences
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in grateful recognition of
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Table of Contents

Preface

The Care of Patients with Severe Chronic Illness: A Report on the Medicare Program

This edition of the Dartmouth Atlas reports on the last two years of life among Medicare enrollees with severe chronic illnesses—the services received by Medicare enrollees who died between 1999 and 2003 and who had at least one of 12 common chronic conditions. The most prevalent conditions in this cohort were congestive heart failure, chronic obstructive pulmonary disease, and cancer. It concentrates on inpatient acute care hospitals and physician services under Medicare Part A and B. Other services provided under traditional Medicare will be reported in upcoming editions of the Atlas. Medicare Part C data are not available.

- In the state studies (Chapter Two), the study populations were all resident enrollees with one or more of the 12 chronic illnesses, whether or not they were hospitalized during the last two years of life.

- In the hospital-specific studies (Chapters Three and Four), Medicare enrollees with one or more of the 12 chronic illnesses were assigned to the hospital most frequently used during the last two years of life. Only decedents who had had one or more medical hospitalization for one of the 12 chronic illnesses were included. (Surgical practices will be the subject of a subsequent Atlas.) Although the focus is on acute care hospitals, the measures of physician services include all care paid for under Medicare Part B, whether provided inside or outside of the hospital.

- In the regional studies (Chapter Five), the study populations were grouped by residence in hospital referral regions (306 tertiary-care markets defined in the Dartmouth Atlas Project). The database for state and regional studies includes records for all Medicare enrollees with one or more of the 12 chronic illnesses who died between 2000 and 2003, whether or not they were hospitalized during the last two years of life.

Several dimensions of care are examined: per decedent Medicare spending for hospital and physician care; FTE physician, hospital bed, and ICU bed inputs; physician visits; hospitalizations and stays in intensive care; and selected quality measures.

The chapters document extensive variation in the amount, as well as the quality, of care given to chronically ill Medicare beneficiaries—among states, regions, and from one hospital to another, even within the same region.

Chapter One provides an overview of the problem of "supply-sensitive" care. It first reviews the evidence that the supply of resources is closely associated with the frequency of use of physician visits, hospital admissions, and diagnostic tests. The chapter then summarizes the evidence that populations exposed to more frequent use of supply-sensitive care do not have better—indeed, might have worse—health outcomes. It then examines the implications of evaluating efficiency in the management of chronic illness, introducing "best practice" benchmarks—areas where resources and care intensity are low, but quality is high—to evaluate efficiency.

Chapter Two looks at variations among the states and the District of Columbia and examines important relationships among resources, utilization, and quality. States that rely more on primary care physicians than on medical specialists in managing chronic illness tend to have lower Medicare spending and use fewer hospital beds, less physician labor, and fewer referrals to multiple specialists—and have better quality scores (measured by CMS's Hospital Compare database). Residents of these states spend less time in intensive care units and have fewer physician visits.

Chapter Three reports on the remarkable variation in managing chronic illnesses among prominent academic medical centers. It illustrates the use of best practice benchmarking in evaluating the performance of the University of California Medical Center Los Angeles and the University of California Medical Center San Francisco, two academic medical centers that belong to the University of California Hospital System. The two medical centers differ substantially in per decedent spending, resource inputs, and utilization. UCLA uses many more ICU beds and medical specialist labor inputs; UCSF relies on primary care labor and uses many fewer physicians of all other types. UCLA patients have, on average, many more physician visits and, especially, many more days in ICUs than patients at UCSF. The "medical care cost equation" is introduced as a tool for evaluating the relative contribution of price (reimbursements per day in hospital or per physician visit) and volume (patient days or physician visits per enrollee) in determining total Medicare reimbursements. Volume is far more important than price in accounting for total reimbursements.

The final section of Chapter Three illustrates the use of benchmarking to evaluate current and future need for physicians. Depending on the benchmark selected for comparison, very different conclusions can be reached about the adequacy of the physician workforce. Benchmarks based on academic medical centers and regions where large group practices dominate indicate that the country has a surplus supply of physicians. The use of other, more highly resourced areas, such as Manhattan, indicates an inadequate current supply and a critical future scarcity.

There are simply too many hospitals in the United States to make it feasible to report on each one in a printed version of the Atlas. Chapter Four introduces the tools available on the Dartmouth Atlas web site to graphically display variation and generate reports comparing hospital, regional, and state performance. The chapter provides an example that describes variation in performance among hospitals located in the Fort Myers, Florida hospital referral region. It also illustrates the use of the medical care cost equation report on hospitals in Miami, using the volume and price benchmarks of the Fort Myers hospital referral region as the standard for comparison. While each of the 25 Miami hospitals exceeded the Fort Myers benchmarks for spending and volume, there was considerable variation in efficiency among the hospitals; inpatient spending and volume varied by a factor of about two.

Chapter Five focuses on the problem of overuse of supply-sensitive care during the last two years of life. The first section shows that, contrary to a common assumption, variation in overall Medicare spending per beneficiary is not driven by variation in the prevalence of chronic illness. What really matters is how much is spent on a per patient basis for those with severe chronic illness: almost two-thirds of the variation in overall Medicare spending is explained by how much is spent during the last two years of life, while virtually none of the regional variation in reimbursements is explained by the prevalence of severe chronic illness. Moreover, it isn't the price per episode of care that matters most, but the volume of supply-sensitive care, including hospitalizations and physician visits.

The chapter presents evidence that variation in use of hospitals for treating people with chronic illnesses is not just a Medicare problem; it affects those under 65 as well. The problem of overuse is growing. Care intensity, measured by the frequency of use of physician visits and intensive

care units, increased over the four-year period 2000-03; *and the rate of increase was greater in regions that were already spending more and had higher utilization rates in the baseline year*. The final section of the chapter illustrates how benchmarking can be used to estimate the savings that would accrue if the utilization rate of acute inpatient hospital care and physician visits were reduced to the benchmarks provided by regions served by efficient health care systems. Savings of more than 32% in inpatient reimbursements and 34% in physician reimbursements would have accrued if the efficiency of the Salt Lake City region had been achieved in other regions. But realizing such savings—and reallocating resources to population-based management of chronic illness—will require new models of financing care. It will also require accountability for system integration. Because they are the only locus of organized care that is available throughout the country, perhaps acute care hospitals could serve as the focus for integrating providers into organized, community-based systems for managing chronic illness.

Information on the database, construction and definition of measures, methods of analysis, and aggregation of populations into regions and hospital-specific cohorts is available in the Appendix on Methods.

Chapter One

Chronic Illness and the Problem of Supply-Sensitive Care

For patients with chronic illnesses, the frequency of certain types of care varies extensively among geographic regions and health care organizations, and that care varies in close association with the supply of medical resources — it is "supply-sensitive." Supply-sensitive care includes visits to primary care physicians and medical specialists, hospitalizations and admissions to intensive care units, as well as diagnostic testing and imaging exams. Supply-sensitive care accounts for well over 50% of Medicare spending, though there is remarkable variation in the per-person use of these services. Among the 306 hospital referral regions defined in the Dartmouth Atlas Project, the frequency of primary care visits per enrollee varied by a factor of about three, visits to medical specialists by more than six, and hospitalizations for congestive heart failure and chronic obstructive pulmonary disease by more than four.

The use of supply-sensitive care for the treatment of chronic illnesses is particularly intense during the last few months of life, but again, the variations among regions and providers is striking. On average, patients with chronic illnesses living in the region using the least supply-sensitive care spent 6.5 days in hospitals during their last six months of life, while those living in the region using the most supply-sensitive services spent an average of 19.4 days as inpatients during the last six months of their lives. Physician visit rates also varied substantially. In the highest-intensity region, terminal patients had an average of more than 50 visits during their last six months; in the lowest-intensity regions, the average was about 15.7 visits.

Evidence-based medicine plays virtually no role in governing the frequency of use of supply-sensitive services. Medical textbooks contain few evidence-based clinical guidelines concerning when to hospitalize, admit to intensive care, refer to medical specialists or, for most conditions, when to order diagnostic or imaging tests for patients at given stages in the progression of chronic illness. As an example, the 2003 edition of the *British Medical Journal's Clinical Evidence Concise* — which describes itself as "the international source of the best available medical evidence for effective health care" — contains not a single reference as to when to hospitalize patients with cancer, chronic lung disease, or heart failure, or when to schedule them for physician visits and revisits.

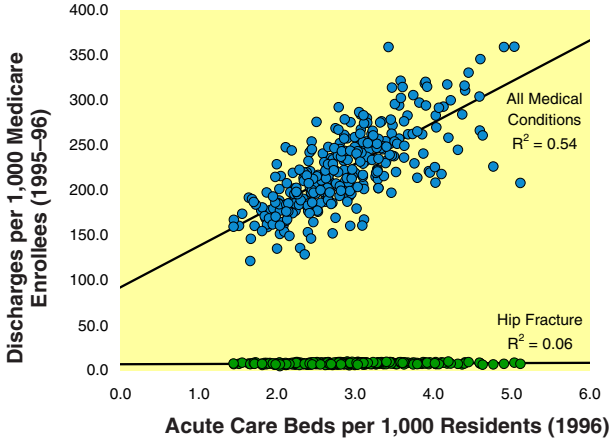


Figure 1.1. The Association Between Hospital Beds per 1,000 Residents (1996) and Discharges per 1,000 Medicare Enrollees (1995–96)

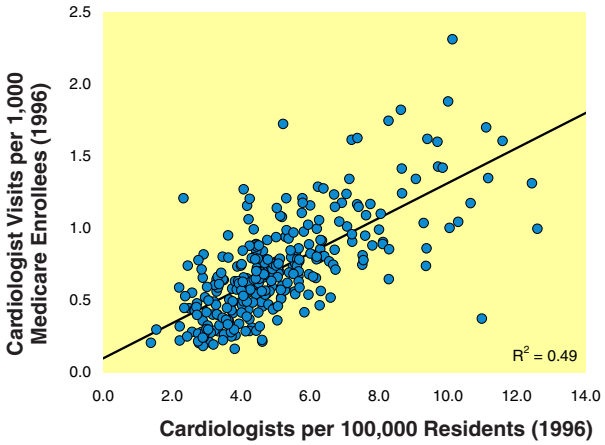


Figure 1.2. The Association Between the Supply of Cardiologists per 100,000 Residents and Visits to Cardiologists per 1,000 Medicare Enrollees (1996)

In the absence of theories and evidence about what constitutes best practice, other factors drive clinical decisions. Foremost among them is the generally held assumption, common to both doctors and patients, that more frequent intervention constitutes better care — that whatever resources are available should be fully utilized in managing difficult illnesses. When providers and patients are working under this assumption, utilization is inevitably driven by the available supply of resources. There is good evidence that this is what is going on in health care markets; the Dartmouth Atlas Project has consistently shown a positive association between the per capita supply of staffed hospital beds and the hospitalization rate for medical (non-surgical) conditions (Figure 1.1). The effect of hospital bed supply on hospital use is so well recognized that it is referred to as "Roemer's law."[a]

There are some exceptions. Hospitalization for hip fracture is one of the few clinical events that varies with the incidence of illness. The explanation is straightforward; hip fracture is a serious, life-threatening condition. It is easily diagnosed, and everyone — physicians, patients, families and insurance companies — agrees on the need for hospitalization. The incidence of hip fracture, not the per capita supply of beds, drives the demand for hospitalization. Unfortunately, very few conditions correspond to the model where demand is determined by the incidence of disease and drives medical practice.

The relationship between the supply of physicians and physician visit rates, particularly in those specialties focused on treating chronic illnesses, is similar to the relationship between bed supply and hospitalization rates. About half of the variation in the number of Medicare visits to cardiologists is associated with the per capita number of cardiologists in the region (Figure 1.2). Such a relationship makes arithmetic sense: on average, regions with twice as many cardiologists per capita will have twice as many available visit hours, since appointments to see physicians are fully booked—very few hours in the work week go unfilled. Available capacity governs the frequency of visits.

Is More Better?

The bottom-line question is whether the 'more is better' assumption is valid: do populations receiving more supply-sensitive care have better outcomes? Do they live longer? Do they have better quality of life? Are they more satisfied with their care? Such questions have received virtually no attention from academic medicine or from federal agencies, such as the National Institutes of Health, that are responsible for the scientific basis of medicine. With the exception of a few studies of chronic disease management, patient-level studies that might shed light on the question simply have not been done. The appropriate quantity of supply-sensitive care is only now beginning to emerge as a topic for general discourse at scientific meetings, at medical rounds, and in medical textbooks.

In the absence of detailed patient-level data, comparing resource inputs and outcomes among populations living in the 306 hospital referral regions (tertiary care markets) in the United States has been the focus of the Dartmouth Atlas Project. The studies consistently show that more resource inputs and utilization do not result in better outcomes. For example, in a recent study, researchers in the Dartmouth Atlas group examined outcomes for three patient cohorts: people who had had hip fractures, heart attacks, or colectomies for colon cancer. The patients were followed for up to five years after their initial events. The study's major finding was that regions with greater care intensity had increased mortality rates.[b]

The results are summarized in Table 1.1, which compares the level of resource inputs and mortality among cohorts living in hospital referral regions in the highest and lowest quintiles of Medicare end of life spending. The high input rate regions had 32% more hospital beds per capita, 31% more physicians, 65% more medical specialists, 75% more general internists, 29% more surgeons—and, of course, more Medicare spending (61% higher, on a price-adjusted basis). The low input rate regions had 26% more family practice physicians.

Although the hip fracture, heart attack, and colon cancer cohorts were comparable in baseline morbidity over the five-year period of follow-up after the index event from which the diagnosis was made, those living in the high-rate regions had higher mortality rates: 1.9% higher for hip fracture patients, 5.2% higher for colon cancer patients, and 5.2% higher for heart attack patients.

To address questions about functional status and patient satisfaction, the researchers used a fourth data set, the ongoing Medicare Current Beneficiary Survey. The results indicated no difference between regions in functional status or satisfaction, but *lower perceived access to patient care in high-rate regions.*

Resource Inputs		Cohort Health Outcomes		
Resource	**Ratio, Q5 vs. Q1**	**Condition**	**Relative risk of death, Q5 vs. Q1**	**95% CL**
Per-capita Medicare spending	1.61	Hip fracture	1.019	(1.0007-1.0386)
Hospital beds per 1,000	1.32	Colon cancer	1.052	(1.0123-1.0936)
Physician supply per 10,000		Heart attack	1.052	(1.0177-1.0884)
All physicians	1.31			
Medical specialists	1.65			
General Internists	1.75	**Functional status:** same		
Family practitioners/GP	0.74	**Satisfaction:** same		
Surgeons	1.29	**Perceived access to care:** worse		

Table 1.1. Per Capita Resource Inputs and Health Outcomes: The Ratio of High to Low Quintiles of Spending (1996)

The study of regional outcomes was repeated, restricting the analysis to patients who received their initial care at academic medical centers. The results were similar: academic medical centers in high input rate, high spending regions provided more supply-sensitive services than those in low input rate, low spending regions. For example, during the first six months following hip fracture, patients using academic medical centers in high-spending areas had 82% more physician visits, 26% more imaging exams, 90% more diagnostic tests, and 46% more minor surgery. Nevertheless, patients in high-intensity regions had higher mortality rates and worse quality scores.[c]

Implications for Evaluating Efficiency in Managing Chronic Illness

The evidence that the outcomes and quality of care tend to be better in regions with low resource use and low care intensity has important policy implications. Health care organizations serving such regions are not rationing care; rather, they are relatively more efficient, achieving equal and possibly better outcomes with fewer resources. This concept of relative efficiency can be useful in evaluating performance using benchmarking, a comparison among regions or providers in per-person spending, resource inputs, and quality measures.

For example, the Dartmouth Atlas Project recently compared the performance of hospital referral regions in California in managing chronic illness over the last two years of life.[d] On an illness, age, sex and race adjusted basis, providers in the Sacramento region were relatively more efficient than those in the Los Angeles region. On a per-person basis, Medicare spending was 69% higher in Los Angeles for patients with similar illnesses and levels of severity. Providers in Los Angeles used 61% more hospital beds, 128% more intensive care beds, and 89% more FTE physician labor in the management of chronically ill patients during the last two years of life. The quality of care given to heart attack, congestive heart failure, and pneumonia patients was uniformly worse in Los Angeles than in Sacramento. The quality of terminal care was also quite different; 33% of Medicare deaths in Los Angeles involved an admission to intensive care, compared to 19% in Sacramento. Moreover, 57% of Los Angeles hospitals were rated below average by patients who had used them, while only 13% of Sacramento hospitals were rated below average by patients who had been admitted to those hospitals.

On the basis of its lower spending, lower resource inputs, lower utilization rates, and its relatively satisfactory quality measures, the Sacramento region's performance provides a benchmark of relative efficiency for evaluating Los Angeles providers. While there was more than a twofold variation among hospitals within the Los Angeles region, *none was lower in per-person spending, resource allocation, or utilization than the Sacramento regional average*. If Sacramento practices were adopted by providers serving the Los Angeles region, the savings would be substantial. For example, had Los Angeles hospitals provided care at the rate of the Sacramento benchmark over the five years of our study (1999-2003), savings from care during the last two years of life for Medicare patients with chronic illnesses would have been approximately $1.7 billion.

The legitimacy of the Sacramento benchmark depends on the evidence that, at the population level, more intensive use of supply-sensitive care — more frequent physician visits, hospitalizations, and stays in intensive care among the chronically ill — does not result in better health outcomes. It can be

argued that what is needed is evidence-based specification of the proper processes of care in order to identify efficient practices. We agree that this should be the goal. But scientifically validated, detailed evidence defining efficient clinical pathways — for example, whom to hospitalize, when to schedule a revisit, or when to refer to a medical specialist, home health agency, or hospice — does not exist. It will take a long time and a major reorientation of the academic research agenda to provide such clinical evidence. In the meantime, we must rely on the results of natural experiments: population-based studies comparing overall quality and outcomes for similarly ill patients exposed to different levels of care intensity. So far, these studies indicate no marginal gain from greater resource use across the range of practice in the United States. Given the critical need to address practice variations, the use of high quality/low resource regions and hospitals as benchmarks for evaluating efficiency seems a fair and prudent policy.

Why We Are Interested in Measuring Care at the End of Life

The emphasis in this edition of the Dartmouth Atlas is on care delivered during the last two years of life. There is growing concern about the way chronic illness is managed in the United States, and about the possibility that some chronically ill and dying Americans might be receiving too much care — more than they and their families actually want or benefit from. Our emphasis on this period of life is also motivated by our interest in developing measures of performance that minimize the chance that variations can be explained by differences in the severity of individuals' illnesses. By looking at measures over fixed intervals of time prior to death, we can say with assurance that the prognosis of all the patients in the cohort is identical — all were dead after the interval of observation. By further adjusting for differences in the age, sex, race and relative frequency of chronic illness in the cohort, we believe that we have developed fair measures of the relative intensity of care provided to equally ill patients — comparisons for which differences among patients are an unlikely explanation.

We also address the question of how the variations in intensity of care observed during the last six months of life compare to variations in care intensity during previous periods. What we found is that care during the last six months of life is consistent with the patterns of practice in previous periods (Chapter Three, Figures 3.7 and 3.8). The frequencies of days spent in hospitals and physician visits during the last six months of life are highly correlated with hospitalization and visit rates in previous periods, even though the average rates during the earlier periods are much lower (reflecting the lower average illness severity of the patients further from death). The hospital, medical center, or physician practice providing the care has an effect on resource consumption and utilization throughout the course of chronic illness, not just in its terminal phase.

[a] Milton I. Roemer first posited Roemer's law around 1960. In 1993, he reiterated this observation in *National Health Systems of the World, Volume Two* (Oxford University Press): "The optimal supply of hospital beds needed by each country, for planning purposes, has been a subject of study and debate everywhere. If there is an assured payment system, it seems that almost any additional hospital beds provided will tend to be used, up to a ceiling not yet determined."

[b] Fisher ES, Wennberg DE, Stukel TA, Gottlieb DJ, Lucas FL, Pinder EL. The implications of regional variations in Medicare spending. Part 1: The content, quality, and accessibility of care. *Ann Intern Med*. 2003 Feb 18;138(4):273-87.

Fisher ES, Wennberg DE, Stukel TA, Gottlieb DJ, Lucas FL, Pinder EL. The implications of regional variations in Medicare spending. Part 2: Health outcomes and satisfaction with care. *Ann Intern Med*. 2003 Feb 18;138(4):288-98.

[c] Fisher ES, Wennberg DE, Stukel TA, Gottlieb DJ. Variations in the longitudinal efficiency of academic medical centers. *Health Affairs* web exclusive, 7 Oct 2004.

[d] Wennberg JE, Fisher ES, Baker L, Sharp SM, Bronner KK. Evaluating the efficiency of California providers in caring for patients with chronic illness. *Health Affairs* web exclusive, 16 Nov 2005.

Chapter Two

Variations Among States in the Management of Severe Chronic Illness

Introduction

The Dartmouth Atlas has traditionally presented its geographic performance measures by local and regional health care markets. While local and regional patterns of practice are reflected in variations in resources and utilization, the amount of care, and the kinds of care used, are also influenced by factors associated with state-level policies, particularly the financing and regulation of care. All states play an active role managing the Medicaid program, which, because of its role in financing much of long term care, has a direct impact on the costs and quality of the care delivered to the chronically ill.

States are also increasingly concerned about rising health care costs because of their responsibilities as payers for their employees and retirees. States routinely regulate, and through such regulation influence, the practice of medicine. In some states, government involvement includes a role in determining the distribution of resources through certificate of need programs. This is a potentially important role because, as the Atlas project has demonstrated, clinical decisions governing the frequency of use of physician visits, referrals to specialists, hospital care and use of diagnostic testing are strongly affected by local capacity. Capacity strongly influences both the quantity and per capita cost of care provided to patients with chronic illnesses.

Some states are seizing leadership roles in the reform of health care; to help inform the process, this edition of the Atlas includes a comparative analysis of state-level data. We believe that significant progress in the redesign of health care will demand close attention to the practice variation phenomenon, as well as attention to the opportunities to reduce waste and improve quality described by the Dartmouth Atlas Project.

This chapter focuses in particular on the levels of spending and resource inputs, and the quality of care, for Medicare enrollees with severe chronic illnesses, and explores important relationships between resources, utilization and quality. The population is comprised of a 20% sample of individuals who were enrolled in traditional Medicare, died over the four-year period 2000-03, and who were diagnosed with at least one of 12 chronic illnesses. The measures are adjusted for differences in age, sex, race and prevalence of the 12 chronic illnesses.

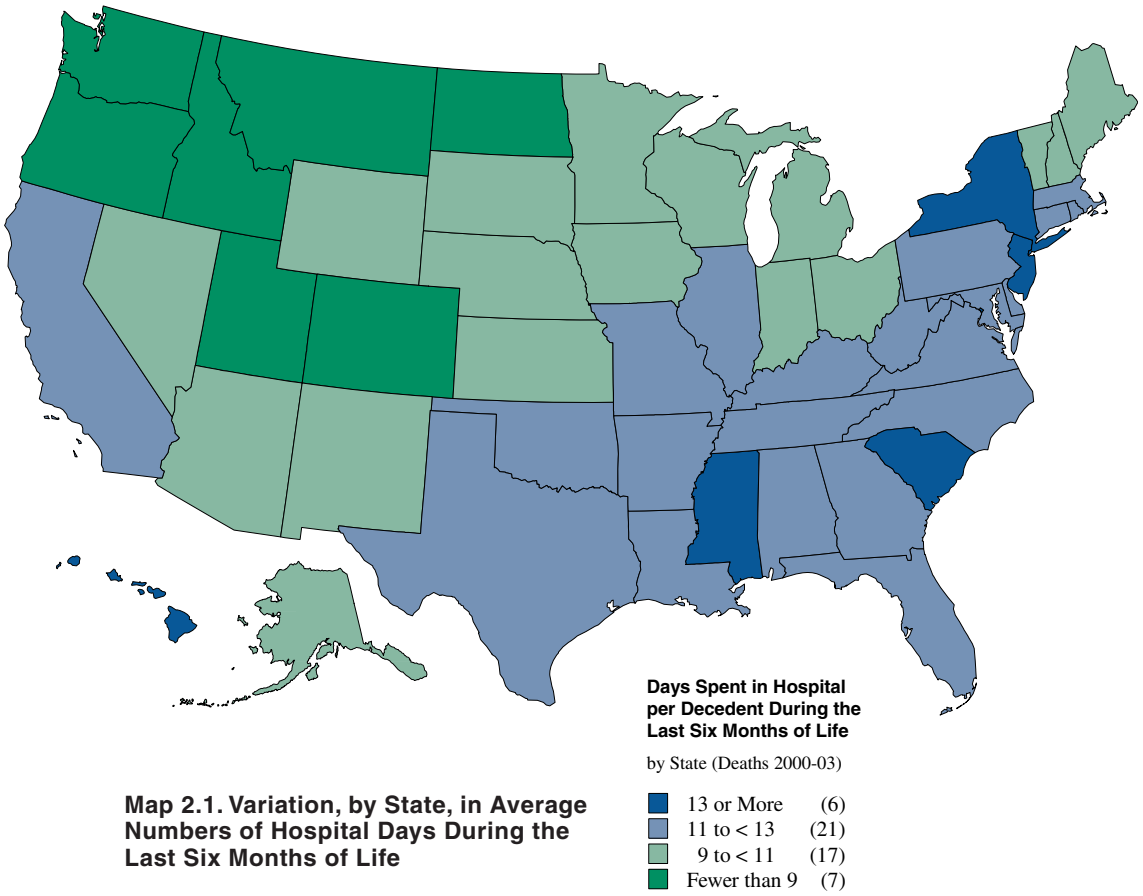
Because we are comparing populations with identical prognoses — all were dead at the end of the two-year period — we believe it is extremely unlikely that differences in illness explain the variation we observe among states (or among regions within states or among hospitals within a region, as discussed in subsequent chapters).

Part One: Care During the Last Six Months of Life

Days Spent in Hospital per Decedent During the Last Six Months of Life

The average number of per decedent days spent in hospitals during the last six months of life, by state, ranged from 7.3 to 16.4. (Total days are the result of both the admission rate and the average length of stay.) The U.S. average was 11.7 days per patient. Some of the Mountain states and the Pacific Northwest states had low rates, compared to residents of Hawaii (16.4), New York (16.3), the District of Columbia (15.8) and New Jersey (15.2). Residents of Mississippi (14.2) and South Carolina (13.1) also had high rates. Residents of Utah (7.3), Oregon (7.8 days) and Idaho (8.2) had rates about half the average among residents of Hawaii and New York.

AL	12.1	IL	12.2	MT	8.6	RI	11.4
AK	10.9	IN	10.0	NE	9.7	SC	13.1
AZ	9.4	IA	10.0	NV	10.3	SD	10.1
AR	12.5	KS	10.5	NH	9.7	TN	12.1
CA	11.7	KY	11.7	NJ	15.2	TX	11.1
CO	8.6	LA	11.6	NM	9.5	UT	7.3
CT	11.4	ME	10.6	NY	16.3	VT	10.1
DE	12.4	MD	12.1	NC	11.8	VA	11.9
DC	15.8	MA	11.5	ND	9.0	WA	8.5
FL	11.3	MI	10.8	OH	10.1	WV	12.1
GA	11.3	MN	9.5	OK	11.4	WI	9.7
HI	16.4	MS	14.2	OR	7.8	WY	9.1
ID	8.2	MO	11.0	PA	11.6	US	11.7

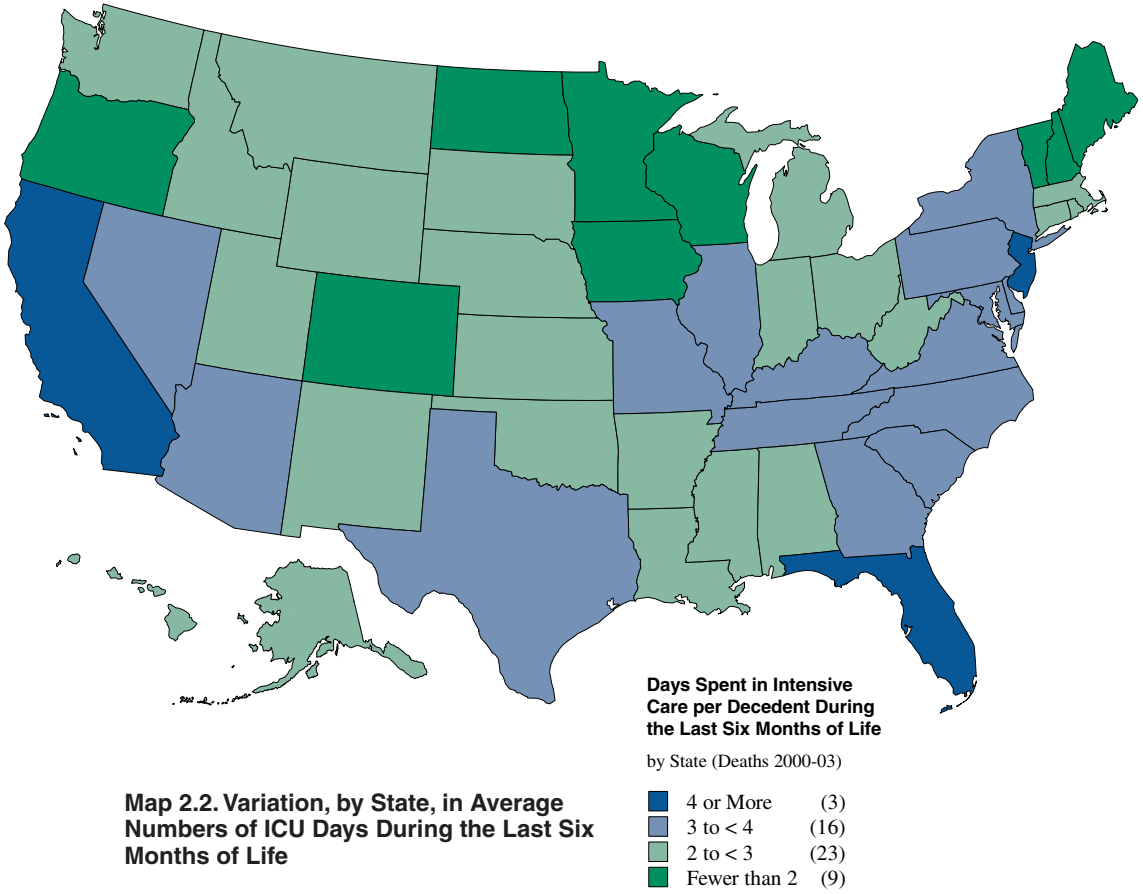


Map 2.1. Variation, by State, in Average Numbers of Hospital Days During the Last Six Months of Life

Days Spent in Intensive Care Units per Decedent During the Last Six Months of Life

The average number of days spent in ICUs per decedent during the last six months of life, a measure of the aggressiveness of end of life care, ranged from fewer than two to almost five. (Total days are the result of both the admission rate and the average length of stay.) The U.S. average was 3.2 days per decedent. States in Northern New England, Oregon and the Upper Midwest had low rates, with an average of two days or fewer in most of these states. Residents of Florida were treated much more intensively, spending an average of 4.7 days in ICUs, three times more than residents of North Dakota (1.5). The average number of days spent in intensive care in California (4.6), New Jersey (4.6), South Carolina (3.9), Delaware (3.9) and the District of Columbia (3.8) exceeded the rates in North Dakota, Vermont (1.7), New Hampshire (1.8), Oregon (1.9) and Maine (1.9) by a factor of two or more.

AL	3.0	IL	3.6	MT	2.1	RI	2.4
AK	2.8	IN	3.0	NE	2.6	SC	3.9
AZ	3.3	IA	2.0	NV	3.4	SD	2.0
AR	2.7	KS	2.3	NH	1.8	TN	3.5
CA	4.6	KY	3.0	NJ	4.6	TX	3.7
CO	2.0	LA	2.8	NM	2.7	UT	2.2
CT	2.8	ME	1.9	NY	3.0	VT	1.7
DE	3.9	MD	3.3	NC	3.2	VA	3.4
DC	3.8	MA	2.3	ND	1.5	WA	2.5
FL	4.7	MI	2.8	OH	3.0	WV	2.9
GA	3.2	MN	2.0	OK	2.2	WI	2.0
HI	2.9	MS	2.5	OR	1.9	WY	2.6
ID	2.0	MO	3.1	PA	3.3	US	3.2

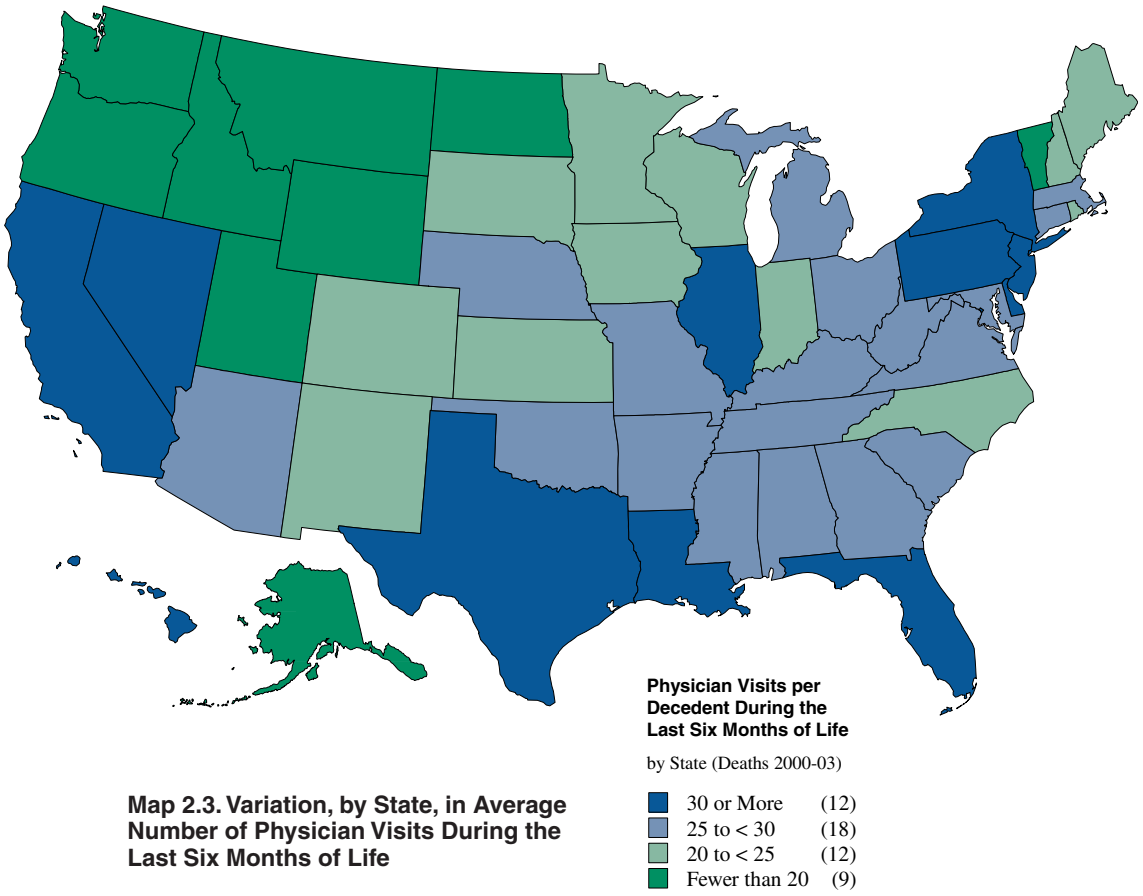


Map 2.2. Variation, by State, in Average Numbers of ICU Days During the Last Six Months of Life

Physician Visits per Decedent During the Last Six Months of Life

The average number of physician visits per decedent during the last six months of life, a measure of intensity of end of life care, ranged from fewer than 20 to more than 40. Vermont, the Mountain States and states in the Pacific Northwest had the lowest rates, with an average of fewer than 20 visits. Residents of New Jersey had the highest number of physician visits (41.5) during the last six months of life, 2.4 times more than residents of Utah (17.0). Rates exceeded Utah's by a factor of two in New York (35.3), Florida (34.9) and California (34.9).

AL	27.7	IL	31.1	MT	19.0	RI	24.0
AK	18.4	IN	24.5	NE	25.6	SC	27.7
AZ	26.6	IA	22.5	NV	33.1	SD	22.4
AR	29.0	KS	24.5	NH	21.3	TN	29.7
CA	34.9	KY	27.5	NJ	41.5	TX	30.9
CO	23.1	LA	31.0	NM	20.7	UT	17.0
CT	25.4	ME	20.3	NY	35.3	VT	19.1
DE	32.3	MD	29.4	NC	24.3	VA	26.1
DC	34.2	MA	26.8	ND	19.9	WA	20.0
FL	34.9	MI	28.3	OH	26.3	WV	25.7
GA	26.5	MN	20.6	OK	25.7	WI	22.0
HI	34.5	MS	28.3	OR	17.9	WY	19.6
ID	18.1	MO	26.3	PA	31.9	US	29.0

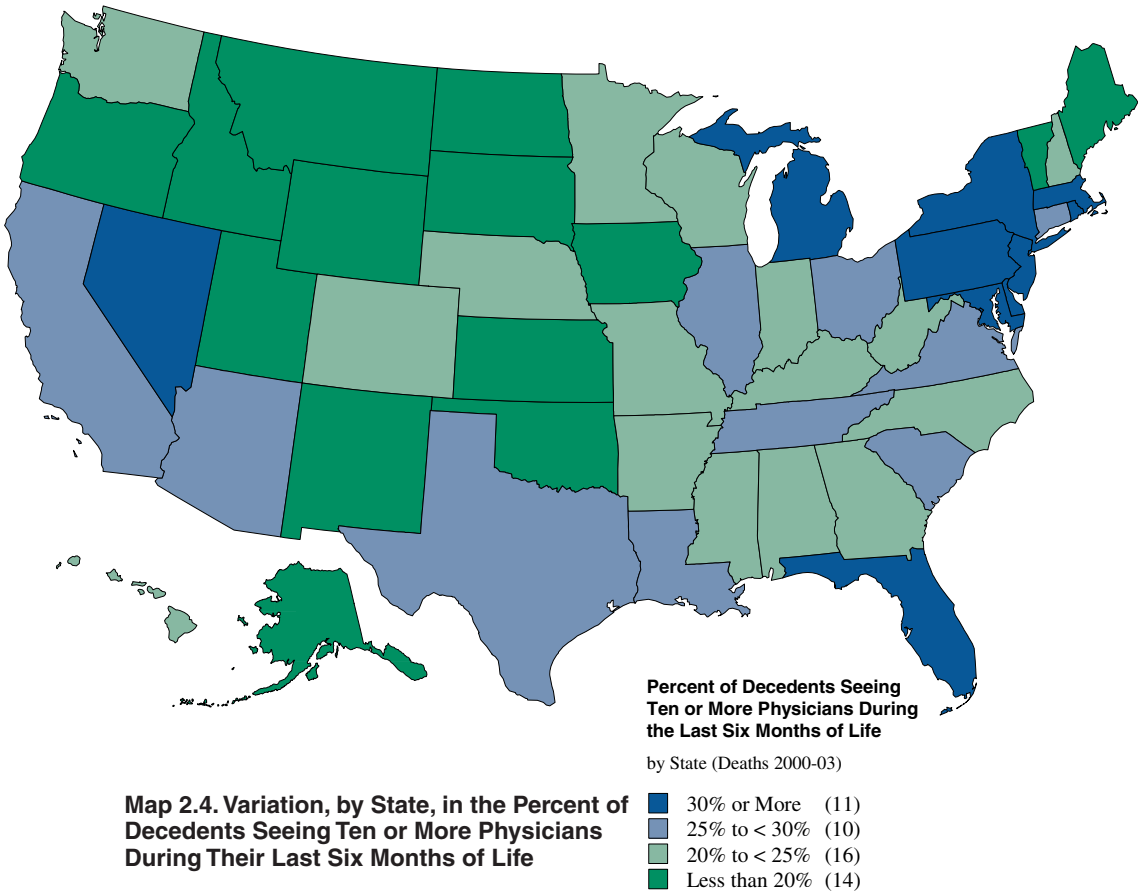


Map 2.3. Variation, by State, in Average Number of Physician Visits During the Last Six Months of Life

Percent of Decedents Seeing Ten or More Physicians During the Last Six Months of Life

The propensity for multiple physicians to be involved in the care of patients was measured by calculating the percent of patients who saw ten or more different physicians during their last six months of life. So many different physicians being involved in the patient's management could indicate problems with continuity of care. The proportion of decedents who had seen ten or more physicians during their last six months of life ranged from 10.8% among residents of Wyoming to 38.7% among residents of New Jersey. Rates were high in the Mid-Atlantic states, including Delaware (35.8%), New York (35.6%) and Maryland (34.2%), as well as in Florida (34.6%) and Massachusetts (34.2%). Rates were substantially lower in the Western and Pacific Northwestern states, including Montana (12.0%), Idaho (13.3%), and Oregon (14.5%).

AL	23.5	IL	28.2	MT	12.0	RI	31.2
AK	16.7	IN	23.1	NE	20.2	SC	27.9
AZ	28.5	IA	18.9	NV	32.1	SD	17.6
AR	20.5	KS	18.6	NH	24.2	TN	26.4
CA	27.4	KY	22.5	NJ	38.7	TX	25.2
CO	23.1	LA	26.3	NM	18.7	UT	15.0
CT	29.2	ME	19.5	NY	35.6	VT	19.2
DE	35.8	MD	34.2	NC	24.3	VA	28.7
DC	35.1	MA	34.2	ND	16.6	WA	20.1
FL	34.6	MI	30.7	OH	27.9	WV	21.6
GA	24.3	MN	23.0	OK	17.6	WI	21.4
HI	20.8	MS	20.7	OR	14.5	WY	10.8
ID	13.3	MO	23.0	PA	34.1	US	27.5

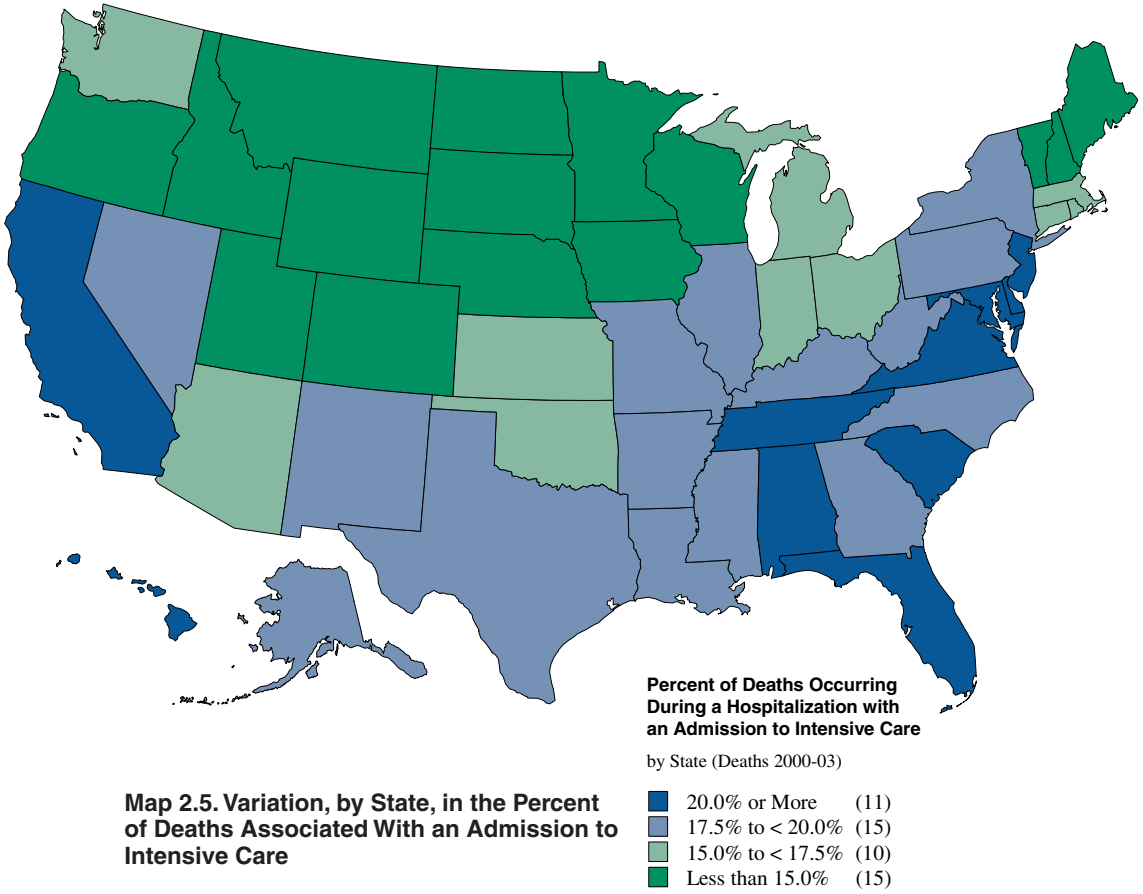


Map 2.4. Variation, by State, in the Percent of Decedents Seeing Ten or More Physicians During Their Last Six Months of Life

Percent of Deaths Associated With an Admission to Intensive Care

Given the expressed wish of many patients to avoid aggressive care at the end of life, our measure of terminal care intensity — the percent of all deaths that occurred during a hospitalization involving one or more stays in intensive care — is useful in evaluating the quality of the end of life. Nationally, over the four-year period of our study, about one death in five was associated with one or more stays in an intensive care unit. However, the manner of managing the final days of life differed from state to state. In some, care was much more aggressive than in others. Among New Jersey residents, 25.1% of all deaths were associated with an ICU stay, compared to only 11.7% among residents of South Dakota. "High tech" deaths were less common in Northern New England, the Upper Midwest and Pacific Northwest, and more common in California and the Southeastern states.

AL	20.0	IL	18.4	MT	13.0	RI	15.4
AK	17.9	IN	17.1	NE	14.8	SC	21.2
AZ	15.5	IA	13.2	NV	19.2	SD	11.7
AR	18.0	KS	16.0	NH	13.4	TN	20.5
CA	21.8	KY	18.6	NJ	25.1	TX	19.7
CO	12.2	LA	18.2	NM	17.5	UT	13.8
CT	17.1	ME	14.7	NY	19.8	VT	13.5
DE	22.4	MD	20.2	NC	19.0	VA	20.1
DC	24.8	MA	16.6	ND	11.8	WA	15.9
FL	20.7	MI	16.9	OH	17.0	WV	18.6
GA	19.5	MN	13.3	OK	16.6	WI	13.6
HI	21.3	MS	18.1	OR	13.6	WY	14.0
ID	13.4	MO	18.4	PA	18.5	US	18.5

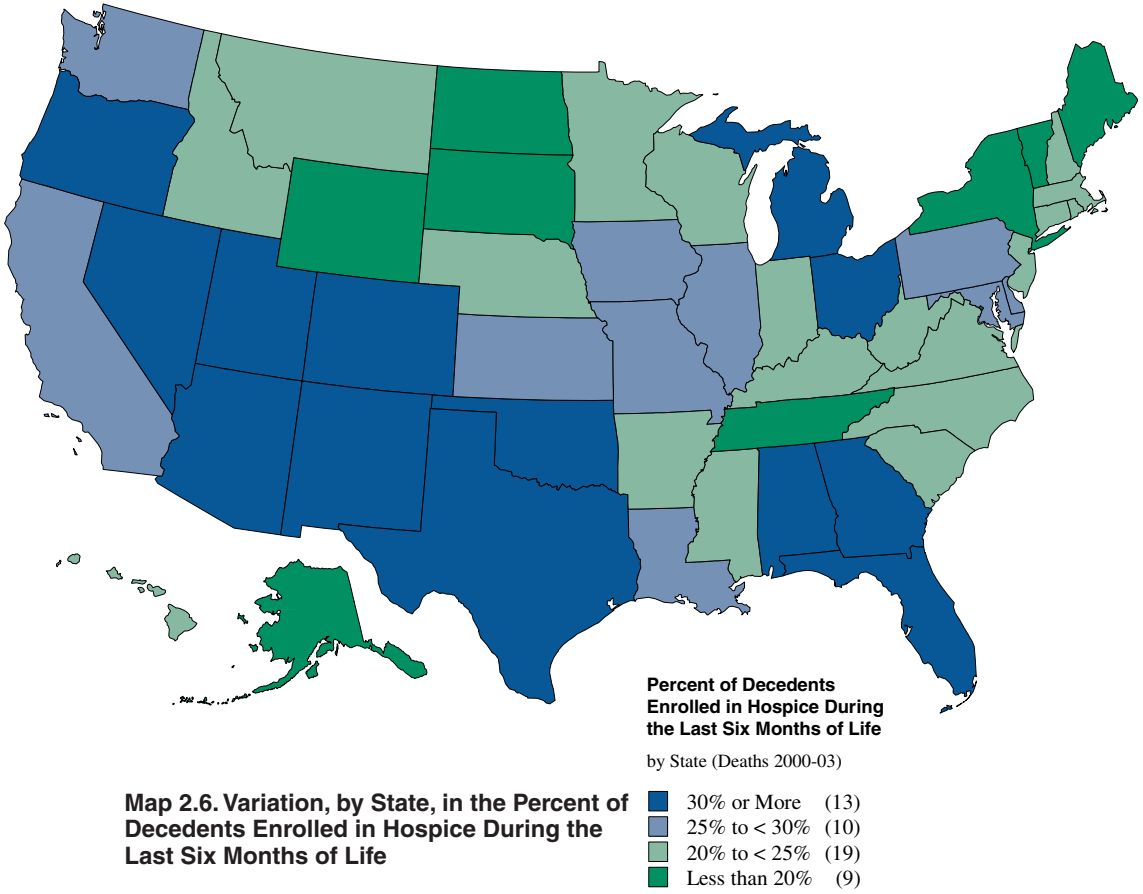


Map 2.5. Variation, by State, in the Percent of Deaths Associated With an Admission to Intensive Care

Percent of Decedents Enrolled in Hospice

The proportion of decedents who were enrolled in hospice care during their last six months of life ranged from less than 7% to more than 40%. Higher proportions of patients were enrolled in hospice during their last six months of life in the Western states, Michigan, Ohio, and Florida than in New England and the Upper Midwest. The proportions enrolled in hospice in Arizona (44.7%), Colorado (39.3%) and Florida (37.9%) were substantially higher than the proportions enrolled in Alaska (6.7%), Maine (12.6%), South Dakota (14.6%), Wyoming (16.3%) and Vermont (17.9%). The national average rate was 27.2%.

AL	30.5	IL	29.9	MT	20.3	RI	22.9
AK	6.7	IN	24.7	NE	24.5	SC	24.8
AZ	44.7	IA	28.8	NV	31.1	SD	14.6
AR	23.3	KS	28.3	NH	20.4	TN	19.3
CA	25.0	KY	24.8	NJ	23.5	TX	33.8
CO	39.3	LA	25.5	NM	31.6	UT	36.6
CT	21.9	ME	12.6	NY	18.7	VT	17.9
DE	27.9	MD	25.5	NC	23.9	VA	22.4
DC	18.9	MA	20.9	ND	19.4	WA	25.7
FL	37.9	MI	34.3	OH	32.7	WV	20.2
GA	31.6	MN	23.7	OK	34.4	WI	24.2
HI	20.4	MS	24.5	OR	34.0	WY	16.3
ID	23.5	MO	26.7	PA	25.6	US	27.2



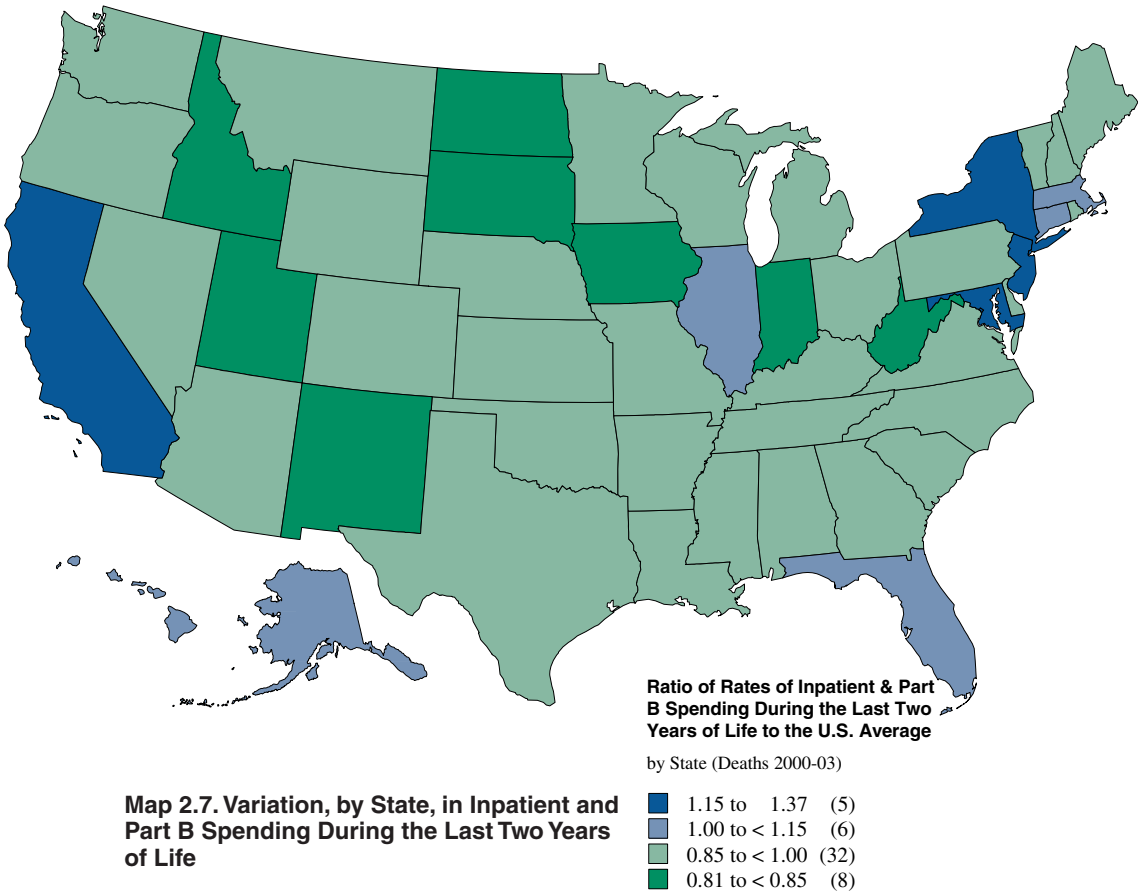
Map 2.6. Variation, by State, in the Percent of Decedents Enrolled in Hospice During the Last Six Months of Life

Part Two: Medicare Spending and Resource Inputs During the Last Two Years of Life

Inpatient and Part B Spending per Decedent During the Last Two Years of Life

The amount of money the Medicare program spent per patient with severe chronic illness varied substantially. The distribution was highly skewed; 13 states and the District of Columbia accounted for half of Medicare's spending, even though they accounted for only 45% of chronically ill Medicare patients. New Jersey had the highest level of spending during the last two years of life – almost $40,000 per person – followed by the District of Columbia ($39,637), California ($38,573), New York ($38,369) and Maryland ($36,337). These states had spending levels that were 24% to 33% above the national average. In forty states, spending was below the national average, and 27 states had spending levels between 10% and 20% below the national average. Among the lowest-spending states were Idaho, Iowa, West Virginia, North Dakota, Indiana, Utah, South Dakota and New Mexico, all with average spending of less than $25,000 per decedent.

AL	25,344	IL	31,197	MT	25,056	RI	29,028
AK	31,957	IN	23,874	NE	25,838	SC	27,095
AZ	27,843	IA	23,746	NV	27,950	SD	24,072
AR	25,724	KS	25,740	NH	25,706	TN	26,464
CA	38,573	KY	25,012	NJ	39,810	TX	28,466
CO	25,888	LA	26,830	NM	24,616	UT	23,936
CT	32,636	ME	25,196	NY	38,369	VT	27,050
DE	28,450	MD	36,337	NC	25,829	VA	25,435
DC	39,637	MA	31,985	ND	23,855	WA	27,698
FL	29,604	MI	28,427	OH	25,005	WV	23,789
GA	26,267	MN	27,411	OK	25,227	WI	25,343
HI	33,518	MS	25,705	OR	25,509	WY	25,173
ID	23,697	MO	25,681	PA	28,487	US	29,199

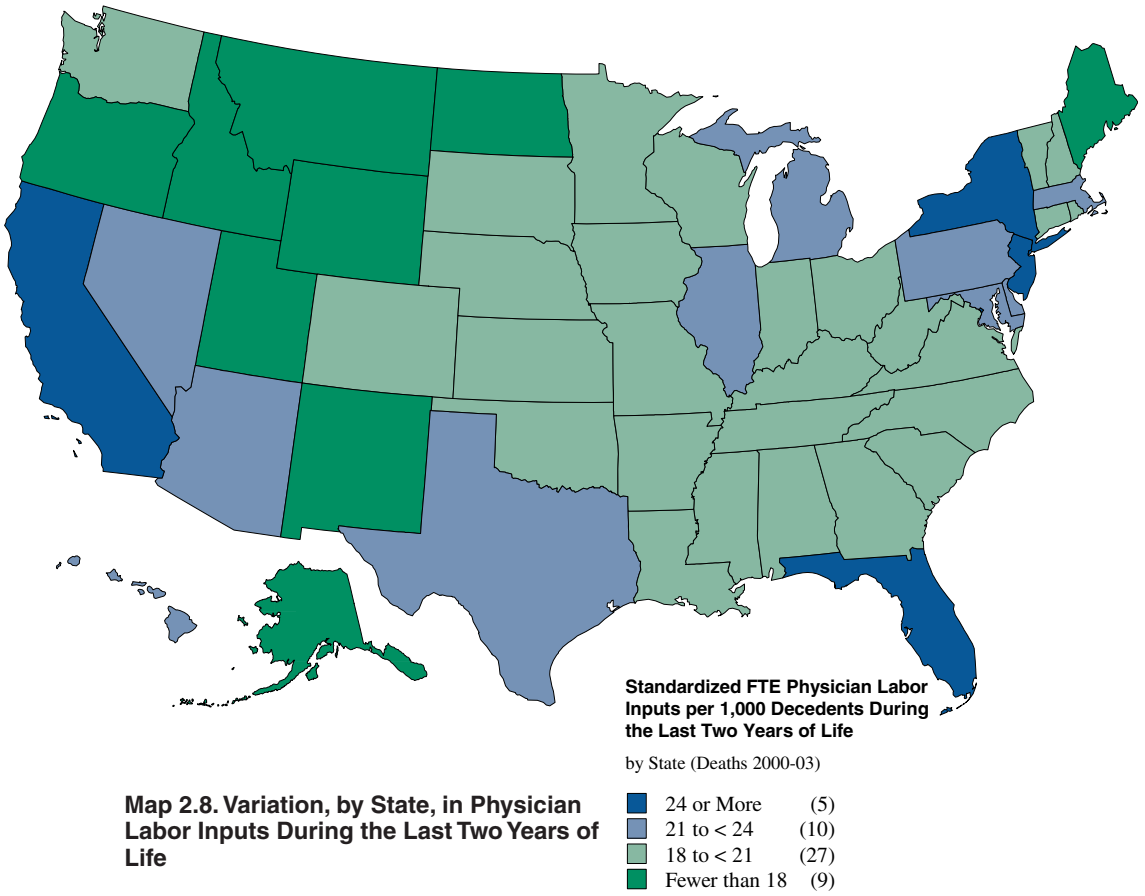


Map 2.7. Variation, by State, in Inpatient and Part B Spending During the Last Two Years of Life

Standardized FTE Physician Labor Inputs per 1,000 Decedents During the Last Two Years of Life

Standardized full-time equivalent physician labor inputs during the last two years of life averaged 21.6 physicians per 1,000 decedents nationally over the period 2000-03. Labor inputs, however, varied substantially from state to state. States with relatively low FTE physician workforce inputs included Maine and several states in the Upper Midwest. Physician labor inputs in New Jersey (27.5), the District of Columbia (26.6), Florida (26.3) and California (25.9) were more than 20% above the national average. Health care organizations serving New Jersey used 27% more than the national average and 70% more than Alaska (16.1). States using the fewest FTE physician labor inputs included North Dakota (17.1), Utah (17.2), Idaho (17.3), and Wyoming (17.4).

AL	20.5	IL	23.1	MT	17.5	RI	19.1
AK	16.1	IN	19.0	NE	19.6	SC	19.9
AZ	21.2	IA	20.7	NV	23.1	SD	18.3
AR	19.6	KS	18.8	NH	18.3	TN	20.7
CA	25.9	KY	19.9	NJ	27.5	TX	22.6
CO	19.8	LA	20.7	NM	17.9	UT	17.2
CT	19.2	ME	17.6	NY	24.6	VT	18.4
DE	22.0	MD	23.2	NC	19.1	VA	19.4
DC	26.6	MA	21.2	ND	17.1	WA	18.4
FL	26.3	MI	22.3	OH	19.9	WV	18.5
GA	19.2	MN	18.3	OK	18.5	WI	18.2
HI	23.4	MS	19.1	OR	17.5	WY	17.4
ID	17.3	MO	19.9	PA	22.1	US	21.6



Map 2.8. Variation, by State, in Physician Labor Inputs During the Last Two Years of Life

Comparing Labor Inputs of Primary Care Physicians and Medical Specialists

The management of chronic illness is for the most part the responsibility of primary care physicians and medical specialists. Over the four-year period 2000-03, the workload appears to have been almost evenly divided between the two disciplines; during the last two years of life, the national average labor input from primary physicians was 8.7 per 1,000 decedents, and medical specialist labor inputs averaged 8.4 per 1,000.

There was, however, considerable variation among the states, particularly in the supply of medical specialist labor. There was a more than twofold range of variation in rates of medical specialist labor input, from 5.2 per 1,000 decedents in Alaska to 13.2 in New Jersey. Primary care physician labor inputs varied by only 60%, from 6.6 per 1,000 decedents in Utah to 10.6 in New York.

If medical specialist labor were substituting for primary care labor, we would expect to find an inverse relationship between the two. In fact, states with higher input rates for primary care physicians tended to have higher rates of medical specialist inputs as well. Figure 2.1 gives the relationship between labor input per 1,000 decedents for primary care physicians (horizontal axis) and medical specialists (vertical axis). The rates are correlated (R^2 = .20).

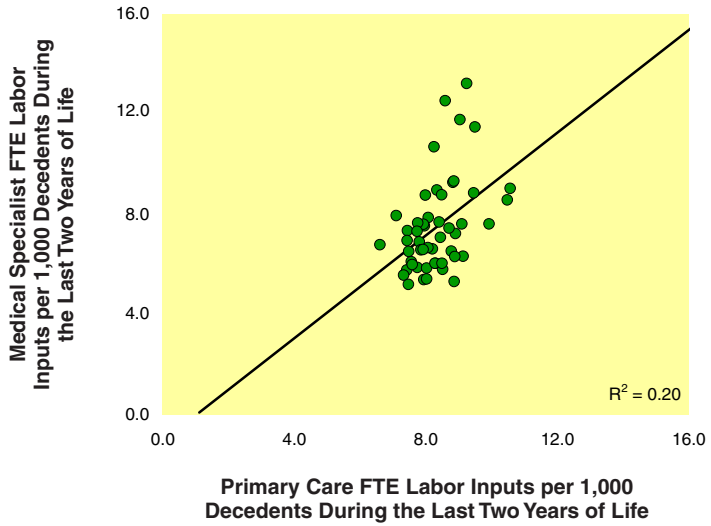


Figure 2.1. The Relationship Between Primary Care and Medical Specialist Physician Labor Inputs (Deaths Occurring 2000-03)

Associations Between Physician Labor Inputs and Hospital Use

We examined the relationships between physician labor input and the use of hospitals. Perhaps contrary to expectation, primary care labor input was positively correlated with Medicare spending for inpatient care (R^2 = .27) (Appendix Figure 2A), hospital days (R^2 = .39) (Appendix Figure 2B), and days in intensive care (R^2 = .15) (Figure 2.2). There were similar positive associations with medical specialist labor; greater inputs were associated with more inpatient spending (R^2 = .36) (Appendix Figure 2C) and more hospital days (R^2 = .29) (Appendix Figure 2D). The association between specialist labor inputs and days decedents spent in intensive care units during the last six months of life was particularly strong: R^2 = .65 (Figure 2.3).

Ironically, the quality of technical processes of care, measured by a composite quality score (based on CMS measurements of the quality of care for patients with heart attacks, heart failure, and pneumonia) was inversely associated with medical specialist labor inputs: r =-.34, (p value = 0.02).

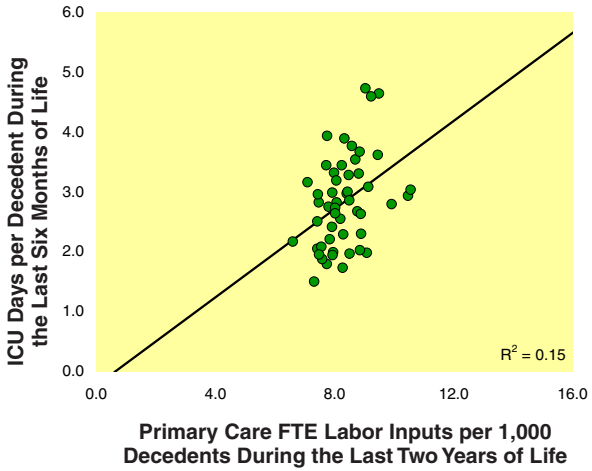


Figure 2.2. The Relationship Between Primary Care Physician Labor Inputs and Average Number of Days in Intensive Care (Deaths Occurring 2000-03)

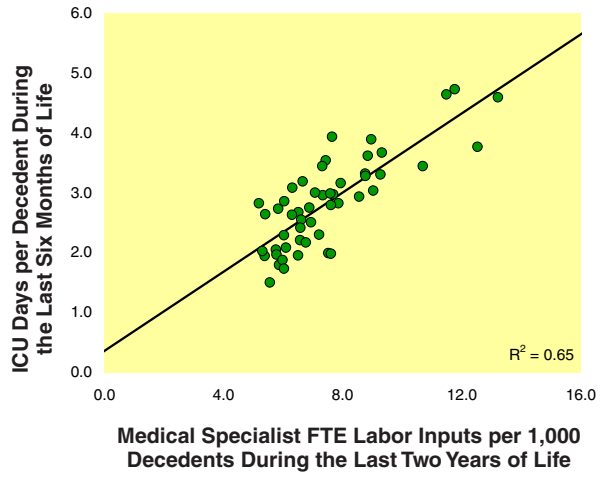


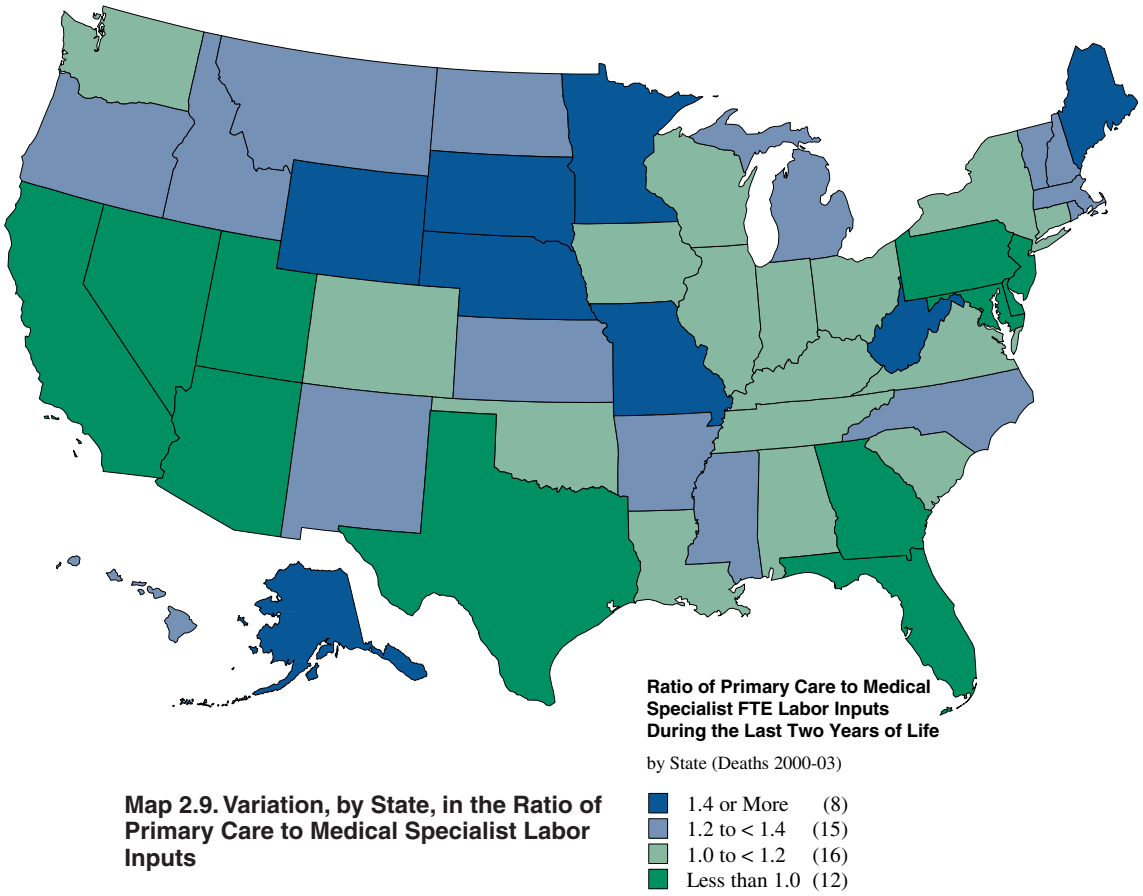
Figure 2.3. The Relationship Between Medical Specialist Labor Inputs and Average Number of Days in Intensive Care (Deaths Occurring 2000-03)

Comparing Labor Inputs of Primary Care and Medical Specialists

Another way of looking at workforce allocation in managing chronic illness is to examine the mix between primary care and medical specialist labor. In care models that emphasize primary care, specialists serve primarily in a referral capacity; in those that depend on medical specialists, specialists are responsible for care management. We have used the ratio of primary care to medical specialist labor inputs to develop a summary index of variation in practice patterns along this dimension.

States most favoring primary care in managing chronic illness included South Dakota (ratio of primary care to medical specialist inputs = 1.67), Wyoming (1.49), Maine (1.47), Minnesota (1.47), and Missouri (1.45). 35% of the Medicare decedents resided in states where the ratio was less than 1.0 — where primary care physician labor input was less than the medical specialist labor input. These included the District of Columbia (0.69), New Jersey (0.70), Florida (0.77), Nevada (0.77) and California (0.83).

AL	1.09	IL	1.07	MT	1.24	RI	1.20
AK	1.44	IN	1.01	NE	1.41	SC	1.01
AZ	0.91	IA	1.20	NV	0.77	SD	1.67
AR	1.35	KS	1.37	NH	1.32	TN	1.17
CA	0.83	KY	1.19	NJ	0.70	TX	0.95
CO	1.06	LA	1.03	NM	1.37	UT	0.98
CT	1.13	ME	1.47	NY	1.17	VT	1.37
DE	0.93	MD	0.95	NC	1.21	VA	1.06
DC	0.69	MA	1.23	ND	1.32	WA	1.07
FL	0.77	MI	1.30	OH	1.04	WV	1.41
GA	0.89	MN	1.47	OK	1.19	WI	1.15
HI	1.22	MS	1.24	OR	1.27	WY	1.49
ID	1.29	MO	1.45	PA	0.97	US	1.04



Map 2.9. Variation, by State, in the Ratio of Primary Care to Medical Specialist Labor Inputs

The Primary Care – Medical Specialist Mix and Variation in Cost, Use and Quality of Care

In examining the association between the ratio of primary care to specialist labor inputs and performance measures in managing severe chronic illness, we find that states that relied more on primary care tended to have lower Medicare spending, lower overall physician labor input, lower utilization and better quality of care. Figure 2.4 provides an example. It shows that states with more primary care labor inputs relative to medical specialists (a higher ratio) also had lower rates of use of intensive care units during the last six months of life (R^2 = .48).

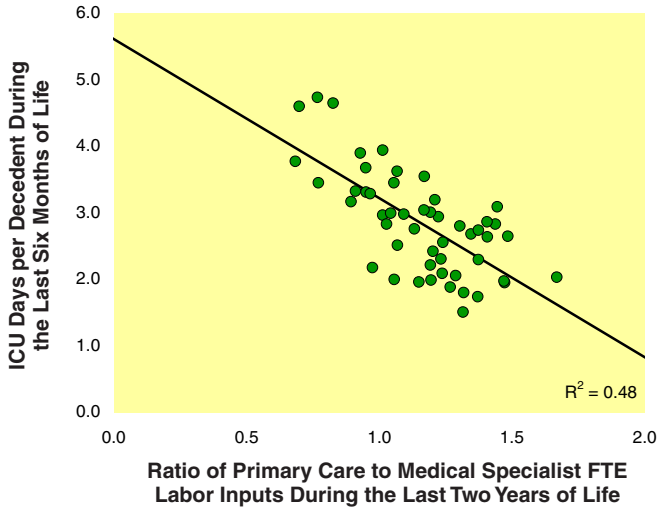


Figure 2.4. The Relationship Between the Ratio of Primary Care Inputs to Medical Specialist Inputs and Average Number of Days in Intensive Care (Deaths Occurring 2000-03)

Table 2.1 summarizes the associations. States that rely more on primary care physicians in managing chronic illness have:

	R^2	
Lower Medicare spending:		
Inpatient reimbursements	.13	view
Part B payments	.52	view
Lower resource inputs:		
Hospital beds	.03	view
ICU beds	.38	view
Total physician labor	.49	view
Primary care labor	.00	view
Medical specialist labor	.75	view
Lower utilization rates:		
Physician visits	.40	view
Days in intensive care units	.48	view
Days in the hospital	.09	view
Percent seeing 10 or more physicians	.42	view
Better quality of care		
Fewer deaths involving the ICU	.39	view
Composite quality score	.11	view

Table 2.1. The Relationships Between the Ratio of Primary Care Inputs to Medical Specialist Inputs and Measures of Medicare Spending, Resource Input, Utilization, and Quality of Care (Deaths Occurring 2000-03)

Chapter Three

Treatment of the Chronically Ill at Academic Medical Centers

Introduction

It is widely recognized that academic medical centers, particularly those closely affiliated with medical schools, have special responsibilities. They educate medical students and other health professionals, they provide postgraduate specialist training, and they play a leading role in continuing education for professionals. These activities constitute the clinical environments and role models that are essential for creating professional identity. Academic medicine is also responsible for establishing the scientific basis of the medical care provided to aging Americans, most of who will die from costly chronic illnesses that must be managed but can't be cured.

This chapter looks at how academic medicine is managing Medicare patients with severe chronic illnesses. The patterns of practice of the nation's most prestigious academic medical centers — those that appear on the Council of Teaching Hospitals' list of integrated academic medical centers* — are compared. The use of care is shown to differ remarkably from one institution to another. The first part of the chapter documents the extensive variations in the utilization of hospitals, intensive care units and physician visits. The second part examines variations in resource inputs — physician labor and hospital beds — and illustrates the use of benchmarking to evaluate the efficiency of academic medical centers. The variation in the numbers and types of physicians used by academic medicine in managing chronic illnesses calls attention to the problem of forecasting the numbers of physicians needed to meet the needs of an aging U.S. population. The final section demonstrates that the forecast depends on which academic medical centers (and regions) are used as the benchmarks when estimating need.

*Integrated academic medical center hospitals are those which are under common ownership with a college of medicine, or have the majority of medical school department chairmen serve as the hospital chiefs of service; are a non-Federal member of the AAMC's Council of Teaching Hospitals and Health Systems (COTH), and provide short-stay, general hospital service. See http://www.aamc.org/data/ocd/fielddefinitions.htm

Part One: Variations in Utilization Among COTH Integrated Academic Medical Centers

The study population for this chapter is the cohort of Medicare Part A and B enrollees who experienced at least one medical hospitalization for chronic illness during the last two years of life and received most of their inpatient care at a COTH integrated academic medical center. Hospital and ICU day rates during the last six months of life and inpatient Medicare spending and hospital resource inputs during last two years of life are based on enrollees who died between January 1, 1999 and December 31, 2003. Part B spending and physician resource inputs during the last two years of life and physician visit rates during the last six months of life are for enrollees who died between January 1, 2000 and December 31, 2003.

In the figures that follow, the rate at each academic medical center that meets the minimum patient population size requirement (400 deaths over the five-year period 1999-2003) is represented by a dot. The ten academic medical centers that were the highest-ranked hospitals on *U.S. News & World Report*'s list of "honor roll"[a] hospitals — those with the highest quality as determined by the magazine's selection process — have been selected for emphasis. They are among the most prestigious hospitals in the United States — indeed, the world.

[a] *U.S. News and World Report*: Best Hospitals 2005: http://www.usnews.com/usnews/health/best-hospitals/honorroll.htm

Average Number of Days in Hospitals

Chronically ill Medicare enrollees who were patients at New York University Medical Center had the highest average number of days in hospitals during their last six months of life (32.1 days per decedent) of all cohorts treated at COTH integrated academic medical centers. Enrollees treated at Scott & White Memorial Hospital, in Temple, Texas, had the lowest average number of days (9.2), less than one-third the rate among patients of NYU Medical Center. Other academic medical centers with more than 24 hospitalized days during the last six months of life included Westchester County Medical Center (27.2), University Hospital of Brooklyn (26.0), the Robert Wood Johnson University Hospital (24.6) and Mt. Sinai Hospital (24.3). Academic medical centers where patients averaged fewer than 11 hospitalized days during their last six months of life included University Medical Center in Tucson, Arizona (10.2 days per decedent), the University of New Mexico Hospital (10.3), and the University of Colorado Hospital (10.7). Among the *U.S. News & World Report* honor roll hospitals, the average number of hospitalized days during the last six months of life ranged from 12.9 days per decedent at St. Mary's Hospital (the principal hospital of the Mayo Clinic in Rochester, Minnesota) to 23.9 at New York-Presbyterian Hospital.

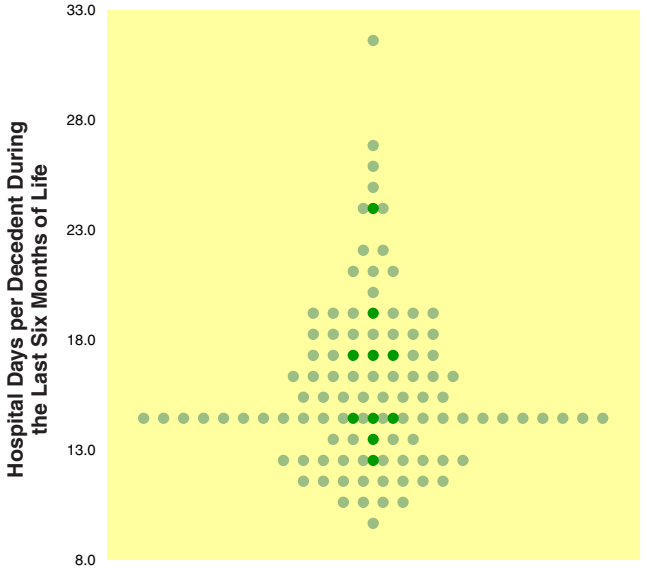


Figure 3.1. Average Number of Days in Hospital per Decedent During the Last Six Months of Life Among Medicare Part A and B Decedents (1999-2003) Who Received Most of Their Inpatient Care at a COTH Academic Medical Center

Selected Academic Medical Center Data	
New York-Presbyterian Hospital	23.9
UCLA Medical Center	19.2
Massachusetts General Hospital	17.7
Barnes-Jewish Hospital	17.3
Johns Hopkins Hospital	17.1
Cleveland Clinic	14.6
University of Washington Medical Center	14.5
Duke University Hospital	14.0
UCSF Medical Center	13.2
Mayo Clinic (St. Mary's Hospital)	12.9

Average Number of Days in Intensive Care Units

UCLA Medical Center, one of *U.S. News & World Report*'s honor roll hospitals, had the highest average number of days in intensive care units during the last six months of life (11.4 days per decedent). Patients at Thomas Jefferson University Hospital had almost as many days (11.2); both hospitals' rates were three times higher than the national average rate of 3.6 days. Other academic medical centers where the numbers of days spent in intensive care were higher than average included the Robert Wood Johnson University Hospital (9.8) and the University of Medicine and Dentistry of New Jersey University Hospital (9.1), both in New Jersey; the Memorial Hermann-Texas Medical Center (8.7) in Houston, Texas; and the University of California-Irvine Medical Center (8.2). At other academic medical centers, end of life care was much less aggressive; the average numbers of days in intensive care at Scott & White Memorial Hospital (1.5 days per decedent) and the Westchester County Medical Center (1.5) were less than half the national average. The University of Vermont Medical School's Fletcher Allen Hospital (1.9) and Dartmouth Medical School's Mary Hitchcock Memorial Hospital (2.0) also had less aggressive patterns of end of life care than the academic medical centers serving downstate New York and New Jersey.

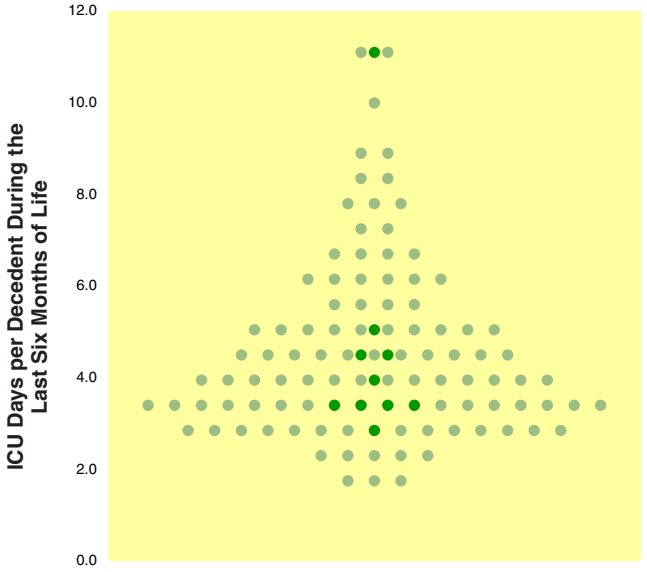


Figure 3.2. Average Number of Days in ICU per Decedent During the Last Six Months of Life Among Medicare Part A and B Decedents (1999-2003) Who Received Most of Their Inpatient Care at a COTH Academic Medical Center

Selected Academic Medical Center Data	
UCLA Medical Center	11.4
New York-Presbyterian Hospital	5.0
Barnes-Jewish Hospital	4.5
Johns Hopkins Hospital	4.3
Mayo Clinic (St. Mary's Hospital)	3.9
Cleveland Clinic	3.5
Duke University Hospital	3.3
UCSF Medical Center	3.3
University of Washington Medical Center	3.2
Massachusetts General Hospital	2.8

Average Number of Physician Visits

Medicare enrollees who were patients of the New York University Medical Center had an average of 76.2 physician visits during their last six months of life, almost one-third more than patients at the next-highest rate academic medical center, the Robert Wood Johnson University Hospital (57.7 visits per decedent). Patients of the University of Kentucky Hospital had slightly more than half as many (18.6) physician visits as the national average (33.5). Among the *U.S. News & World Report* honor roll academic medical centers, the average numbers of physician visits during the last six months of life varied by a factor of more than two, from 22.6 visits per decedent at the University of Washington Medical Center to 52.1 among patients at the UCLA Medical Center.

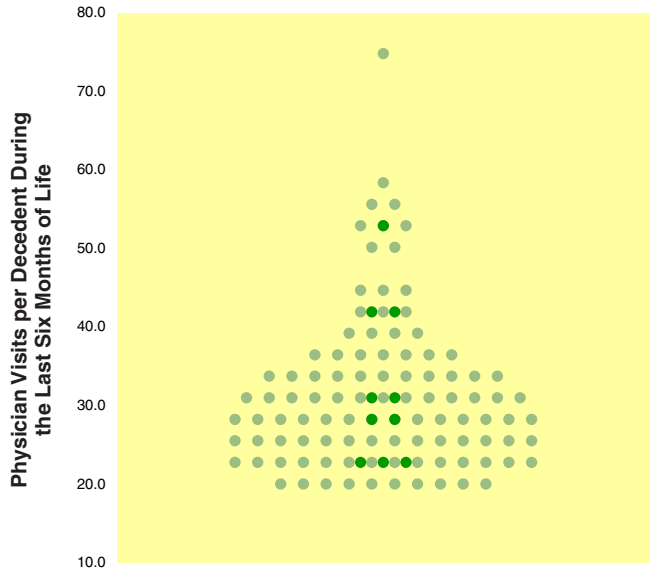


Figure 3.3. Average Number of Physician Visits per Decedent During the Last Six Months of Life Among Medicare Part A and B Decedents (2000-03) Who Received Most of Their Inpatient Care at a COTH Integrated Academic Medical Center

Selected Academic Medical Center Data	
UCLA Medical Center	52.1
New York-Presbyterian Hospital	42.5
Massachusetts General Hospital	42.0
Cleveland Clinic	32.1
UCSF Medical Center	30.4
Johns Hopkins Hospital	29.8
Barnes-Jewish Hospital	29.5
Mayo Clinic (St. Mary's Hospital)	23.8
Duke University Hospital	23.3
University of Washington Medical Center	22.6

Academic Medical Centers and the Capacity Effect

The extensive variation in the use of hospitals, intensive care units, and physicians' services among academic medical centers is prima facie evidence that there is no consensus based on medical science guiding decisions about the use of resources in managing patients with severe chronic illnesses. In the absence of consensus based on clinical science, and under the assumption that more health care is better, an important determinant of variation is the quantity of the supply of resources relative to the size of the population (see Chapter One). Academic medical centers, like other health care organizations, have varying levels of capacity — per-capita physicians, beds, and imaging equipment — relative to the size of their loyal populations.

The capacity effect influences clinical decisions about which patients to hospitalize or admit to intensive care, as well as the timing of those admissions. It also influences decisions about scheduling revisits and referrals to medical specialists, and ordering diagnostic tests. The capacity effect of the place where care is obtained — the specific hospital and its associated physicians — is often more important in determining the amount of care provided than are illness factors (the nature of the chronic illness and the severity of disease) or demographic factors (race, age, and sex).

Hospital Days per Decedent with Cancer and with Congestive Heart Failure

The hospital where care was received had an important effect on utilization, independent of the nature of the disease. Hospitalized days per decedent among patients with cancer (horizontal axis) and congestive heart failure (vertical axis) at academic medical centers with more than 400 deaths for each condition were highly correlated (R^2 = .85). CHF patients spent slightly more days in hospitals than cancer patients (demonstrated by the predominance of dots in the graph above the 45-degree line). The hospital where care was given explained most of the almost threefold variation in utilization rates.

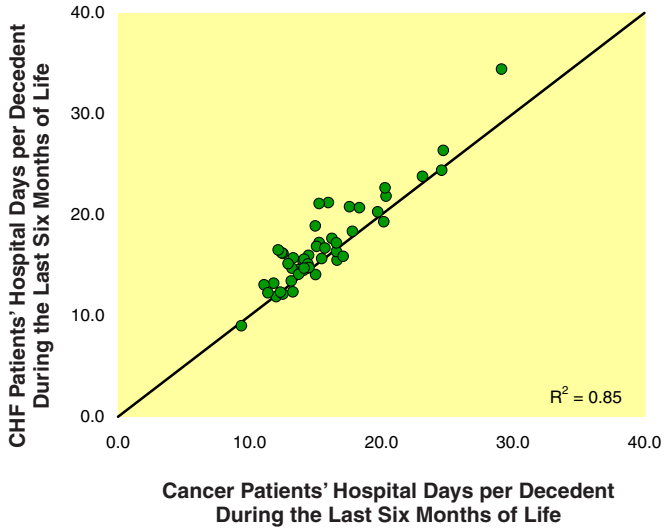


Figure 3.4. The Relationship Between Hospital Days per Decedent with Cancer and Hospital Days per Decedent with Congestive Heart Failure During the Last Six Months of Life Among Decedents (1999-2003) Who Received Most of Their Inpatient Care at a COTH Integrated Academic Medical Center

Physician Visits per Decedent with Cancer and with Congestive Heart Failure

The variation in use of physician visits at academic medical centers was also largely independent of the nature of the disease being treated. At the same academic medical centers, visit rates for CHF patients tended to be slightly higher than visit rates for cancer patients (the predominance of dots in the graph are above the 45-degree line). However, the visit rates for cancer and CHF varied by a factor of more than three, and the propensity of academic medical centers to schedule physician visits was similar for cancer and CHF patients, as indicated by the high correlation between cancer and CHF visit rates (R^2 = .76).

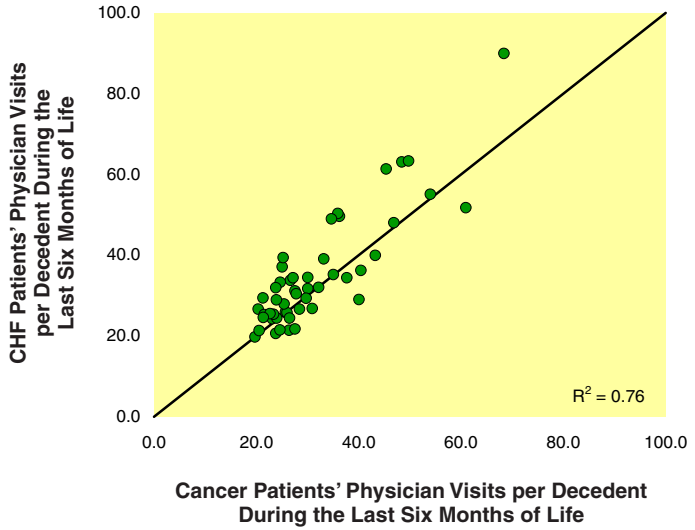


Figure 3.5. The Relationship Between Physician Visits per Decedent with Cancer and Physician Visits per Decedent with Congestive Heart Failure During the Last Six Months of Life Among Decedents (1999-2003) Who Received Most of Their Inpatient Care at a COTH Integrated Academic Medical Center

Hospital Days per Decedent for Black and Non-Black Patients

At the same hospitals (controlling for differences in age, sex, and illness), black patients tended to receive slightly more inpatient care than non-blacks, as evidenced by the predominance of points above the 45-degree line in Figure 3.6. What really mattered in determining the risk of hospitalization was not race, but the hospital where most of the care was received. Hospital days among blacks, as among non-blacks, varied by a factor 2.5, and the rates among blacks and non-blacks were highly correlated (R^2 = .74).

At the clinical level, there is an explanation for the behavior reflected in Figures 3.4-3.6. Patients with congestive heart failure and cancer are quite sick, particularly during the terminal phases of their illnesses, and physicians find it easier to manage these patients' often-complex care in the hospital. Meanwhile, hospitals (and regions) with greater numbers of hospital beds per number of loyal patients have more opportunity to admit sick patients and to keep them in the hospital for longer periods. While blacks had slightly higher use rates than non-blacks (perhaps reflecting blacks' relative lack of alternatives to hospital care), the effect of the place where care was given on the propensity to hospitalize was much stronger than the effect of race.

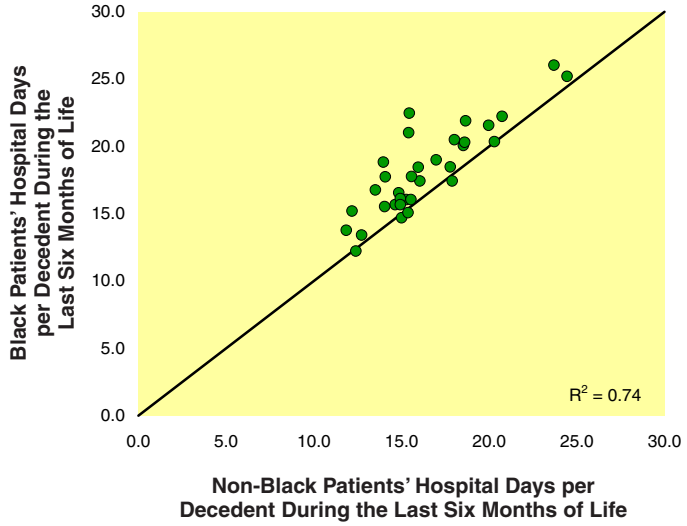


Figure 3.6. The Relationship Between Hospital Days per Decedent for Black and Non-Black Patients During the Last Six Months of Life Among Decedents (1999-2003) Who Received Most of Their Inpatient Care at a COTH Integrated Academic Medical Center

The Capacity Effect During Earlier Periods of Illness

The capacity effect influences more than just the care for the desperately, terminally ill. Capacity influenced the frequency of use of care during periods when patients were less ill — earlier in the course of their diseases — the same way it drove the use of care when patients were very sick and nearing death. This is evident in the correlations (Figures 3.7 and 3.8) between patient days in hospitals and physician visits during the last six months of life (when average severity was great) and utilization rates during the 19th-24th months prior to death (when severity was less) according to the academic medical center where the patients received most of their care. The hospital where most care was obtained had a consistent effect on the risk of hospitalization and physician visits that was independent of disease severity.

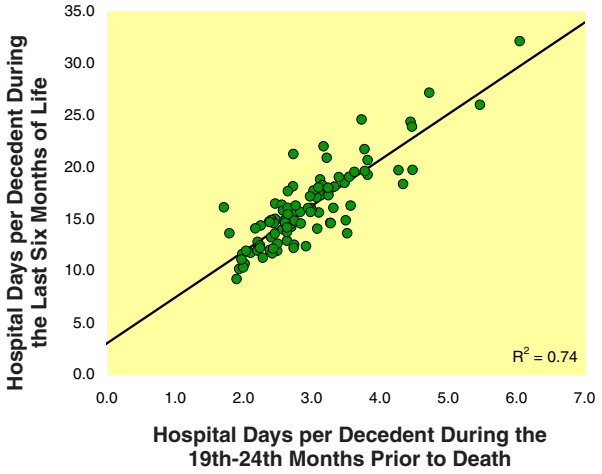


Figure 3.7. The Relationship Between Hospital Days During the Six Months and 19th-24th Months Prior To Death Among Decedents (1999-2003) Who Received Most of Their Inpatient Care at a COTH Integrated Academic Medical Center

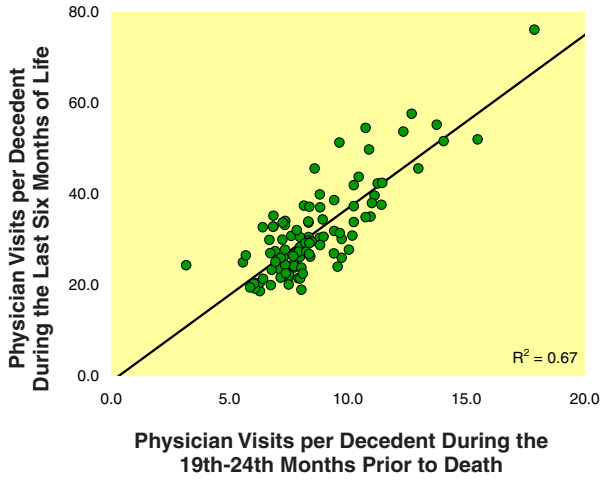


Figure 3.8. The Relationship Between Physician Visits During the Six Months and 19th-24th Months Prior To Death Among Decedents (2000-03) Who Received Most of Their Inpatient Care at a COTH Academic Medical Center

The effect on utilization was consistent across a series of disease and demographic factors. Table 3.1 gives the R^2 measure of the association between disease and demographic factors and hospital days and physician visits, which are measures of utilization. Clicking on the Appendix figure number accesses the graphic display of these associations.

	R^2			
	Hospital days	Physician visits	R^2 Numbers Link to Appendix Figures:	
Chronic pulmonary disease vs. congestive heart failure patients	0.96	0.92	3A	3B
Chronic pulmonary disease vs. cancer patients	0.89	0.81	3C	3D
Younger* vs. older** Medicare patients	0.88	0.80	3E	3F
Medicaid buy-in vs. all other patients	0.91	0.74	3G	3H
Male vs. female patients	0.93	0.82	3I	3J

*age 65-74 **age 85+

Table 3.1. The Relationship Between Other Disease and Demographic Characteristics and Numbers of Hospital Days (Deaths Occurring 1999-2003) and Physician Visits (Deaths Occurring 2000-2003) During the Last Six Months of Life Among Medicare Part A and B Decedents Who Received Most of Their Inpatient Care at a COTH Integrated Academic Medical Center

Part Two: Variations in Medicare Spending and Resource Inputs and Benchmarking Relative Efficiency

Academic medical centers differ in per-person Medicare spending and in the amounts of resources they allocate to the management of chronic illnesses. This section first examines the variation in Medicare spending and resource inputs — physician labor and hospital beds — among patient populations that received most of their care from the Council of Teaching Hospitals' integrated hospitals. The University of California at Los Angeles (UCLA) and University of California at San Francisco (UCSF) are used as an example of how benchmarking can be used to evaluate the relative efficiency of academic medical centers. An example of a management report demonstrates a useful way of evaluating the relative contribution of variations in the volume of care (patient days per person) and the price of care (average spending per day in hospital) to variations in per-person spending at hospitals belonging to hospital networks that have been organized by COTH integrated academic medical centers. The example uses the nine hospitals of the New York-Presbyterian Healthcare System, which includes the major teaching hospitals of the Columbia and Cornell medical schools.

Variations in Medicare Spending and Resource Inputs

Although per-person Medicare spending over a fixed period of time for patients with similar illnesses might be viewed as the gold standard for comparing resource use, per-person spending involves price, and price does not necessarily correspond to a hospital's actual cost of providing care. Cost shifting between service lines and among payers, variations in the proportions of patients with outlier payments, and Medicare subsidies for indirect medical education and disproportionate share payments distort price as an accurate summary of resource input per unit of care per person. This problem is particularly acute when comparing academic medical centers because they are in different regions of the country (with different labor costs) and because there are differences in indirect medical education and disproportionate share payments. Claims-based measures of resource inputs — hospital beds, intensive care beds and FTE physician labor inputs — estimate real differences in the amounts of resources allocated to similarly ill patients, independent of price. Benchmarks of resource use should be directly relevant to management decision making, because they provide information about capacity that should play an important role in decisions about building new facilities or hiring additional physicians.

Inpatient and Part B Medicare Spending

Inpatient and Part B spending per decedent for patients with chronic illnesses who received most of their inpatient care from COTH academic medical centers varied from less than $30,000 at Scott & White Memorial Hospital ($27,429) to more than $100,000 at Hahnemann University Hospital ($109,846). Per-decedent spending among patients of the UCLA Medical Center averaged $72,793, 28% more than average per-decedent spending among patients of the UCSF Medical Center ($56,859), although the hospitals are members of the same system. Spending among patients of the Mayo Clinic's St. Mary's Hospital ($37,271) and the Cleveland Clinic ($35,455) was only about half the rate at UCLA and New York-Presbyterian Hospital ($69,962).

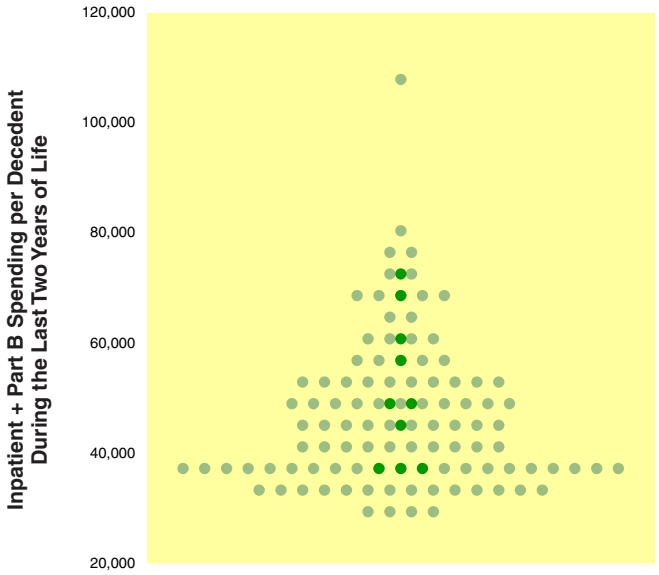


Figure 3.9. Part A and Part B Medicare Spending per Decedent During the Last Two Years of Life Among Medicare Enrollees Who Received Most of Their Care at a COTH Academic Medical Center (Deaths Occurring 2000-2003)

Selected Academic Medical Center Data	
UCLA Medical Center	72,793
New York-Presbyterian Hospital	69,962
Johns Hopkins Hospital	60,653
UCSF Medical Center	56,859
University of Washington Medical Center	50,716
Massachusetts General Hospital	47,880
Barnes-Jewish Hospital	44,463
Duke University Hospital	37,765
Mayo Clinic (St. Mary's Hospital)	37,271
Cleveland Clinic	35,455

Physician Labor

The amount of physician labor used in managing patients with severe chronic illness over the last two years of life at COTH integrated academic medical centers varied from fewer than 15 standardized FTE physicians per 1,000 decedents at the Medical Center of Louisiana at New Orleans (13.8) and the Parkland Health and Hospital System in Dallas (14.8), to more than 50 at the New York University Medical Center (52.2). FTE physician labor inputs varied by a factor of two among the *U.S. News & World Report*'s honor roll hospitals, from 20.3 FTEs at the Mayo Clinic's St. Mary's Hospital to 40.6 FTEs at the UCLA Medical Center.

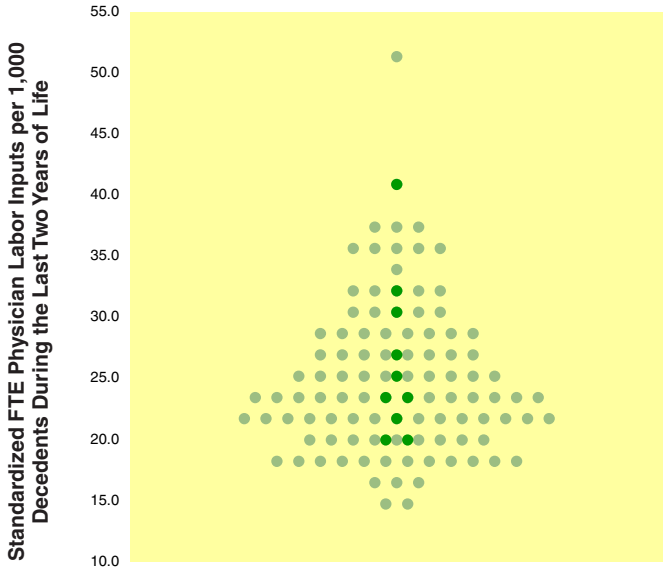


Figure 3.10. Standardized FTE Physician Labor Input During the Last Two Years of Life for Medicare Part A and B Decedents (2000-03) Who Received Most of Their Inpatient Care at a COTH Academic Medical Center

Selected Academic Medical Center Data	
UCLA Medical Center	40.6
Massachusetts General Hospital	31.5
New York-Presbyterian Hospital	31.0
Johns Hopkins Hospital	27.7
Barnes-Jewish Hospital	25.7
UCSF Medical Center	24.5
Cleveland Clinic	24.1
Duke University Hospital	21.1
University of Washington Medical Center	20.7
Mayo Clinic (St. Mary's Hospital)	20.3

Use of Intensive Care Unit Beds

Academic medical centers differed remarkably in the numbers of ICU beds they used in treating chronic illnesses during the last two years of life. UCLA Medical Center used almost five times more (50.4) intensive care beds per 1,000 decedents than the Massachusetts General Hospital (10.5). UCLA used four times more ICU beds than its sister hospital in the University of California system, UCSF Medical Center (12.2 ICU beds). Thomas Jefferson University Hospital in Philadelphia used 48.1 ICU beds per 1,000 decedents, eight times more than were used at Scott & White Memorial Hospital (5.8).

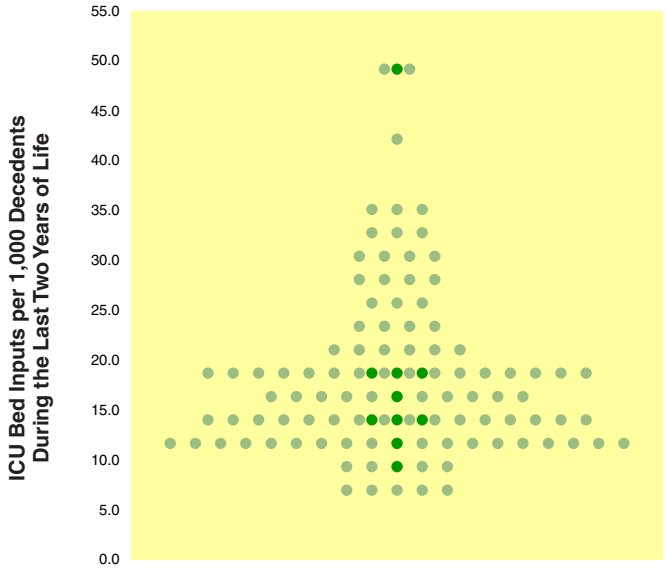


Figure 3.11. Intensive Care Unit Bed Inputs During the Last Two Years of Life for Medicare Part A and B Decedents (1999-2003) Who Received Most of Their Inpatient Care From a COTH Academic Medical Center

Selected Academic Medical Center Data	
UCLA Medical Center	50.4
New York-Presbyterian Hospital	18.9
Barnes-Jewish Hospital	18.1
Mayo Clinic (St. Mary's Hospital)	17.8
Johns Hopkins Hospital	16.7
Cleveland Clinic	13.5
Duke University Hospital	13.4
University of Washington Medical Center	13.3
UCSF Medical Center	12.2
Massachusetts General Hospital	10.5

Comparing UCLA to the UCSF Benchmark

The use of best-practice benchmarks in evaluating the relative efficiency of regions or hospitals in their management of chronic illnesses was described in a recent study of California hospitals published in *Health Affairs*.* Briefly, the process identifies providers that have achieved reasonably high quality (according to reputation and to available objective measures) and lower Medicare spending and resource inputs. The Medicare spending and/or resource input levels of these providers are used as benchmarks for quantifying overuse in less efficient regions and/or hospitals. Overuse is quantified as the difference in the level of spending or resource inputs per person at the less efficient hospital compared to the benchmark, multiplied by the number of patients who received care at the less efficient hospital. While it would be preferable if the evaluation of efficiency could be based on detailed information on cost effectiveness, such evidence is not available. Evidence at the population level, however, indicates no marginal gain from greater resource inputs across the range of practice observed among the nation's academic medical centers or among regions within the United States (Chapter One). Regions and academic medical centers with lower costs and fewer resource inputs, and relatively good quality measures, were more efficient because they achieved the same or better outcomes using fewer resources and less spending.

The Health Affairs article measured performance in managing chronic illnesses among academic medical centers belonging to the University of California system. Performance was measured along four dimensions: Medicare spending, resource inputs, utilization, and quality. Although both hospitals were highly acclaimed by *U.S. News & World Report*'s reputation-based ranking, objective quality measures indicated that the quality of care was as good — and on some measures better — at the UCSF Medical Center. For example, a survey of patients' ratings of their hospital experiences conducted by the California Healthcare Foundation showed that patients gave higher ratings to UCSF ("above average") than to UCLA ("average"). Chronically ill Medicare patients who were loyal to the UCLA Medical Center had higher spending levels and their physicians used many more resource inputs on a per-patient basis than did physicians treating patients loyal to the UCSF Medical Center. On the basis of its quality and efficiency, UCSF provides a reasonable benchmark for evaluating resource management at UCLA.

*Wennberg JE, Fisher ES, Baker L, Sharp SM, Bronner KK. Evaluating the efficiency of California providers in caring for patients with chronic illness. Health Affairs web exclusive, 16 November 2005. (http://content.healthaffairs.org/cgi/content/abstract/hlthaff.w5.526)

Table 3.2 illustrates the use of benchmarking to estimate the savings in resource inputs that would have been achieved during the study period among the 1,761 patients who were assigned to UCLA, had UCLA used the same amount of resources per person as UCSF. The last column in the table indicates the number of beds and FTE physician labor inputs that would have been saved. For example, the estimate of a saving of 28.3 FTE physicians was made by calculating the difference between per-person use of physician labor at UCLA and UCSF (.0406 - .0245 = .0161) and multiplying this difference by the number of patients served by UCSF (.0161 x 1,761 = 28.3 FTE physicians).

The biggest differences in management practices between UCLA and UCSF were in the use of medical specialists and intensive care unit beds. Had UCLA followed UCSF's care management style, it would have used 67.2 fewer intensive care beds — a reduction of 76% — and 24.5 fewer standardized FTE medical specialists, a reduction of 61%. To reach the UCSF benchmark, UCLA would have needed 2.6 additional FTE primary care physicians, a 16.1% increase.

		Use rate per 1,000 decedents	(Ratio UCLA/ UCSF)	Resource quantity used	Over/ Underuse
Hospital bed inputs					
	UCLA Medical Center	93.5	(1.52)	164.7	56.5
	UCSF Medical Center	61.4		82.9	
Intensive care bed inputs					
	UCLA Medical Center	50.4	(4.14)	88.7	67.2
	UCSF Medical Center	12.2		16.4	
Standardized FTE physician labor inputs					
Total					
	UCLA Medical Center	40.6	(1.66)	71.5	28.3
	UCSF Medical Center	24.5		33.1	
Medical specialists					
	UCLA Medical Center	22.9	(2.55)	40.4	24.5
	UCSF Medical Center	9.0		12.1	
Primary care					
	UCLA Medical Center	9.3	(0.86)	16.4	-2.6
	UCSF Medical Center	10.8		14.6	

Table 3.2. Benchmarking Resources for Medicare Patients With Severe Chronic Illness (N = 1,761) Assigned to the UCLA Medical Center to Rates at the UCSF Medical Center. Estimates are resource inputs during the last two years of life. Per decedent utilization rates for hospital inputs are estimated based on deaths occurring January 1, 1999 through December 31, 2003. Physician inputs are based on deaths occurring January 1, 2000 through December 31, 2003. (See text comparing how the quantity of resources used and UCLA over- or under-use compared to UCSF were calculated.)

The Medical Care Cost Equation

Medicare spending for inpatient care and for physician visits varied extensively among regions and hospitals. Spending has two components, volume and price.

Inpatient spending per person = patient days per person x average spending per day in hospital

Physician spending per person = physician visits per person x average spending per visit

There are variations in both volume and price, but the volume component is usually of more importance than the price per unit of care in accounting for variation in per-person spending. The following describes the hospital-specific variation in per-decedent spending for inpatient care, and evaluates the contribution of both price and volume to Medicare spending at hospitals belonging to the New York-Presbyterian Healthcare System. Table 3.3 gives the cost equation for inpatient spending expressed as ratios to the benchmarks. (The actual data is in Appendix Table 3A.) The columns on the left are the ratios to the average for the United States. The highest rate of Medicare inpatient spending per decedent was not at the major academic medical center, New York-Presbyterian Hospital, which ranked third among the system's nine hospitals; spending was highest at Wyckoff Heights Hospital ($69,734 per Medicare enrollee), where the rate was 2.85 times higher than the national average. The rate was high because the volume of service delivered — the average number of days per decedent — was 2.06 times higher than the national average, and the price of care — the average inpatient reimbursement per day — was 1.38 times higher (2.85 = 2.06 x 1.38). The comparison on the right is to the average for the New York-Presbyterian Healthcare System. Wyckoff Heights Hospital's per-capita spending was 34% higher than the system average, the product of 17% more hospital days per decedent and 14% higher reimbursements per day than the system average. By contrast, the New York United Hospital Medical Center had the lowest reimbursements in the system: its reimbursements were 30% higher than the national average, the product of volume that was 37% higher than the average and a price per day 5% lower than the national average. Reimbursements at the next-to-lowest ranked hospital, the New York Westchester Square Medical Center, were 47% above the national average, but 31% below the average for the New York-Presbyterian Healthcare System.

A similar report has been generated to evaluate the contribution of volume of physician visits (number per decedent) and the average price (Medicare reimbursements per visit) to variation in Medicare spending for physician visits (Appendix Table 3B).

The data in Table 3.3 and in Appendix Table 3A can be used to estimate the system-wide savings if the volume benchmark and/or the price benchmark had been achieved by hospitals belonging to the system whose rates were higher than the benchmark. Compared to the U.S. average, inpatient reimbursements per person for the New York-Presbyterian system as a whole were 2.13 times greater because hospital days were 1.76 times greater and reimbursements per day were 1.21 times greater. If the volume of care – patient days per decedent – had been equal to the U.S. average at each hospital in the system, the savings would have been $458.3 million, or 43.2% of the $1.06 billion Medicare spent for the inpatient care of those chronically ill patients who received most of their care from these nine hospitals over the five-year period 1999-2003. It is important to note that this volume-related saving could have been achieved by reducing overuse of hospitals without reducing the higher unit price (much of which is influenced by the high cost of labor in New York and not directly under the control of hospital management). If the price had been equal to the national average, but the volume had remained the same, the savings would have been $186.7 million, or 17.6%. If both volume and spending had equaled the national average, the savings would have been 53.1%, or $562.8 million.

Hospital Name	Ratios to U.S. average					Ratios to New York-Presbyterian Healthcare System average				
	Inpatient reimb.	=	Hospital days	x	Reimb. per day	Inpatient reimb.	=	Hospital days	x	Reimb. per day
Wyckoff Heights Hospital	2.85	=	2.06	x	1.38	1.34	=	1.17	x	1.14
Brooklyn Hospital Center	2.72	=	1.89	x	1.44	1.28	=	1.08	x	1.18
New York-Presbyterian Hospital	2.33	=	1.71	x	1.36	1.09	=	0.98	x	1.12
New York Methodist Hospital	2.33	=	2.02	x	1.15	1.09	=	1.15	x	0.95
New York Community Hospital of Brooklyn	2.05	=	1.85	x	1.11	0.96	=	1.05	x	0.91
New York Hospital Medical Center of Queens	1.82	=	1.51	x	1.21	0.85	=	0.86	x	0.99
Palisades General Hospital	1.62	=	1.82	x	0.89	0.76	=	1.04	x	0.74
New York Westchester Square Medical Center	1.47	=	1.64	x	0.89	0.69	=	0.93	x	0.74
New York United Hospital Medical Center	1.30	=	1.37	x	0.95	0.61	=	0.78	x	0.78

Table 3.3. Disaggregation of Inpatient Reimbursements per Decedent During the Last Two Years of Life into Contributions of Volume and Price. The data are for Medicare decedents with one or more hospitalizations for chronic illness during the last two years of life who received most of their inpatient care from a hospital listed in the table. The data are for deaths occurring January 1, 1999 to December 31, 2003.

Either the system average or the rate at any hospital within the system can be used to benchmark. For example, if inpatient spending in system hospitals with rates above the system average had been reduced to the system average, Medicare reimbursements would have been $89.0 million, or 8.4%, lower. If spending had been reduced to the level of the hospital with the second-lowest spending in the system, New York Westchester Square Medical Center, the savings would have been $334.4 million, or 31.5% of total reimbursements for inpatient care.

Part Three: Benchmarking Physician Labor Inputs

Over the next 20 years, the size of the elderly population — those age 65 and older — is forecast to increase by more than 50%. To meet the health care needs of this population — primarily the management of their chronic illnesses — the Association of American Medical Colleges has recently called for a 15% increase in total U.S. medical school enrollment. This recommendation, and the projections of need on which it is based, has yet to take into account the evidence that that there is no consensus among academic medical centers about how the present-day physician workforce should be allocated (much less how it should be constituted in the future). This section first examines the variation in the labor inputs of physicians primarily responsible for managing chronic illnesses, primary care physicians and medical specialists. It then considers how many physicians will be needed in 2020, based on projections using benchmarks from academic medical centers and regions that meet the low resource and high quality criteria for the efficient use of the physician workforce discussed in the previous section.

Allocation of Medical Specialists

Academic medical centers varied in the numbers of medical specialists they allocated to the management of patients with severe chronic illnesses. New York University Medical Center used the most medical specialists in managing chronic illness (28.4 FTEs per 1,000), almost seven times more than the academic medical center with the lowest rate, Parkland Hospital in Dallas (4.8). UCLA, the University of Tampa, the Robert Wood Johnson Medical Center, Mt. Sinai and Hahnemann University hospitals all had medical specialist input rates of at least 15 FTEs per 1,000 decedents. Academic medical centers with the lowest FTE medical specialist inputs included the Medical College of Louisiana (5.7), Creighton University Medical Center (6.1), Mary Hitchcock Memorial Hospital (6.3), and the University of Rochester's Strong Memorial Hospital (6.4). Among the *U.S. News & World Report* honor roll academic medical centers, use of medical specialist labor varied from 8.4 per 1,000 decedents receiving most of their care at the Mayo Clinic's St. Mary's Hospital to 22.9 per 1,000 decedents receiving most of their care at UCLA Medical Center.

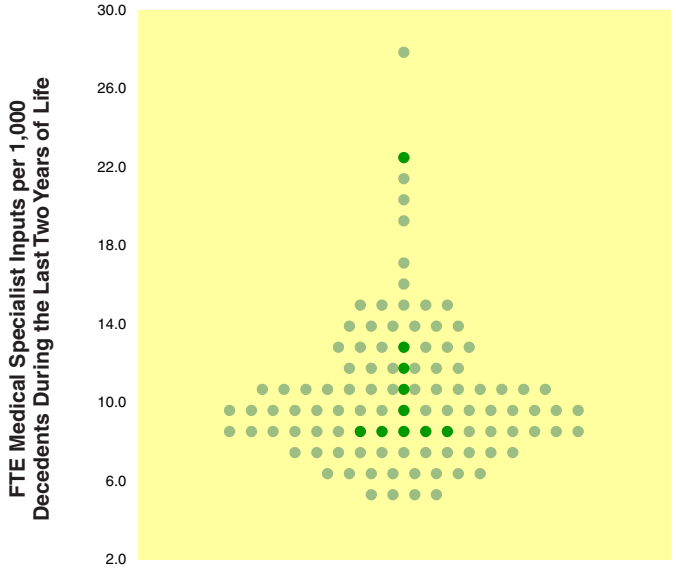


Figure 3.12. Standardized FTE Medical Specialist Labor Inputs for Medicare Part A and B Decedents (2000-03) Who Received Most of Their Inpatient Care at a COTH Academic Medical Center

Selected Academic Medical Center Data	
UCLA Medical Center	22.9
New York-Presbyterian Hospital	13.0
Massachusetts General Hospital	11.9
Barnes-Jewish Hospital	10.3
Cleveland Clinic	9.4
UCSF Medical Center	9.0
Duke University Hospital	8.8
Johns Hopkins Hospital	8.7
University of Washington Medical Center	8.6
Mayo Clinic (St. Mary's Hospital)	8.4

Allocation of Primary Care Physicians

Some academic medical centers used much more primary care physician labor in caring for chronically ill patients over the last two years of life than others. The University of Iowa Medical Center's standardized primary care physician FTE labor input per 1,000 decedents (16.7 FTEs) was almost four times greater than the rate at the University of Mississippi Medical Center (4.3). Primary care inputs were high for patients loyal to the University Hospital of Brooklyn (15.8); Mt. Sinai Hospital (15.2); New York University Medical Center (14.0); and Wayne State University's Harper University Hospital (14.0). Primary care labor inputs per 1,000 decedents were much lower at Wake Forest University's North Carolina Baptist Hospital (4.6), the Medical Center of Louisiana at New Orleans (4.9), and the Oklahoma University Medical Center (5.1). Among the *U.S. News & World Report* honor roll academic medical centers, primary care physician labor inputs varied from 6.4 FTEs per 1,000 decedents at Duke University Hospital to 12.0 per 1,000 at the Massachusetts General Hospital.

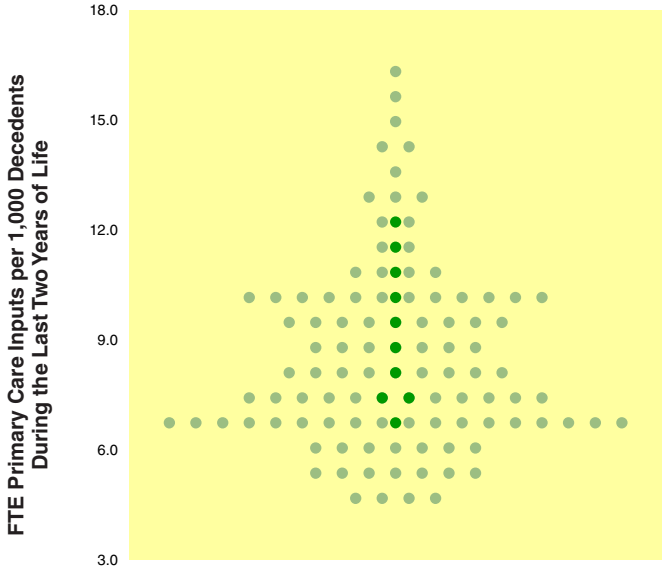


Figure 3.13. Standardized FTE Primary Care Labor Input During the Last Two Years of Life for Medicare Part A and B Decedents (2000-03) Who Received Most of Their Inpatient Care at a COTH Academic Medical Center

Selected Academic Medical Center Data	
Massachusetts General Hospital	12.0
New York-Presbyterian Hospital	11.6
UCSF Medical Center	10.8
Johns Hopkins Hospital	10.3
UCLA Medical Center	9.3
Barnes-Jewish Hospital	8.9
Cleveland Clinic	8.4
University of Washington Medical Center	7.1
Mayo Clinic (St. Mary's Hospital)	7.0
Duke University Hospital	6.4

Ratio of Primary Care to Medical Specialist Labor

The ratio of primary care to medical specialist labor input is an indicator of the relative dependency of academic medical centers on primary care physicians or medical specialists in managing chronic illnesses. A high ratio indicates greater reliance on primary care, while a low ratio means more reliance on medical specialists. Primary care dominated at the University Hospital of Brooklyn (ratio of 2.14); the University of New Mexico Hospital (1.69); the University of Kansas Hospital (1.62); the University of Rochester's Strong Memorial Hospital (1.41); the University of Iowa (1.29); and at the University of Minnesota's Fairview Medical Center (1.28). The academic medical centers with ratios indicating more reliance on medical specialist labor in managing their chronically ill patients included Hahnemann University Hospital (ratio of .37); the Robert Wood Johnson University Hospital (.44); North Carolina Baptist Hospital (.44); Albany Medical Center (.49); and New York University Medical Center (.49). Among the *U.S. News & World Report* honor roll hospitals, the extremes in dependency on primary care and on specialty care were between two hospitals belonging to the University of California system. UCLA Medical Center relied heavily on medical specialists in managing its chronic patients (ratio of .41) while at the UCSF Medical Center, workforce policy favored the use of primary care labor (1.20).

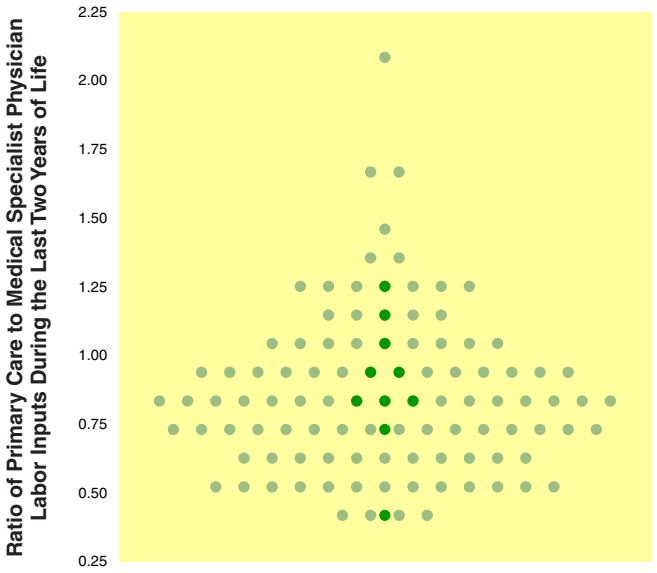


Figure 3.14. Ratio of FTE Primary Care Labor Input to FTE Medical Specialist Input During the Last Two Years of Life for Medicare Part A and B Decedents (2000-03) Who Received Most of Their Inpatient Care From a COTH Academic Medical Center (Derived from data displayed in figures 3.12 and 3.13)

Selected Academic Medical Center Data	
UCSF Medical Center	1.20
Johns Hopkins Hospital	1.18
Massachusetts General Hospital	1.01
New York-Presbyterian Hospital	0.90
Cleveland Clinic	0.89
Barnes-Jewish Hospital	0.86
Mayo Clinic (St. Mary's Hospital)	0.84
University of Washington Medical Center	0.83
Duke University Hospital	0.73
UCLA Medical Center	0.41

Benchmarking Workforce Need

A recent article evaluated workforce need through 2020 using benchmarks provided by efficient regions and academic medical centers.* The researchers concluded that the current training pipeline would be sufficient to meet needs through 2020, if integrated multidisciplinary group practices were the standard of practice throughout the United States.

This section provides an overview and an update of this analysis, using data from 2000-03. The focus is on physician workforce inputs over the last two years of life at *U.S. News & World Report*'s honor roll hospitals, as well as two other COTH integrated academic medical center hospitals, the Mary Hitchcock Memorial Hospital (MHMH) in Lebanon, New Hampshire, and the Scott & White Memorial Hospital (SWMH) in Temple, Texas. We added these hospitals to the list because, like the Mayo Clinic, they are staffed by affiliated multidisciplinary group practices.

Table 3.4 describes total physician inputs allocated by each academic medical center to the treatment of patients with chronic illnesses during the last two years of life. It gives the rate per 1,000 patients and the number of standardized FTE physician inputs. For example, at UCLA Medical Center, the input was 40.6 FTEs per 1,000 decedents; the total number of physicians used was 71.5 standardized FTEs. The table also estimates the number of physicians in excess of the amount predicted by the experience of the benchmark academic medical centers. For example, had the workforce inputs of the Mayo Clinic's St. Mary's Hospital been the standard at UCLA Medical Center, UCLA would have used 50% fewer physicians than it actually did. The MHMH and SWMH benchmarks predict the need for even fewer physicians — 54.7% and 57.0% fewer, respectively.

Predicted need for physicians depends on the benchmark used in making the projections.

*Goodman DC, Stukel TA, Chang CH, Wennberg JE. End-of-life care at academic medical centers: Implications for future workforce requirements. Health Affairs 2006;25(2):521-31. (http://content.healthaffairs.org/cgi/content/abstract/25/2/521)

Academic medical center labor input was closely associated with the FTE physicians input per enrollee in the surrounding region (R^2 = 0.64); regions have physician workforces that closely resemble patterns in academic medical centers within the region. Using various regions as benchmarks for estimating physician requirements concludes that the current workforce represents either a shortage or surplus. If Manhattan is the standard by which to judge the adequacy of supply, there is a current national shortage of 27,274 standardized FTE physicians. If Rochester, Minnesota, is the benchmark, then there is a current surplus of 30,163 FTE physicians. The physician workforce in Lebanon, New Hampshire predicts an even larger surplus — 34,298 FTE physicians.

Hospital Name	Physician inputs per 1,000	Est. FTE physicians used	Overuse compared to Mayo		Overuse compared to MHMH		Overuse compared to SWMH	
			#	%	#	%	#	%
UCLA Medical Center	40.6	71.5	35.7	50.0%	39.1	54.7%	40.7	57.0%
Massachusetts General Hospital	31.5	120.6	42.9	35.6%	50.2	41.6%	53.8	44.6%
New York-Presbyterian Hospital	31.0	188.1	64.8	34.4%	76.4	40.6%	82.1	43.7%
Johns Hopkins Hospital	27.7	52.9	14.1	26.6%	17.7	33.5%	19.6	36.9%
Barnes Jewish Hospital	25.7	114.3	23.9	20.9%	32.4	28.3%	36.6	32.1%
UCSF Medical Center	24.5	33.1	5.7	17.1%	8.2	24.9%	9.5	28.8%
Cleveland Clinic	24.1	69.8	10.9	15.6%	16.4	23.5%	19.2	27.5%
Duke University Hospital	21.1	70.4	2.5	3.5%	8.9	12.6%	12.1	17.1%
University of Washington Medical Center	20.7	16.9	0.3	1.8%	1.9	11.0%	2.6	15.6%
Mayo Clinic (St. Mary's Hospital)	20.3	87.6			8.2	9.4%	12.3	14.1%
Mary Hitchcock Memorial Hospital	18.4	35.9					1.9	5.2%
Scott & White Memorial Hospital	17.5	32.1						
Total Excess			**200.7**	**22.5%**	**259.4**	**29.0%**	**290.5**	**32.5%**

Table 3.4. Benchmarks of the Management of Chronic Illness During the Last Two Years of Life Among Medicare Enrollees who Received Most of Their Inpatient Care at COTH Academic Medical Centers on the U.S. News & World Report's Honor Roll (Estimates are for deaths occurring January 1, 2000 to December 31, 2003)

Assuming a 56% projected growth in the number of Americans over age 65 by 2020 and current training rates of physicians, the Manhattan benchmark predicts a national deficit in 2020 of 44,162. But the benchmarks from regions where group practice is dominant predict a surplus. The Rochester benchmark predicts a surplus of 49,917 physicians; the Lebanon, New Hampshire benchmark predicts a surplus of 56,692; and the Temple, Texas benchmark predicts a surplus of 38,692.

If all regions were as efficient as the group practice model, the current workforce would be sufficient to meet both current and future needs for managing chronic illness. This suggests that the nation needs to learn how to better organize care, particularly for those with chronic illnesses, instead of addressing the pseudo-scarcity that arises from the wasteful uses of resources. The bottom line is that it matters what doctors do, not how many doctors there are doing it.

Chapter Four

How to Use the Dartmouth Atlas to Compare Performance in Managing Chronic Illnesses

All health care is ultimately local. It is delivered in local and regional health care markets, for the most part to local residents and by local providers. Since both the supply and the use of resources can vary substantially among providers within a given community, it is important to have information specific to individual hospitals and their associated physician staffs.

The Dartmouth Atlas Project is able to report on Medicare spending, resource inputs, utilization and quality measures for over 4,300 hospitals and associated physicians in 306 hospital referral regions. Given the large number of providers, these reports cannot be contained within a single printed edition of the Atlas. However, reports and tables similar to those presented in this chapter can be generated using data and data analysis tools available on the Dartmouth Atlas web site.

In this chapter, we provide examples of graphs and hospital-specific reports. The hospitals in the Fort Myers and Miami hospital referral regions are used in examples of reports comparing providers within a region and of benchmarking to evaluate relative efficiency. In the final section, we suggest that performance reporting and benchmarking has a place in the evaluation of hospitals belonging to hospital networks or chains.

Part One:
Graphic Representation of Variation: the Distribution Graph

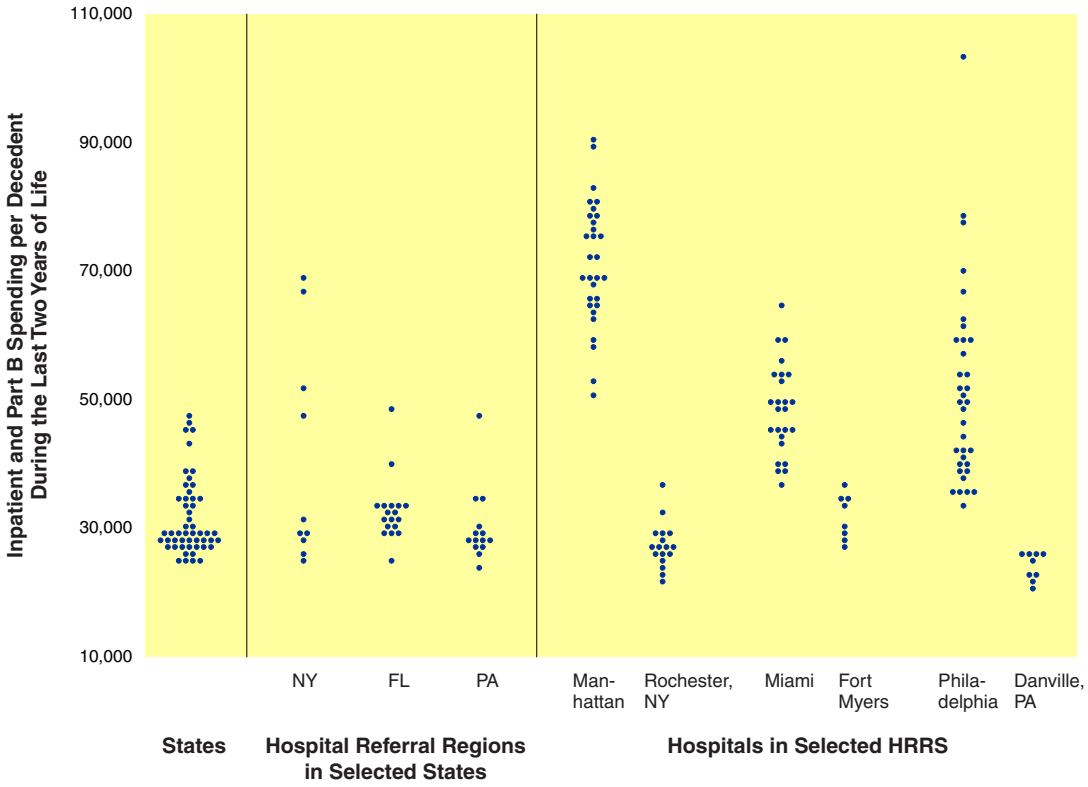


Figure 4.1. Inpatient and Part B Medicare Spending During the Last Two Years of Life Among States, Selected Regions Within States and Hospital-Specific Cohorts Within Selected Regions (Deaths Occurring 2000-03)

Since 1996, the emblematic display of Dartmouth Atlas data has been the distribution graph (which, because its shape often resembles an outline of the root vegetable, is sometimes referred to as a "turnip graph"). The principal advantage of this graph is that large numbers of observations (for example, the 306 hospital referral regions) can be represented. The individual regions and values represented by the points on the graph can be identified and labeled on the interactive Dartmouth web site. Graphs generated on the web site can be custom-designed for use in presentations or in written reports.

Figure 4.1 illustrates the use of the distribution graph to describe variation at three levels of aggregation: the state, the region, and among the cohorts of patients assigned to individual hospitals. It describes Medicare inpatient and Part B spending per decedent during the last two years of life for patients with chronic illnesses among the states (left); among regions within three selected states (middle); and among the hospitals within two hospital referral regions in each of the three states (right). The figure shows that variation is a local phenomenon. While there is considerable variation among states, it is a weighted average of the variation among regions; within states, there is considerable variation among constituent hospital referral regions; and within regions, what really matters in determining the amount of health care people receive are the providers from which care is obtained.

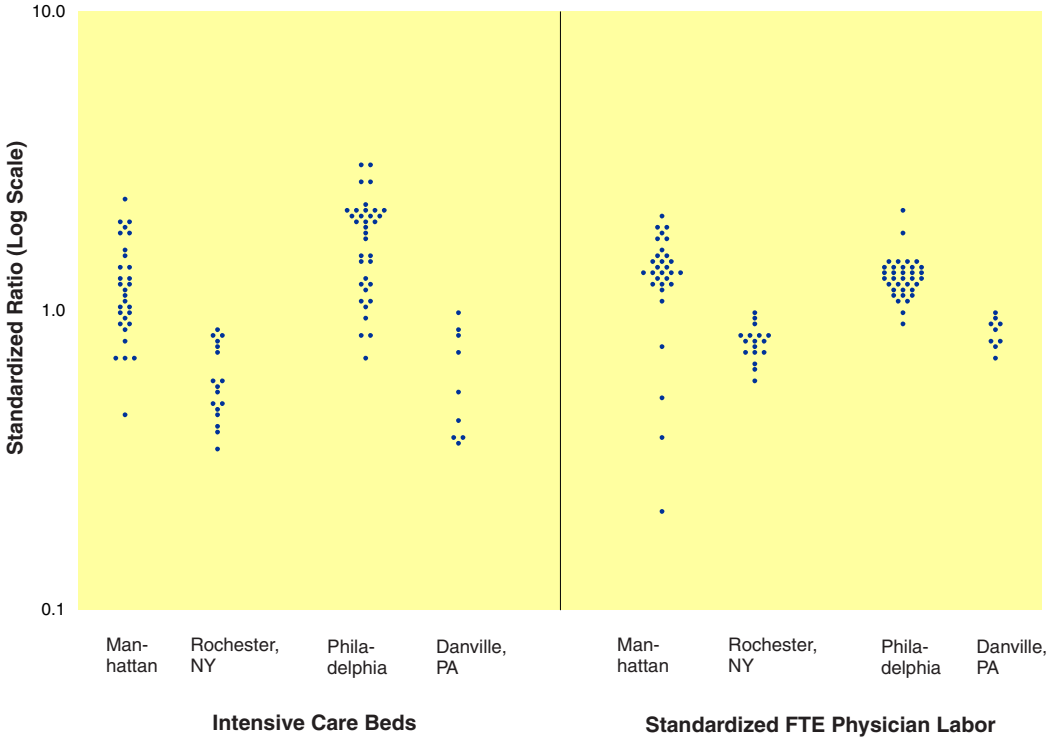


Figure 4.2. Inputs of Intensive Care Beds (Deaths Occurring 1999-2003) and FTE Physician Labor per Decedent (Deaths Occurring 2000-03) During the Last Two Years of Life Among Hospitals Located within the Manhattan, Rochester NY, Philadelphia and Danville PA Hospital Referral Regions

The rates displayed in the distribution graph can be standardized to any desired reference point, which allows comparison among multiple variables. For example, in Figure 4.2, variations in ICU bed inputs are displayed on the left side of the figure, and physician inputs are displayed on the right side of the figure; in this case the measures are standardized to the U.S. average. Each of the six plots in the figure displays the range of variation in these resource measures among hospitals serving the Manhattan and Rochester, NY hospital referral regions (on the left of each pair) and Philadelphia and Danville, PA hospital referral regions (on the right of each pair). There was considerable variation among hospitals within regions. While every hospital in the Rochester and Danville hospital referral regions used fewer ICU beds and less physician labor in managing chronically ill patients than the national average, some hospitals within the Rochester and Danville regions used considerably more resources than others. There was similar variation among hospitals in the Manhattan and Philadelphia hospital referral regions, except that most were well above the national average.

Part Two: Hospital-Specific Performance Reports

We have developed a series of reports that characterize variation among states, regions, and hospitals. They can be generated for hospitals, regions or states selected by the user. The following example is for specific hospitals located within the Fort Myers hospital referral region, limited to the eight hospitals with 400 or more deaths between 1999 and 2003.[a] It consists of Tables 4.1-4.6. The patients assigned to the included hospitals had at least one medical (non-surgical) inpatient stay for chronic illness.

Hospital Name	City	State	Number of deaths among chronically ill patients assigned to hospital, 1999-2003	Percent of enrollees' medical inpatient days at assigned hospital
Cape Coral Hospital	Cape Coral	FL	2,841	90.3
Charlotte Regional Medical Center	Punta Gorda	FL	1,629	88.9
Fawcett Memorial Hospital	Port Charlotte	FL	2,129	89.8
Lee Memorial Hospital	Fort Myers	FL	4,345	89.9
Lehigh Regional Medical Center	Lehigh Acres	FL	484	86.5
Naples Community Hospital Inc.	Naples	FL	6,280	94.9
Southwest Florida Regional Medical Center	Fort Myers	FL	1,873	85.8
St. Joseph Hospital	Port Charlotte	FL	1,999	88.9

Table 4.1. Hospital Information for Selected Hospitals in the Fort Myers Hospital Referral Region (Deaths Occurring 1999-2003)

Table 4.1 provides the name, location, and number of deaths in the cohort assigned to the hospitals in the Fort Myers hospital referral region, as well as the percent of inpatient days among cohort members that occurred at the assigned hospital. There was a high loyalty to the hospitals in the hospital referral region among the cohort of chronically ill patients: between 85.8% and 94.9% of hospital days were at the named hospital, indicating that the observed practice patterns accurately reflect hospital and physician practices.

Hospital Name	Inpatient reimbursements				Part B reimbursements	
	Total	Outlier	% outlier	Per day	Total	E&M
Fawcett Memorial Hospital	22,556	2,169	9.6%	948	13,885	4,925
St. Joseph Hospital	22,212	1,633	7.4%	940	12,583	4,708
Charlotte Regional Medical Center	21,527	1,152	5.4%	846	12,674	5,001
Naples Community Hospital Inc.	20,543	1,642	8.0%	972	13,312	4,899
Lee Memorial Hospital	19,086	919	4.8%	1,027	11,121	4,011
Southwest Florida Regional Medical Center	19,070	2,123	11.1%	1,030	10,453	3,826
Lehigh Regional Medical Center	18,409	1,503	8.2%	1,002	9,732	3,838
Cape Coral Hospital	16,379	463	2.8%	951	10,381	3,735

Table 4.2. Medicare Reimbursements per Decedent for Inpatient Care (1999-2003) and Reimbursements for Part B Care (2000-03) During the Last Two Years of Life Among Selected Hospitals in the Fort Myers Hospital Referral Region

Inpatient reimbursements varied from $16,379 per decedent at Cape Coral Hospital to $22,556 at Fawcett Memorial Hospital. Average price per day ranged from $846 at Charlotte Regional Medical Center to $1,030 at Southwest Florida Regional Medical Center. Part B reimbursements varied from $9,732 among patients at Lehigh Regional Medical Center to $13,885 among patients at Fawcett Memorial Hospital. 11.1% of reimbursements for inpatient care to the Southwest Florida Medical Center were outlier payments, but only 2.8% of Cape Coral Hospital's per-decedent reimbursements were outlier payments.

Hospital Name	Inpatient reimb.	=	Hospital days	x	Reimb. per day	E&M reimb.	=	Physician visits	x	Reimb. per visit
Fawcett Memorial Hospital	1.13	=	1.15	x	0.98	1.11	=	1.21	x	0.92
St. Joseph Hospital	1.11	=	1.15	x	0.97	1.06	=	1.15	x	0.92
Charlotte Regional Medical Center	1.08	=	1.23	x	0.87	1.13	=	1.20	x	0.94
Naples Community Hospital Inc.	1.03	=	1.02	x	1.00	1.10	=	1.06	x	1.04
Lee Memorial Hospital	0.95	=	0.90	x	1.06	0.90	=	0.88	x	1.03
Southwest Florida Regional Medical Center	0.95	=	0.90	x	1.06	0.86	=	0.83	x	1.03
Lehigh Regional Medical Center	0.92	=	0.89	x	1.03	0.86	=	0.83	x	1.04
Cape Coral Hospital	0.82	=	0.84	x	0.98	0.84	=	0.84	x	1.00

Table 4.3. The Medical Care Cost Equation: Disaggregation of Medicare Reimbursements per Decedent for Inpatient Care (1999-2003) and Physician Visits (2000-03) During the Last Two Years of Life into Contributions of Volume and Price Among Selected Hospitals in the Fort Myers Hospital Referral Region

Table 4.3 provides the medical care cost equation — the disaggregation of per-person spending into the contribution of volume (patient days or visits per person) and price (average reimbursements per day in hospital or per physician visit). In this example, the table is standardized to the average for the Fort Myers hospital referral region.* Cape Coral Hospital, the lowest in rates of inpatient reimbursement, had a rate that was 82% of the Fort Myers hospital referral region average, realized because its volume (patient day rate) was 84% and its reimbursement rate per day was 98% of the Fort Myers benchmark. The hospital with the highest spending level, Fawcett Memorial Hospital, was reimbursed at a rate 13% higher than the hospital referral region average because, although its reimbursement rate per day was 2% lower than the Fort Myers average, its average number of days per decedent was 15% higher than the average.

* Hospitals with fewer than 80 deaths among their assigned populations were not included in the weighted average inpatient reimbursement calculation; hospitals with fewer than 400 deaths among their assigned populations were not included in the weighted average physician reimbursement calculation. The medical care cost equation is standardized to the Fort Myers weighted average.

Hospital Name	Resource input rates						Ratios to U.S. average					
			Standardized FTE physician labor						Standardized FTE physician labor			
	Hospital beds	ICU beds	Total	Primary care	Medical specialists	Ratio PC/MS	Hospital beds	ICU beds	Total	Primary care	Medical specialists	
Fawcett Memorial Hospital	65.2	33.0	31.9	11.7	14.6	0.80	0.99	2.19	1.29	1.17	1.50	
St. Joseph Hospital	64.8	14.3	31.3	10.7	14.8	0.73	0.99	0.95	1.26	1.07	1.52	
Charlotte Regional Medical Center	69.7	16.6	32.0	12.3	12.1	1.02	1.06	1.10	1.29	1.23	1.24	
Naples Community Hospital Inc.	57.9	7.0	30.5	9.6	14.5	0.66	0.88	0.46	1.23	0.96	1.49	
Lee Memorial Hospital	50.9	22.0	24.6	7.2	11.7	0.62	0.78	1.46	0.99	0.72	1.20	
Southwest Florida Regional Medical Center	50.7	13.5	23.3	6.7	11.5	0.59	0.77	0.89	0.94	0.67	1.18	
Lehigh Regional Medical Center	50.3	12.7	24.6	9.8	9.0	1.09	0.77	0.84	0.99	0.98	0.92	
Cape Coral Hospital	47.2	18.0	22.3	7.5	10.2	0.73	0.72	1.20	0.90	0.75	1.04	

Table 4.4. Hospital Resource Inputs (Deaths Occurring 1999-2003) and Physician Labor Inputs (Deaths Occurring 2000-03) per 1,000 Decedents During the Last Two Years of Life Among Selected Hospitals in the Fort Myers Hospital Referral Region

Hospital bed inputs were lower than the Fort Myers hospital referral region average at Cape Coral Hospital, Lehigh Regional Medical Center, Southwest Florida Regional Medical Center and Lee Memorial Hospital. Naples Community Hospital used the fewest ICU beds in managing patients during the last two years of life. Physician labor inputs were lowest among patients managed primarily at Cape Coral Hospital and Southwest Florida Regional Medical Center.

Hospital Name	Utilization rates				Ratios to U.S. average		
	Hospital days	ICU days	Physician visits	Ratio MS/PC visits	Hospital days	ICU days	Physician visits
Fawcett Memorial Hospital	14.8	8.0	46.7	1.43	1.06	2.24	1.39
St. Joseph Hospital	14.1	3.6	39.8	1.52	1.01	1.02	1.19
Charlotte Regional Medical Center	15.2	4.1	46.8	0.98	1.09	1.14	1.40
Naples Community Hospital Inc.	12.1	1.7	36.4	1.45	0.87	0.49	1.09
Lee Memorial Hospital	11.0	5.0	29.0	1.65	0.79	1.41	0.87
Southwest Florida Regional Medical Center	10.7	3.1	28.5	1.82	0.77	0.88	0.85
Lehigh Regional Medical Center	10.6	3.1	26.4	0.75	0.77	0.87	0.79
Cape Coral Hospital	10.2	4.3	27.4	1.42	0.73	1.20	0.82

Table 4.5. Utilization of Hospital Resources (Deaths Occurring 1999-2003) and Physician Visits (Deaths Occurring 2000-03) per Decedent During the Last Six Months of Life Among Selected Hospitals in the Fort Myers Hospital Referral Region

Chronically ill Medicare patients who received most of their care at Fawcett Memorial Hospital, St. Joseph Hospital, and Charlotte Regional Medical Center tended to be hospitalized more often and receive more physician visits than those treated at Southwest Florida Regional Medical Center, Lehigh Regional Medical Center, and Cape Coral Hospital. Those at Fawcett Memorial Hospital were admitted much more often to intensive care than those assigned to other hospitals in the Fort Myers hospital referral region.

Hospital Name	% seeing 10 or more physicians	Intensity of terminal care		CMS technical process quality measures			
		% of deaths with ICU	% admitted to hospice	Composite score	AMI score	CHF score	Pneumonia score
Fawcett Memorial Hospital	41.8	28.9	31.6	76.6	82.3	58.0	79.7
St. Joseph Hospital	37.8	19.0	32.9	74.4	74.8	74.5	73.7
Charlotte Regional Medical Center	44.0	19.4	35.7	85.9	94.0	90.5	69.3
Naples Community Hospital Inc.	38.9	15.6	39.6	73.7	87.8	69.5	53.0
Lee Memorial Hospital	43.4	21.2	47.9	82.4	91.0	91.5	62.0
Southwest Florida Regional Medical Center	43.5	16.2	48.7	83.6	90.2	83.0	73.0
Lehigh Regional Medical Center	28.2	21.0	43.0	n/a	n/a	n/a	n/a
Cape Coral Hospital	36.6	19.4	49.6	84.7	89.5	92.5	71.3

% seeing 10 or more physicians in during the last six months of life is for deaths occurring 2000-03.

Intensity of terminal care variables are for deaths occurring 1999-2003.

CMS quality measures are for the first and second quarters of 2004. All eligible patients at reporting hospitals are included.

Table 4.6. Quality of Care Among Selected Hospitals in the Fort Myers Hospital Referral Region

There were few differences among the hospitals in the percent seeing ten or more physicians during the last six months of life. Compared to patients using other hospitals in the region, those treated at Fawcett Memorial Hospital had an increased risk of experiencing a high-intensity death (death that occurred in association with an admission to intensive care). Fawcett Memorial Hospital also had the lowest percentage of decedents enrolled in hospice care. CMS quality scores varied substantially. Charlotte Regional Medical Center, Southwest Florida Regional Medical Center, Lee Memorial Hospital and Cape Coral Hospital achieved better overall scores than Fawcett Memorial, Naples Community and St. Joseph hospitals.

Part Three: The Medical Care Cost Equation: Miami Hospitals Benchmarked to the Fort Myers Hospital Referral Region (Decedents with One or More Medical [Non-Surgical] Hospitalizations for Chronic Illness During the Last Two Years of Life)

Spending has two variable components: volume and price (Chapter Three). Variations in the volume of care — the amount provided over a given period of time — is usually more important than price in determining per capita reimbursements for inpatient care and physician visits. Among hospital referral regions, variation in inpatient days per person was correlated with per-person spending but less correlated with average price per day. Per person spending for physician visits was strongly associated with volume and less strongly correlated with price per visit.

The associations between volume, price and spending for inpatient care and for physician services among hospitals in the Miami and Fort Myers hospital referral regions reflected this phenomenon:

Inpatient spending vs. volume (patient day per decedent): R^2 = .63 (Appendix Figure 4A)

Inpatient spending vs. price (reimbursements per day): R^2 = .23 (Appendix Figure 4B)

Physician spending vs. volume (physician visits per decedent): R^2 = .94 (Appendix Figure 4C)

Physician spending vs. price (reimbursements per visit): R^2 = .26 (Appendix Figure 4D)

(For a graph showing these relationships click on the figure label.)

The medical care cost equation table focuses on the relative importance of variations in volume of care and price of care in determining institutions' reimbursements for inpatient care and physician visits. The medical care cost equation can be standardized to a benchmark region or hospital.

Table 4.7. Medical Care Cost Equations for Inpatient Spending and Spending for Physician Visits: Selected Miami Hospitals Benchmarked to the Fort Myers Hospital Referral Region

Hospital Name	Inpatient Spending					Physician Spending				
	Inpatient reimb.	=	Hospital days	x	Reimb. per day	E&M reimb.	=	Physician visits	x	Reimb. per visit
Jackson Memorial Hospital	2.27	=	1.55	x	1.47	1.15	=	1.06	x	1.09
Westchester General Hospital	2.19	=	1.87	x	1.17	2.23	=	1.88	x	1.19
South Shore Hospital & Medical Center	2.11	=	2.77	x	0.76	3.04	=	2.73	x	1.12
Cedars Medical Center Inc.	2.03	=	1.59	x	1.27	2.12	=	1.75	x	1.21
Hialeah Hospital	1.94	=	1.61	x	1.20	1.97	=	1.86	x	1.06
Mount Sinai Medical Center	1.92	=	2.02	x	0.95	2.02	=	1.76	x	1.15
Pan American Hospital	1.88	=	1.65	x	1.14	1.88	=	1.70	x	1.11
Palmetto General Hospital	1.86	=	1.46	x	1.27	1.80	=	1.54	x	1.17
Coral Gables Hospital	1.77	=	1.47	x	1.20	1.68	=	1.57	x	1.07
Palm Springs General Hospital	1.76	=	1.69	x	1.04	1.83	=	1.72	x	1.06
Kendall Medical Center	1.76	=	1.34	x	1.31	1.81	=	1.56	x	1.16
Mercy Hospital Inc.	1.74	=	1.49	x	1.17	1.53	=	1.34	x	1.14
North Shore Medical Center	1.72	=	1.50	x	1.15	1.79	=	1.74	x	1.03
Lower Keys Medical Center	1.70	=	1.27	x	1.33	1.12	=	0.95	x	1.18
Larkin Community Hospital	1.64	=	1.52	x	1.08	2.05	=	1.63	x	1.25
South Miami Hospital Inc.	1.58	=	1.42	x	1.11	1.51	=	1.38	x	1.10
Parkway Regional Medical Center	1.54	=	1.45	x	1.07	1.81	=	1.66	x	1.09
Baptist Hospital of Miami Inc.	1.50	=	1.38	x	1.08	1.57	=	1.42	x	1.10
Healthsouth Doctors Hospital	1.48	=	1.48	x	1.00	1.82	=	1.61	x	1.13
Homestead Hospital Inc.	1.42	=	1.09	x	1.30	1.28	=	1.12	x	1.14
Memorial Hospital Pembroke	1.38	=	1.29	x	1.07	1.41	=	1.37	x	1.03
Aventura Hospital & Medical Center	1.33	=	1.33	x	1.00	1.83	=	1.75	x	1.04
Memorial Hospital West	1.28	=	1.28	x	1.00	1.39	=	1.31	x	1.06
Memorial Regional Hospital	1.22	=	1.26	x	0.97	1.32	=	1.33	x	0.99
Hollywood Medical Center	1.22	=	1.29	x	0.95	1.75	=	1.83	x	0.96

Table 4.7 provides an example of Medicare reimbursements among the hospitals in the Miami hospital referral region, using the weighted average of hospitals in the Fort Myers hospital referral region as the benchmark.

The data are limited to the 25 Miami hospitals with 400 or more Medicare deaths occurring between 1999 and 2003. Columns 2-4 list the medical care cost equations for inpatient spending; columns 5-7 list the cost equations for physician spending for evaluation and management services (visits and consultations). The price/volume relationships of inpatient and physician spending at each hospital are computed as ratios to the weighted average of the hospitals in the Fort Myers region. The data for inpatient reimbursements are for deaths occurring 1999-2003. For Part B E&M spending, the data are for deaths occurring 2000-03.

The hospitals are ranked by inpatient spending, which ranged from $24,394 per decedent at Hollywood Medical Center to $45,479 at Jackson Memorial Hospital. Reimbursements for inpatient care at every Miami hospital exceeded the Fort Myers hospitals' average (ratios greater than 1.0 in column 2). Inpatient spending at Jackson Memorial Hospital was 2.27 times greater than the average of the Fort Myers region's hospitals. This was the result of a patient day rate at Jackson Memorial Hospital that was 1.55 times higher than the Fort Myers hospitals' average rate, and a price per day that was 47% higher than the average of the Fort Myers hospitals. While the price per day was below the average of the Fort Myers hospitals at four of the hospitals, the patient day rates

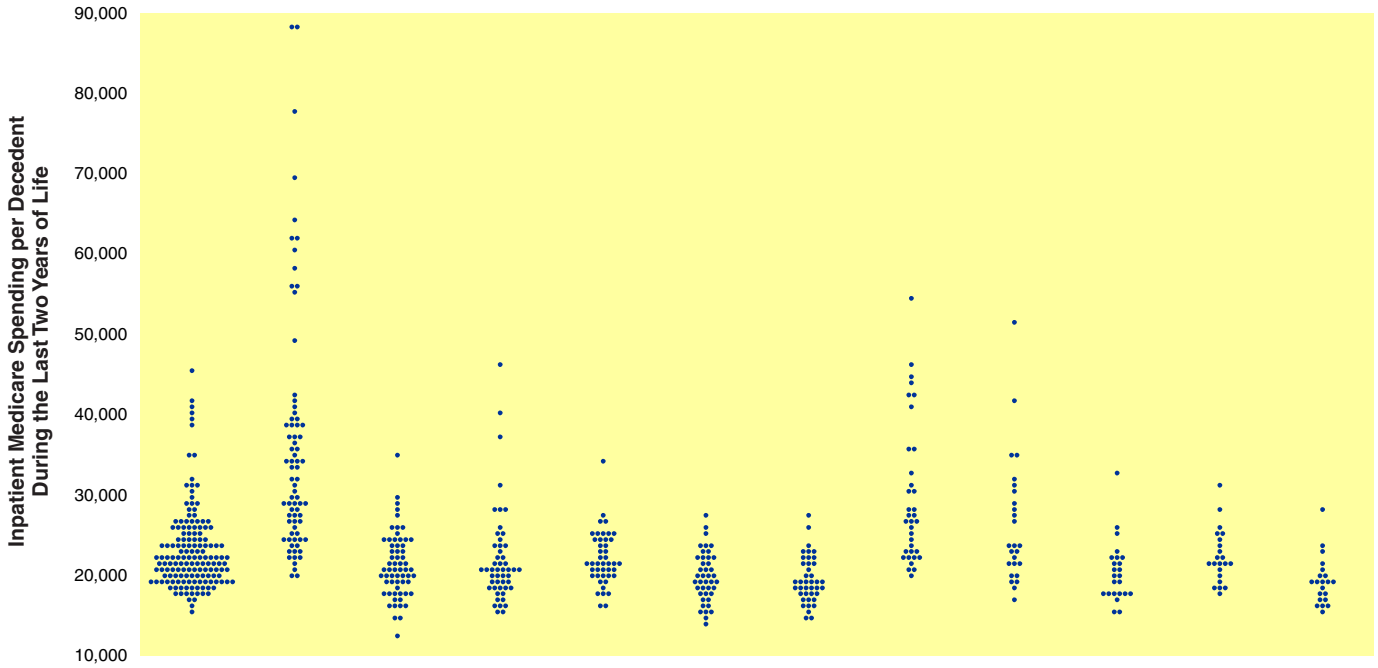
exceeded the benchmark by a large enough margin that per decedent spending exceeded the average of the Fort Myers hospitals in every example.

In all but two Miami hospitals, reimbursements per physician visit were higher than the average of the Fort Myers hospitals, but the visit rate played a more important role in determining per decedent spending for evaluation and management services during the last two years of life. For example, spending per decedent was 3.04 times higher at South Shore Hospital than the average of the Fort Myers hospitals, because the volume of care (visits per decedent) was 2.73 times higher and the price per visit was 1.12 times higher than the benchmark.

The Medicare program would have spent less if the per decedent volume and/or the price of care in the Miami hospitals included in Table 4.7 had been equal to that of the average of the Fort Myers hospitals. For example, had the number of inpatient days per decedent (1999-2003) been at the level of the average of the hospitals in the Fort Myers region, Medicare reimbursements for inpatient care would have been $717.9 million, rather than the actual spending level of $1,091.5 million — $373.6 million, or 34.2%, less. Had the price per patient day been the same in the Miami hospitals as the Fort Myers hospitals' average, the net saving would have been only 8.6%. Reducing the volume of physicians' evaluation and management services (2000-03) in the Miami hospitals to the level of the Fort Myers hospitals' average would have resulted in a saving of 37.4%; reducing the Miami hospitals' price per unit of service to the Fort Myers hospitals' average price per unit of service would have saved much less — 9.4%.

Part Four: Hospital-Specific Reports for Large Hospital Networks

Over the past decade or so, many hospitals have organized into networks. Hospital networks, particularly those that view themselves as integrated health systems, are logical places to establish accountability for managing resource allocation and for implementing population-based approaches to managing chronic illness. There are striking variations between hospital systems as well as among hospitals within systems.



	HCA	Tenet Healthcare Corporation	Community Health Systems, Inc.	Ascension Health	Health Mgmt. Associates	Triad Hospitals, Inc.	Catholic Health Initiatives	Catholic Healthcare West	Catholic Health East	Trinity Health	Adventist Health System Sunbelt	Catholic Healthcare Partners
Maximum	45,322	88,661	35,025	46,417	33,966	27,202	27,420	54,416	51,449	32,661	31,339	28,041
75th percentile	25,479	39,218	24,002	23,432	24,243	22,183	21,585	34,385	30,346	22,008	24,075	20,100
System average	22,934	34,139	21,921	22,424	21,830	19,716	20,174	29,238	25,775	21,416	22,483	19,635
25th percentile	19,915	25,533	18,885	18,796	20,127	17,536	17,704	22,873	21,602	17,772	20,255	17,199
Minimum	15,738	20,106	12,123	15,558	16,005	13,637	14,382	19,972	16,645	15,491	17,997	15,807

Figure 4.3. Inpatient Medicare Spending During the Last Two Years of Life (Deaths Occurring in 1999-2003) Among Decedents who Received Most of Their Care from a Hospital Belonging to One of Twelve Hospital Systems

Figure 4.3 summarizes variations in inpatient Medicare spending among hospitals that, according to the American Hospital Association's *Annual Survey Database 2003*, belonged to networks. The data are limited to hospital systems comprising 20 or more hospitals, with 400 or more deaths at each hospital, between 1999 and 2003. There was extensive variation among hospitals belonging to systems. For example, the weighted average inpatient reimbursement of hospitals belonging to the Hospital Corporation of America was about $23,000 per decedent. Among the 151 HCA hospitals with more than 400 deaths, inpatient reimbursements varied by a factor of almost three, from $15,700 per decedent to $45,300. Per decedent spending during the last two years of life varied by a factor of 1.28 between the hospital at the 75th percentile ($25,500) and the hospital at the 25th percentile ($19,900). There was even more variation among the

hospitals belonging to the Tenet Healthcare Corporation; the hospitals with the highest per decedent spending in the systems hospital cohort were members of this group.

Figures similar to Figure 4.3 that compare other performance measures are available in the appendix and can be accessed by clicking on the label:

Appendix Figure 4E. Medicare Reimbursements for Part B Care

Appendix Figure 4F. Hospital Bed Inputs

Appendix Figure 4G. ICU Bed Inputs

Appendix Figure 4H. Standardized FTE Physician Labor Inputs

Appendix Figure 4I. Hospital Days

Appendix Figure 4J. Days in Intensive Care

Appendix Figure 4K. Physician Visits

Appendix Figure 4L. Percent of Decedents Seeing Ten or More Physicians

Appendix Figure 4M. Percent of Deaths Associated with an Admission to Intensive Care Unit

Endnotes:

[a] The excluded hospitals are Cleveland Clinic Hospital (253 deaths) Gulf Coast Hospital (314 deaths) and Hendry Regional Medical Center (259 deaths)

Chapter Five

The Problem of the Overuse of Acute Care Hospitals in Managing Chronic Illnesses: A Regional Analysis

Most of Medicare's spending for the chronically ill pays for admissions to acute care hospitals. The dominant role of the acute care hospital is not an historic accident. Three things fostered the ascendancy of acute care hospitals in the second half of the 20th century. First was the growth of teaching hospitals as the source of clinical innovation and biomedical science. Second were the increases in the supply of physicians, particularly those specialists whose professional work was based at hospitals. The third influence was a combination of massive federal subsidies to promote the expansion of hospitals through the Hill-Burton program, easy financing of expansion projects through tax-free bonds and the stock markets, strong philanthropic support, and generous reimbursements from public and private sector insurers.

The clinical justification for the emphasis on "rescue" care and the use of admissions to acute care hospitals to manage patients with chronic illnesses is the assumption that more intensive management of these patients results in better health outcomes. That assumption is being challenged by the hospice and palliative care movement, the growing chronic disease management industry, and by community-wide, population-based models of chronic illness management. The assumption that more is better is also under scientific assault by health care epidemiology (Chapter One). It can no longer be assumed that people with severe chronic illness who live in communities with more intensive use of inpatient care have improved survival, better quality of life, or better access to care. What is clear is that people with severe chronic illnesses have a greater chance of dying in an intensive care unit, rather than elsewhere. It is also clear that, over the course of their lives, the care of people with severe chronic illnesses living in high-resource, high-utilization areas costs a lot more than the care that is provided to equally sick people who live in areas where resources such as hospital beds and medical specialists are more scarce and care is much less aggressive and intensive.

This chapter focuses on the need to address the problem of the overuse of inpatient services in acute care hospitals. The first section examines why the Medicare program should be concerned about the role its reimbursement policies play in sustaining and supporting the growth of regional variation. Medicare Parts A and B pay for utilization under the assumption that Medicare's spending per beneficiary in a given region is driven primarily by the prevalence of disease (its illness rate) and the local price of care (which reflects local labor costs, a factor that is out of the control of local providers). These assumptions are incorrect. Regional variation in Medicare spending has

little correlation with the prevalence of chronic illness or with variations in the price of services. What really matters is the volume of hospital and physician services provided to those with chronic illnesses. As a result of Medicare's reimbursement policies, taxpayers and Medicare enrollees living in regions with lower spending are subsidizing the greater intensity of care — more frequent hospitalizations, diagnostic tests, and physician visits — provided to those living in high-spending regions.

The second section addresses why the nation — not just the Medicare program — needs to focus on the overuse of acute care hospitals. First, the problem is almost certainly not confined to Medicare; it is a "system effect," related to capacity, that affects the care the chronically ill receive, whether uninsured or insured by private insurers, Medicare, or Medicaid. Second, and more important, the care intensity problem is getting worse. The overuse of acute care hospitals in managing chronic illness is increasing rapidly. Ironically, this increase is occurring more rapidly in regions with already high rates of use than in regions with low rates. Over the four-year period 2000-03, this trend was particularly alarming.

The final section of the chapter illustrates the large savings that could be realized if the rates of admissions to acute care hospitals and physician visits in all regions of the United States could be reduced to the level of regions served by the Mayo Clinic and Intermountain Healthcare, and of Portland, Oregon. (Portland is the largest and most metropolitan region in a state that has made improvement in end-of-life care a public policy goal.) In these regions, health care quality is better than average and resource inputs and utilization, particularly the use of acute care hospitals and medical specialists, is lower than in most other regions of the country.

Realizing these savings is not easy. First, we would need a reimbursement policy that supported the transition from the current dependency on the acute care sector (where most of the money now flows) to a stable, well-financed system that supported all sectors of care essential for the population-based management of chronic illness. Second, we would need to establish accountability for efficiency in managing chronic illness, including the integration of preventive, ambulatory, long-term, home health, and hospice care.

Part One: Illness, Medicare Spending, Volume, and Price

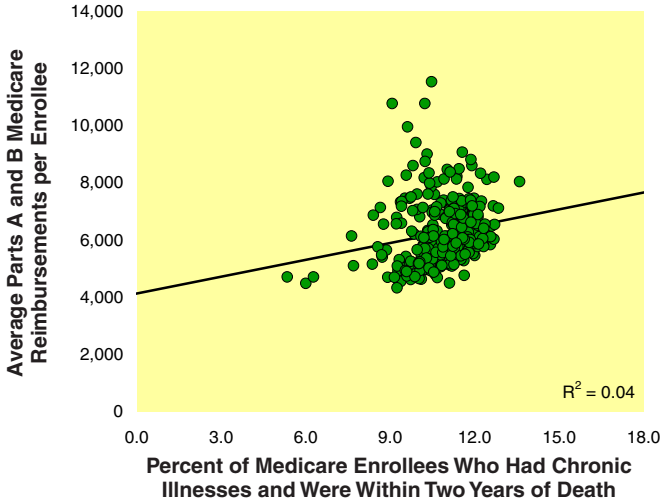


Figure 5.1. The Relationship Between the Prevalence of Severe Chronic Illness and Medicare Parts A and B Reimbursements per Enrollee (2000-01)

This section first shows that there is virtually no relationship between the prevalence of severe chronic illness, defined as the proportion of Medicare enrollees who are chronically ill and in the last two years of life, and per-enrollee Medicare spending. It then documents the strong association between the amount spent in managing patients with established chronic illness over the last two years of life and overall Medicare spending. It also shows that the volume of care during the last six months of life is a more important predictor of overall Medicare spending than the price of care. Finally, the section addresses the problem of transfer payments from low to high spending regions that in large part result from the overuse of acute care hospitals in managing enrollees with severe chronic illnesses.

Illness and Medicare Spending

Much of health care policy in the United States is based on the assumption that illness rates are the main driver of variation in rates of utilization. Yet among the 306 hospital referral regions compared in the Dartmouth Atlas Project, there is little relationship between spending and the prevalence of severe chronic illness. Over the four-year period 2000-03, overall Medicare Part A and Part B spending per enrollee varied 2.5-fold, from $4,543 per enrollee living in the Appleton, Wisconsin hospital referral region to $11,453 per enrollee in the Bronx, New York hospital referral region. During the period 2000-01, the prevalence of severe chronic illness (measured as the age-, sex-, and race-adjusted percent of Medicare enrollees who were chronically ill and in the last two years of life) also varied more than 2.5-fold, from 5.4% of Medicare Part A and Part B residents of Honolulu to 13.6% of residents of the Slidell, Louisiana hospital referral region. Yet only a small proportion—about 4%—of the variation in Medicare spending was associated with regional variation in the prevalence of severe chronic illness (Figure 5.1).

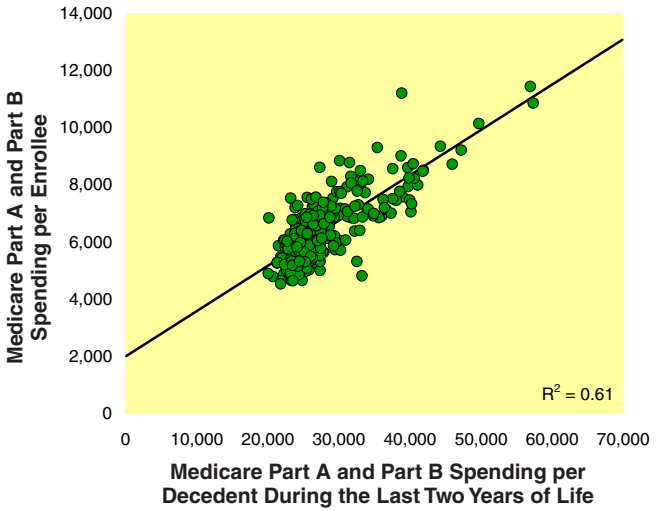


Figure 5.2. The Relationship Between Medicare Part A and Part B Spending per Decedent During the Last Two Years of Life (Deaths Occurring 2000-03) and Average Part A and Part B Spending per Enrollee (2000-03)

Overall Medicare spending was closely related to how much was spent on those with severe chronic illnesses. For deaths occurring from January 1, 2000 to December 31, 2003, Medicare spending for inpatient and Part B care during the last two years of life varied from less than $21,000 per decedent with chronic illness living in Grand Junction, Colorado, Wichita Falls, Texas, and Columbus, Georgia to almost $60,000 per decedent in Manhattan and the Bronx. Among the 306 hospital referral regions, per decedent spending for chronic illness during the last two years of life was highly correlated (R^2 = 0.61) with total Part A and Part B spending per enrollee (Figure 5.2).

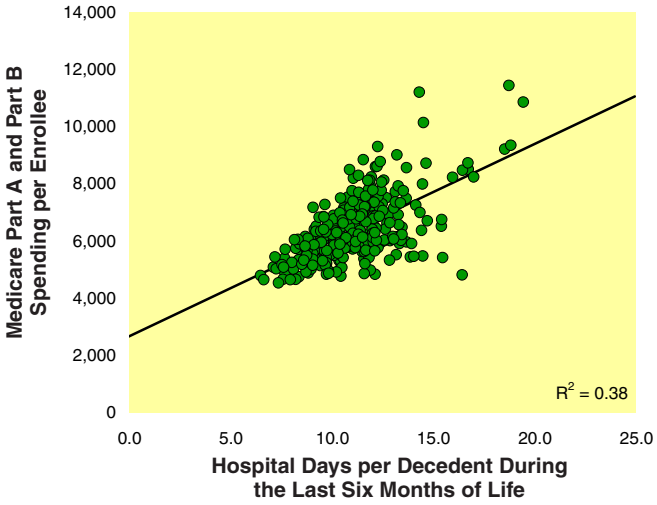


Figure 5.3. The Relationship Between Hospital Days per Decedent During the Last Six Months of Life (Deaths Occurring 2000-03) and Average Medicare Part A and Part B Reimbursements per Enrollee (2000-03)

Medicare Spending, Volume and Price

The volume of services provided to patients with established chronic illnesses is a more important contributor to overall Medicare spending than the average price of those services. The number of days spent in hospital per decedent with chronic illness during the last six months of life varied from 6.5 days in the Grand Junction, Colorado hospital referral region to 19.4 days in the Manhattan hospital referral region. The volume of hospital care (patient days per decedent) during the last six months of life was highly correlated (R^2 = 0.38) with overall per capita spending for traditional Medicare among regions (Figure 5.3).

There is an even stronger relationship between the volume of physician visits during the last six months of life and total per-enrollee Medicare spending. Over the four years 2000-03, the number of physician visits and consultations per decedent during the last six months of life varied from fewer than 18 visits per decedent in the Lebanon, New Hampshire, Salt Lake City, La Crosse, Wisconsin, and Mason City, Iowa hospital referral regions to about 50 visits per decedent in the Los Angeles, Newark, New Jersey, and New Brunswick, New Jersey hospital referral regions. The variation in the number of physician visits during the last six months of life was highly correlated (R^2 = 0.64) with overall Medicare spending (Figure 5.4).

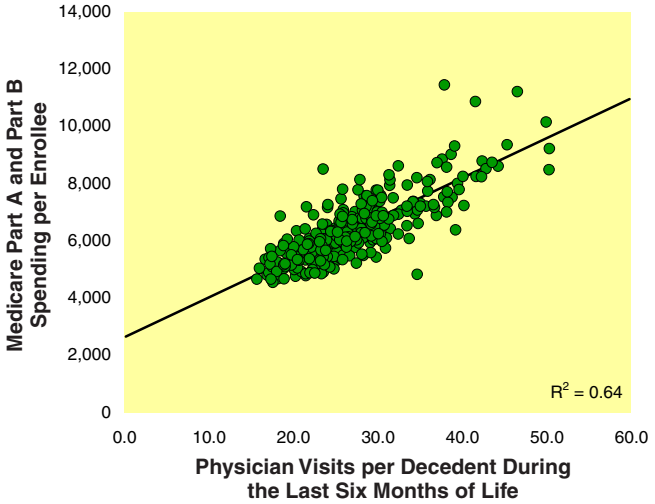


Figure 5.4. The Relationship Between Physician Visits per Decedent During the Last Six Months of Life (Deaths Occurring 2000-03) and Average Part A and Part B Reimbursements per Enrollee (2000-03)

Variations in price contributed much less to per-capita Medicare spending. Regionally, there was little correlation (R^2 = 0.06) between variations in the price of hospital care (reimbursements per day) during the last six months of life and overall Medicare Part A and Part B spending. There was a similar (R^2 = 0.07) correlation between variations in the price of physician visits (reimbursements per visit) and total per-enrollee Medicare reimbursements.

Utilization and Equity

Medicare's reimbursement policy is based on paying for brief episodes of care, such as hospitalizations, physician visits, diagnostic tests, and medical procedures. The amount Medicare spends per enrollee is the sum of the various bills submitted by providers. Utilization contributes substantially more than price per unit of care to variations in per enrollee spending.

In previous publications, we have raised concerns about distributional equity, pointing out the subsidies (or transfer payments) resulting from taxation and patient co-payments that are not adjusted for local spending patterns. The cross-market subsidies are sometimes very large. For example, based on regional Medicare spending data and analysis of taxation policies, we estimate that Medicare will reimburse about $50,000 more for health care services during the lifetime of a 65-year-old in Miami than it will reimburse for a 65-year-old living in Minneapolis. In total, the difference would be enough to purchase a Lexus for everyone over 65 in Miami. But the money doesn't purchase cars. Nor, as we have shown elsewhere, does it purchase elective surgery, including interventions that might improve the quality of life, such as knee replacements or the removal of cataracts.[1] On average, elective surgery rates are just about the same in low-cost Minneapolis, Salt Lake City, and Portland, Oregon, as they are in high-cost Manhattan, Los Angeles, and Miami. The transfer payments principally purchase more hospitalizations, more stays in ICUs, and more physician visits for those with chronic illness. The most important "system" factor determining whether a community is a net importer or exporter of Medicare dollars is the size of its acute care sector relative to the number of chronically ill patients who need treatment. Miami and Manhattan have over-built their acute care sectors; Minneapolis and Portland, Oregon, have been more frugal, using fewer hospital beds, less physician labor, and fewer expensive technologies such as intensive care beds and medical imaging devices.

The problem is getting worse. While care intensity is increasing everywhere, growth in medical specialist visits and ICU stays has been more rapid in the high-cost regions that historically have been net importers of Medicare dollars. Financial disparity among regions thus can be expected to increase. Ironically, from the perspective of clinical equity, regions with less dependency on acute care hospitals appear to be better off; they have better outcomes and less overuse of services.

[1]Wennberg JE, Fisher ES, Skinner JS. Geography and the debate over Medicare reform. *Health Affairs* web exclusive, 13 February 2002.

Feenberg D, Skinner JS. Federal Medicare transfers across states: Winners and losers. National Tax Journal. Vol. LIII, No. 3, Part 2.

Part Two: Two Reasons Why the Nation Needs to Focus on Reducing the Overuse of the Acute Care Sector

This section first illustrates that the problem of supply-sensitive care is not just a Medicare problem. It reviews Atlas studies comparing Medicare and Michigan Blue Cross Blue Shield utilization showing that the variation among regions in the Medicare population is highly predictive of variation among the population insured through Michigan Blue Cross. Moreover, hospital capacity has the same strong association with hospitalization rates in the Blue Cross population that it has in the Medicare population. The chapter then examines trends in the intensity of care provided to Medicare enrollees during the last two years of life among those whose deaths occurred between 2000 and 2003. Over this period of time, acute care sector intensity, measured in terms of resource inputs and utilization of ICUs and physician services, increased in all parts of the United States, but more so in regions which in 2000 were at the high end of the national distribution.

Variation in Volume of Supply-Sensitive Care Is Not Just a Medicare Problem

Like Medicare, commercial health plans have focused on controlling price as their principal strategy for cost containment, while ignoring utilization. They do this by obtaining discounts on the price of care—the amount they pay per hospital day, medical procedure, or physician visit. To assess the effectiveness of this strategy, it would be useful to conduct studies similar to those we have done for the Medicare populations to compare the relative importance of price and volume in driving overall per capita spending. Unfortunately, commercial health plans rarely conduct such studies. Most commercial plans regard information on the unit prices they pay a given provider (and per capita spending among regions) as proprietary. Moreover, most commercial plans do not have a large enough share of the commercially insured population to support population-based analysis of utilization rates. The exception is Blue Cross Blue Shield. In the recent *Dartmouth Atlas of Health Care in Michigan*, we compared rates of hospitalization for chronic illnesses among Medicare Part A and Part B enrollees and Blue Cross Blue Shield members between 21 and 65. The patterns of hospitalization among the Medicare population were highly predictive of what happened to the commercially insured population. Figure 5.5, adapted from the Michigan Atlas, compares the hospitalization rates for Medicare enrollees and Blue Cross Blue Shield members in Michigan hospital service areas with at least 10,000 adult Blue Cross Blue Shield members. Hospitalization rates for medical conditions varied more than twofold for both populations, and the rates were highly correlated ($R^2 = 0.75$). Medicare hospitalization rates were also correlated, although not so strongly, with hospitalization rates for those under age 21 ($R^2 = 0.36$).

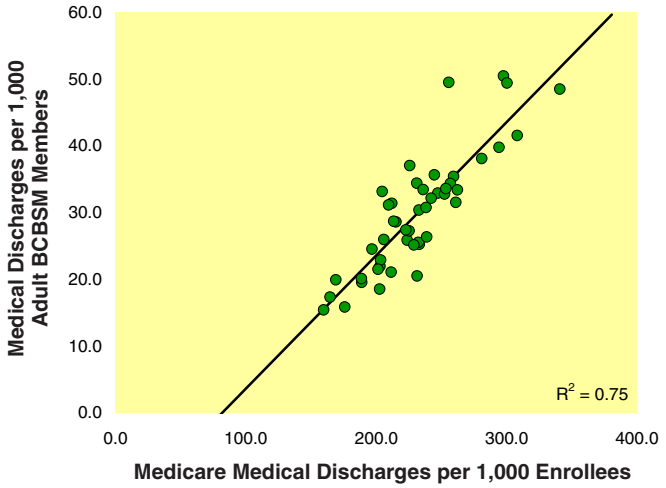


Figure 5.5. The Association Between Medicare Medical Discharges (1996) and Medical Discharges of Adult Blue Cross Blue Shield of Michigan Members (1997) Among Michigan Hospital Service Areas

The common denominator appears to be the supply of hospital beds. The supply of acute care beds per 1,000 residents among the Michigan hospital service areas with at least 100,000 residents in 1996 was correlated with both the hospitalization rates for Medicare enrollees (R^2 = 0.29) and for Blue Cross Blue Shield members age 21-65 (R^2 = 0.53). Capacity has a strong effect on clinical decision-making about hospital admissions, irrespective of the insurer or the patient's age.

Trends in Resource Inputs and Utilization: 2000-03

Because Medicare spending is rising at what many believe is an unsustainable rate, it is important to ask what treatments and services are contributing most to the increases. A comprehensive answer would require a thorough scan of the database, including trends in surgical interventions, which will be added to our analyses in subsequent publications. We have, however, examined changes in care intensity in managing chronic illness over the four-year period 2000-03 and found some alarming trends. Nationally, the per capita amount of resources allocated to managing chronic illness during the last two years of life increased steadily each year (Table 5.1). By 2003, the nation's health care providers were using 13.6% more ICU beds than they did in 2000. The amount of physician labor used to manage chronic illness over the last two years of life also increased by 13.4% for medical specialists and 7.7% for primary care physicians.

Resource	2000	2001	2002	2003	% increase in 4 years
Intensive care beds	12.4	12.9	13.5	14.0	13.6%
Medical specialists	7.9	8.1	8.5	8.9	13.4%
Primary care physicians	8.4	8.6	8.7	9.0	7.7%

Table 5.1. Increases in the Average Inputs of Intensive Care Beds, Medical Specialist Physicians, and Primary Care Physicians per 1,000 Chronically Ill Medicare Enrollees (2000-03)

Quintile	Patient Days in Intensive Care			Medical Specialist Visits			Primary Care Visits		
	% increase in 4 years	Ratio to Q5		% increase in 4 years	Ratio to Q5		% increase in 4 years	Ratio to Q5	
		2000	2003		2000	2003		2000	2003
1 ($37,622)	15.8%	1.76	1.86	12.0%	2.14	2.21	8.8%	1.24	1.29
2 ($27,774)	14.1%	1.38	1.43	11.8%	1.52	1.56	6.7%	1.05	1.08
3 ($25,272)	11.6%	1.28	1.30	11.0%	1.29	1.32	6.8%	1.08	1.10
4 ($23,774)	10.2%	1.14	1.15	9.2%	1.13	1.13	3.7%	1.03	1.03
5 ($21,599)	9.7%	1.00	1.00	8.6%	1.00	1.00	4.4%	1.00	1.00

Table 5.2. Increases in the Use of Intensive Care Beds, Medical Specialist Physicians, and Primary Care Physicians per Chronically Ill Medicare Enrollee by Quintile of Spending (2000-03)

Rates of utilization of ICUs and physician visits during the last six months of life also increased rapidly, particularly among regions that at baseline (2000) were already providing the most care. In other words, the disparity in utilization between high and low rate regions grew over the four years. In this study, regions were aggregated into five groups ranked on spending for inpatient care and Part B services per decedent during the last two years of life among those whose deaths occurred in 2000 (Table 5.2). Each group had approximately equal patient populations. Average Medicare spending for deaths occurring in 2000 in the lowest-ranked quintile was $21,599; in the highest-ranked quintile it was $37,622 per decedent, or 74% higher. The growth in utilization rates was proportionate to the baseline spending level: the greater the spending in 2000 the greater the percent increase in utilization over the four-year period 2000-03. For example, use of intensive care grew 15.8% in the highest-spending regions, 11.6% in the median-ranked regions, and 9.7% in the lowest-ranked regions. The range in variation in per decedent days in ICUs increased from 1.76 for deaths occurring in 2000 to 1.86 for deaths that occurred in 2003. Medical specialist visits per decedent grew 12% in the high-spending regions and 8.6% in the low-spending regions, with corresponding increases in the range in variation. The growth rate in primary physician care visits per decedent in the high-spending regions was 8.8%, twice that of the low-spending regions. The disparity between the highest and lowest quintile regions increased from a factor of 1.24 to 1.29.

Part Three: Breaking the Growing Dependency on Acute Care Hospitals

Most of Medicare's spending for services for the chronically ill is provided in hospitals during acute exacerbations of underlying illnesses. However, some regions and health care organizations had less reliance on acute inpatient care than others. Regions dominated by organized care, whether group practices or integrated health care systems, tended to manage chronic illness using fewer acute care beds and fewer physician visits. Notable examples are the Mayo Clinic, which is the predominant provider serving the Rochester, Minnesota hospital referral region, and Intermountain Healthcare, an integrated system serving the Salt Lake City hospital referral region. Some states, notably Oregon, have made concerted efforts, through public debate and professional action, to improve the quality of end-of-life care. In these areas, the quality of care tends to be relatively high, reflected in process quality measures that are above average. Medicare enrollees in these areas are less likely to die "high-tech" deaths — including admissions to intensive care — than Medicare enrollees who live in other parts of the country. The Mayo Clinic and Intermountain Healthcare have reputations for excellence and are noted for their leading research efforts in rationalizing the clinical pathways for managing chronic illness.

Because they provide higher quality care at lower cost, the utilization rates in Salt Lake City, Rochester, Minnesota, and Portland, Oregon are useful benchmarks for estimating the potential savings from a successful national effort to improve efficiency in managing chronic illness.

	Hospital Days			Physician Visits		
Benchmark Region	Benchmark Patient Day Rate	Sum of Estimated Spending Reduction (billions)	Percent of U.S. Spending	Benchmark Physician Visit Rate	Sum of Estimated Spending Reduction (billions)	Percent of U.S. Spending
Rochester, MN	17.3	$14.0	13.2%	40.6	$5.1	30.4%
Portland, OR	13.6	$32.4	30.6%	39.3	$5.5	32.7%
Salt Lake City, UT	13.2	$34.3	32.4%	38.5	$5.8	34.0%

Table 5.3. Estimated Reductions in Spending Had All Regions of the United States with Higher Volume (Hospital Day and Physician Visit Rates) Been as Efficient as Three Benchmark Regions (2000-03)

Table 5.3 illustrates the savings in Medicare spending that would have accrued if the utilization rates — hospital days and physician visits — in the efficient regions had been the standard of practice during the four-year study period 2000-03. Price is held constant, and it is assumed that regions with lower utilization rates did not increase their rates. (See footnote 2 for an example of how the Manhattan hospital referral region was benchmarked to the Rochester, Minnesota hospital referral region.) The Salt Lake City benchmark results in the greatest estimated reduction in acute care hospital spending. If, over the four years of our study, hospital utilization rates had been at the level of Salt Lake City, Medicare spending for inpatient care would have been reduced by $34.3 billion — a saving of 32.4%. If physician visit rates had been at the level of Salt Lake City, spending would have been $5.8 billion less — a saving of 34%. Smaller but still substantial reductions in acute care hospital and physician spending were estimated using the Portland, Oregon and the Rochester, Minnesota hospital referral regions as the benchmarks.

We believe that the evidence speaks clearly to the need to address the inadequacies in the way chronic illness is managed. A major challenge is to develop reimbursement policies that facilitate the transition from the current over-reliance on inpatient hospital care to a population-based

[2] In Manhattan, inpatient spending per decedent over the last 2 years of life was $46,443; the patient day rate per decedent was 30.3; the average reimbursement per day in hospital was $1,532. The Rochester, Minnesota benchmark for patient days was 17.3 days. If the volume of inpatient care in Manhattan had been equal to the Rochester region (but price remained as it was in Manhattan), per decedent spending in Manhattan during the last two years of life would be 17.3 days x $1,532 = $26,573, a savings of $19,870 per decedent. Since there were 59,395 Medicare deaths in Manhattan during 2000-03, the savings in Medicare outlays by reducing utilization of hospitals to the level of Rochester would be $ 1.18 billion. The savings in hospital beds would be 2.1 million, a 43% reduction in beds allocated to managing chronic illness over the last 2 years of life.

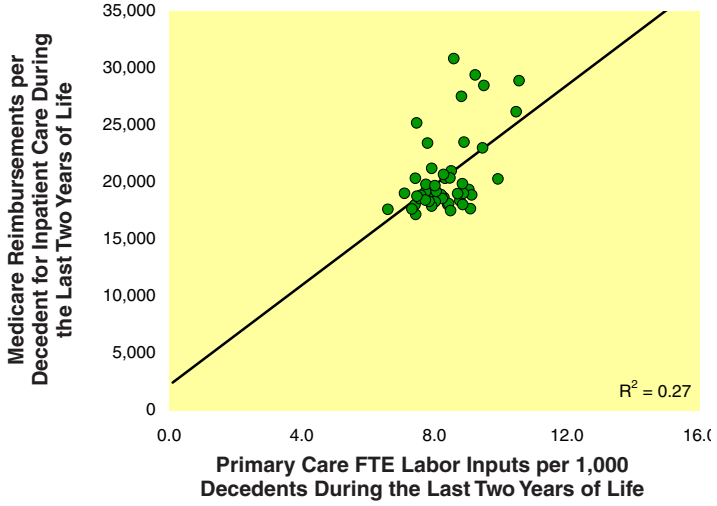
model based on the integration of the various services and providers of care. As illustrated in Table 5.3, the substantial savings could be redirected toward building integrated systems. Traditional reimbursement policies do not allow for this kind of reallocation. When payment is based on utilization, reducing hospitalization rates results in financial loss to hospitals and gain to payers. We need to develop community-wide integration and new models for financing the longitudinal care of patients over the course of their chronic illnesses. The Dartmouth Atlas data, because it measures spending, resource allocation, and utilization over fixed periods of time in the progression of chronic illness, is useful for estimating the actuarial costs of managing chronic illness according to where care is provided, either on a geographic (regional) or hospital and associated provider-specific basis.[3] This information should be useful to providers and payers in planning pay-for-performance reimbursement experiments such as Section 646 of the Medicare Modernization Act of 2003.

About 30% to 35% of Medicare dollars are spent on patients who are in the last two years of their lives; most are suffering from one or more chronic illnesses. With so much money at stake and so many parties involved in an individual's care, it is important to ask who is in charge. Unfortunately, for many at this stage of life, the answer is nobody. In addressing the inadequacies in the way chronic illness is managed, a major challenge is to establish who accepts accountability. Which organization is responsible for integrating the various sectors of care and developing the clinical guidelines and clinical pathways that define responsibilities among providers and assure the continuity of care? Large group practices such as the Mayo Clinic and integrated delivery systems such as Intermountain Healthcare provide examples of how it can be done. But large group practices and integrated delivery systems are available only in some communities, and they are hard to replicate. The only locus of organized care that is available throughout the United States is the acute care hospital. Perhaps the acute care hospital could evolve from its present orientation on acute inpatient care toward a new mission: to serve as the focus for integrating its associated providers into systems of care for managing chronic disease. The Dartmouth Atlas hospital-specific data, because it documents the contribution of the full complement of providers who provide care to patients using a hospital — including those who are not formally associated with the hospital — could serve as a useful tool for such an expansion of mission.

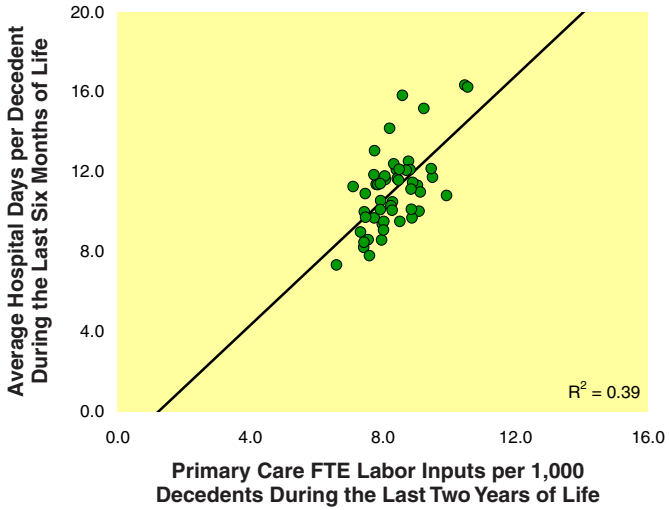
[3] The data release associated with this edition of the Atlas is restricted to inpatient care and physician and hospice services; subsequent releases will include long-term care, home health care, and medical devices.

Appendix One

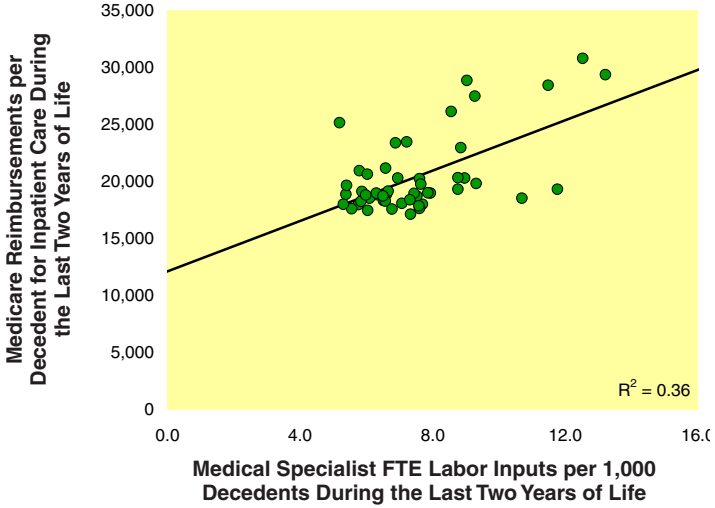
Supplemental Figures



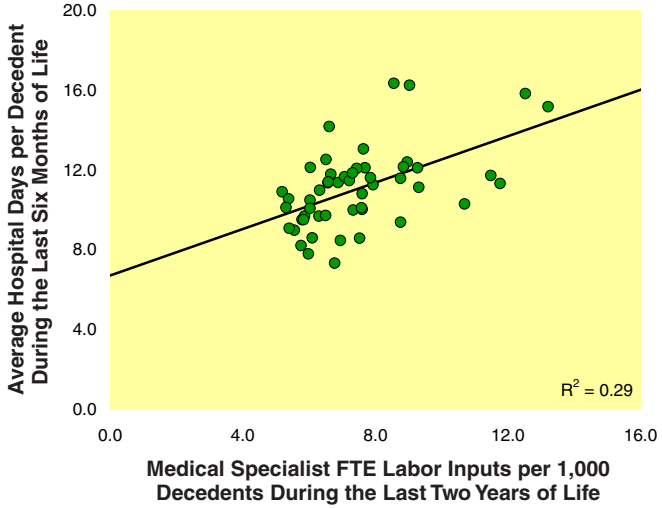
Appendix Figure 2A. The Relationship Between Primary Care Labor Inputs and Medicare Reimbursements for Inpatient Care Among States (Deaths Occurring 2000-03)



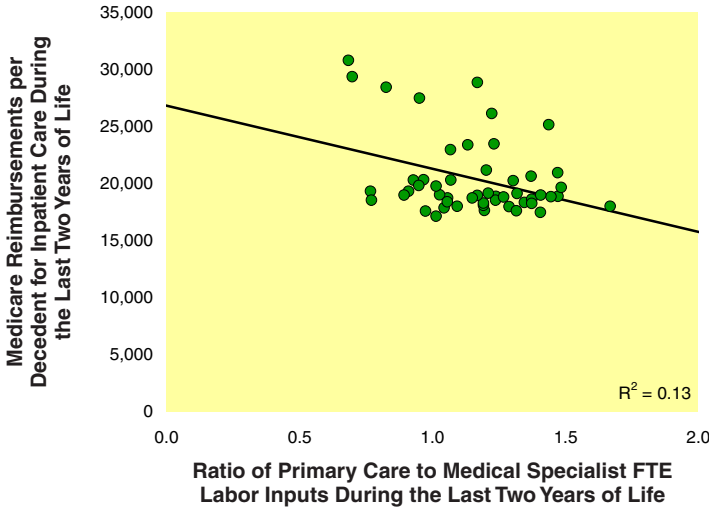
Appendix Figure 2B. The Relationship Between Primary Care Labor Inputs and Average Number of Days in Hospital Among States (Deaths Occurring 2000-03)



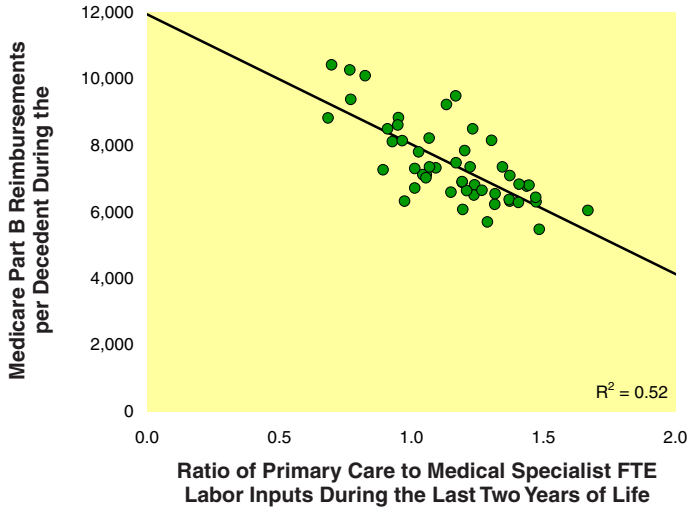
Appendix Figure 2C. The Relationship Between Medical Specialist Labor Inputs and Medicare Reimbursements for Inpatient Care Among States (Deaths Occurring 2000-03)



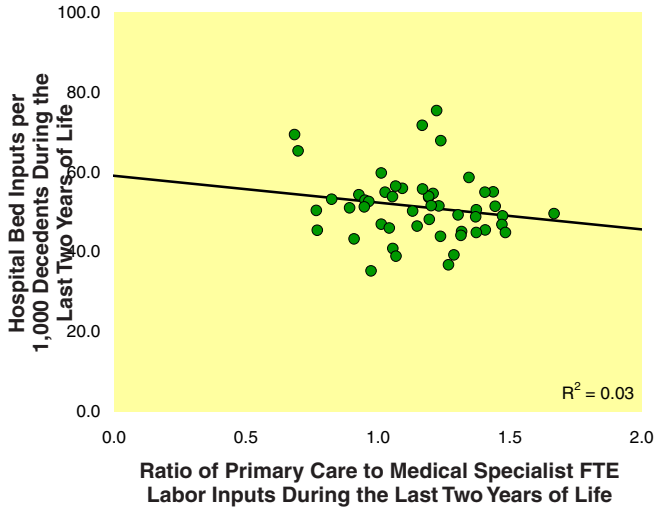
Appendix Figure 2D. The Relationship Between Medical Specialist Labor Inputs and Average Number of Days in Hospital Among States (Deaths Occurring 2000-03)



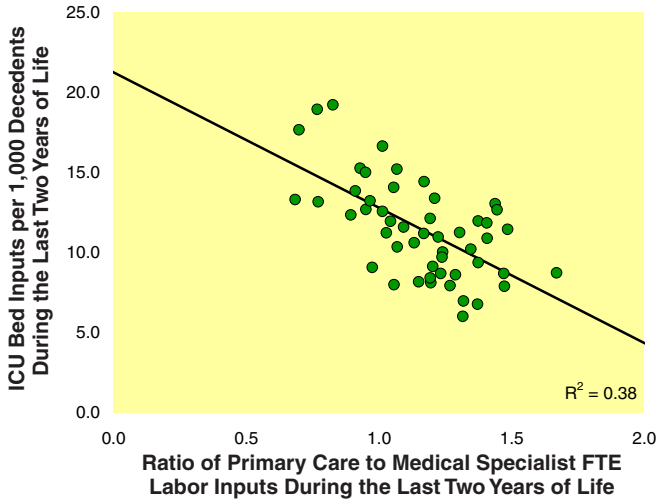
Appendix Figure 2E. The Relationship Between the Ratio of Primary Care Inputs to Medical Specialist Inputs and Medicare Reimbursements for Inpatient Care Among States (Deaths Occurring 2000-03)



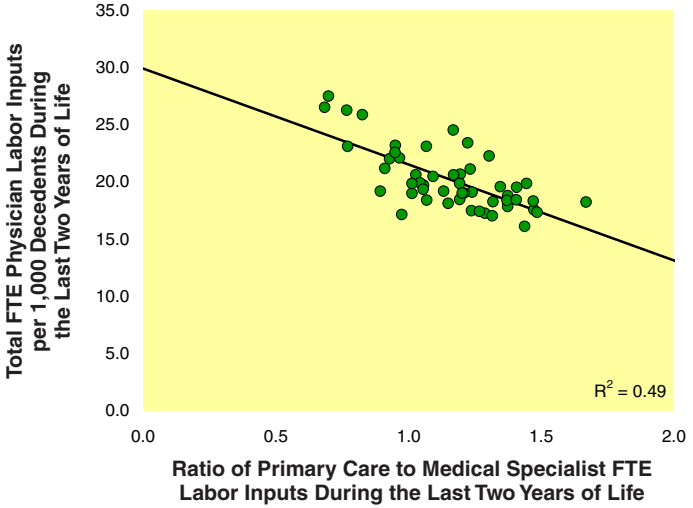
Appendix Figure 2F. The Relationship Between the Ratio of Primary Care Inputs to Medical Specialist Inputs and Medicare Part B Reimbursements Among States (Deaths Occurring 2000-03)



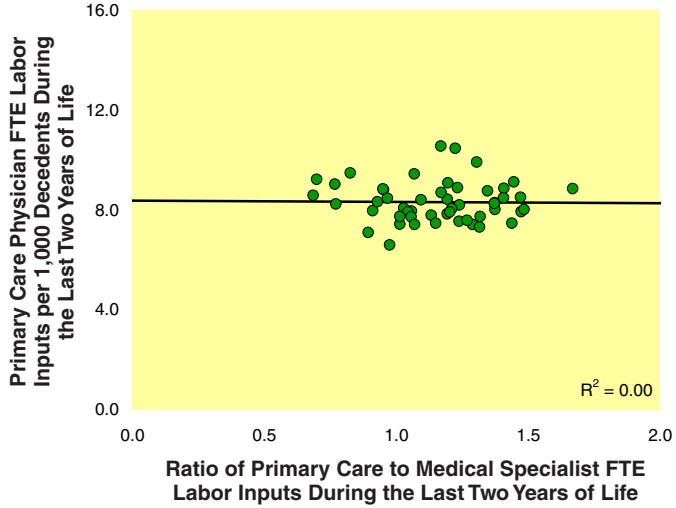
Appendix Figure 2G. The Relationship Between the Ratio of Primary Care Inputs to Medical Specialist Inputs and Hospital Bed Inputs Among States (Deaths Occurring 2000-03)



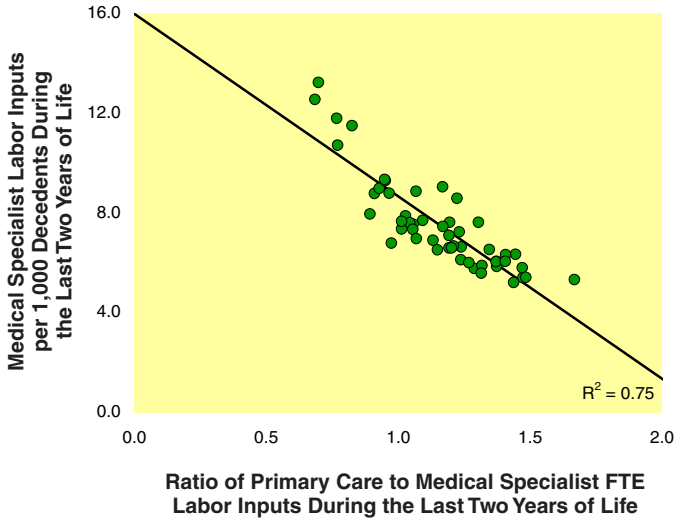
Appendix Figure 2H. The Relationship Between the Ratio of Primary Care Inputs to Medical Specialist Inputs and Intensive Care Bed Inputs Among States (Deaths Occurring 2000-03)



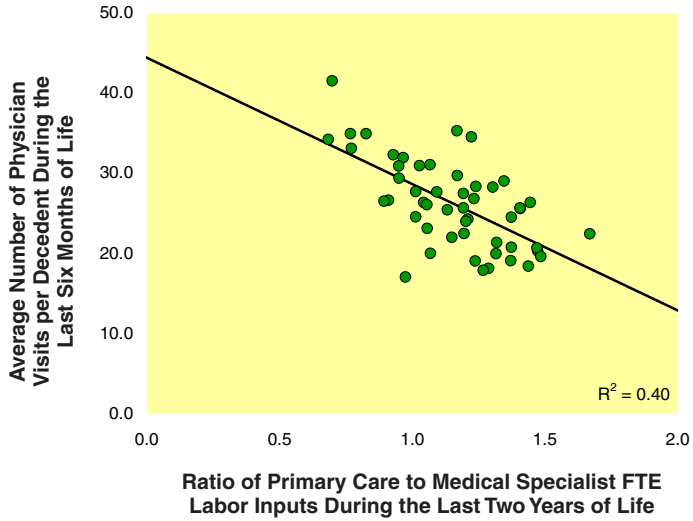
Appendix Figure 2I. The Relationship Between the Ratio of Primary Care Inputs to Medical Specialist Inputs and Total Physician Labor Inputs Among States (Deaths Occurring 2000-03)



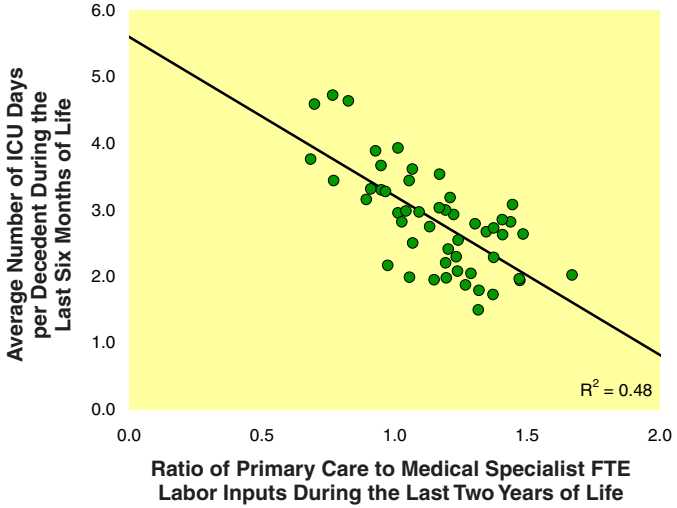
Appendix Figure 2J. The Relationship Between the Ratio of Primary Care Inputs to Medical Specialist Inputs and Primary Care Physician Labor Inputs Among States (Deaths Occurring 2000-03)



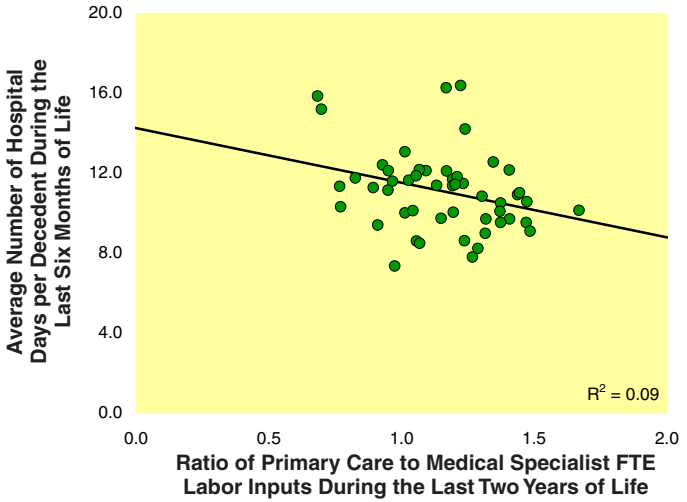
Appendix Figure 2K. The Relationship Between the Ratio of Primary Care Inputs to Medical Specialist Inputs and Medical Specialist Labor Inputs Among States (Deaths Occurring 2000-03)



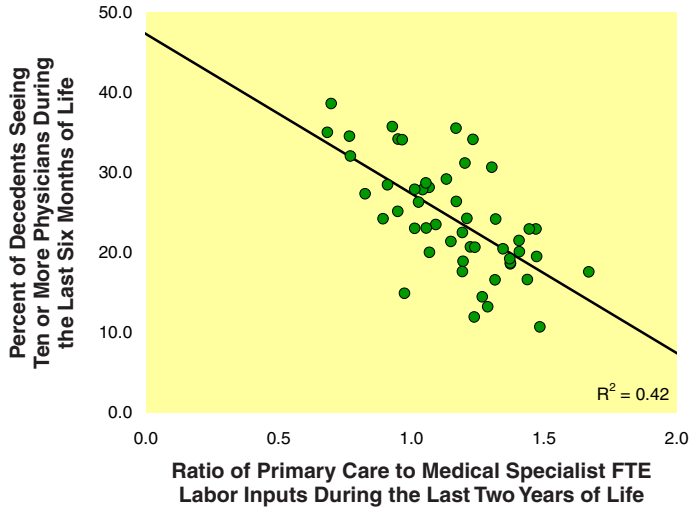
Appendix Figure 2L. The Relationship Between the Ratio of Primary Care Inputs to Medical Specialist Inputs and Average Number of Physician Visits Among States (Deaths Occurring 2000-03)



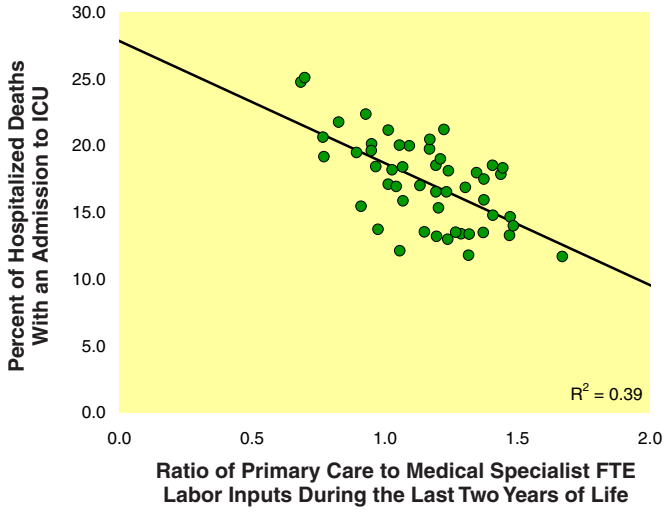
Appendix Figure 2M. The Relationship Between the Ratio of Primary Care Inputs to Medical Specialist Inputs and Average Number of Days in Intensive Care Among States (Deaths Occurring 2000-03)



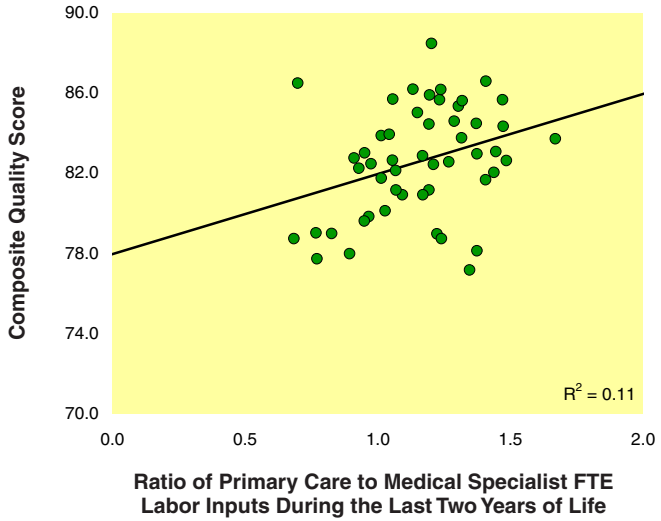
Appendix Figure 2N. The Relationship Between the Ratio of Primary Care Inputs to Medical Specialist Inputs and Average Number of Hospital Days Among States (Deaths Occurring 2000-03)



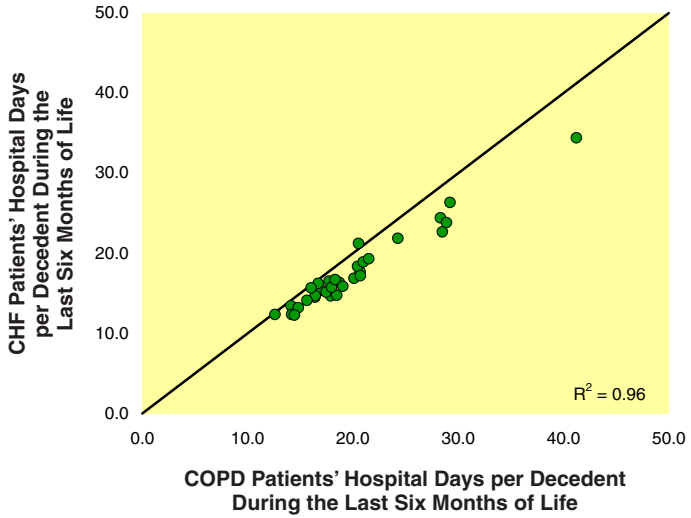
Appendix Figure 2O. The Relationship Between the Ratio of Primary Care Inputs to Medical Specialist Inputs and the Percent Seeing Ten or More Physicians During the Last Six Months of Life Among States (Deaths Occurring 2000-03)



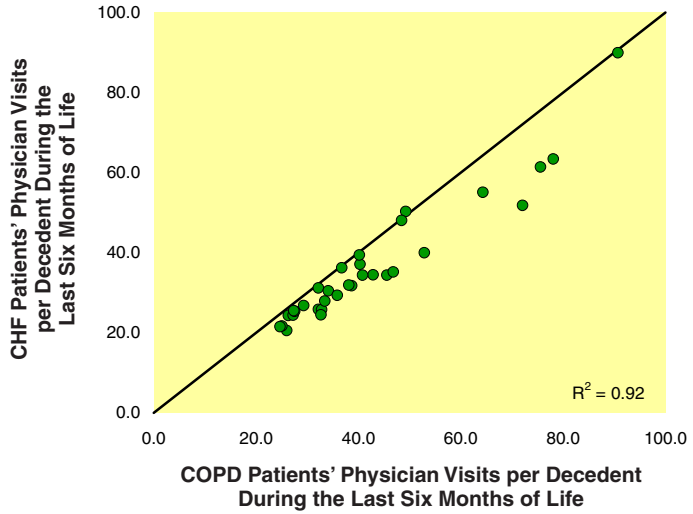
Appendix Figure 2P. The Relationship Between the Ratio of Primary Care Inputs to Medical Specialist Inputs and Hospitalized Deaths With an Admission to ICU Among States (Deaths Occurring 2000-03)



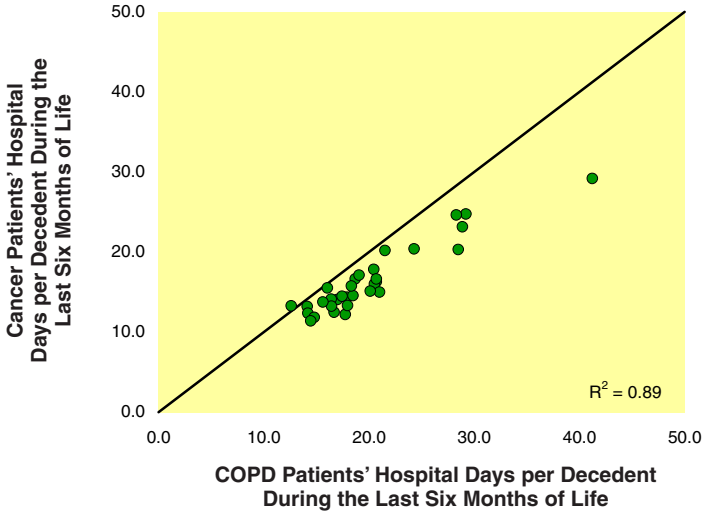
Appendix Figure 2Q. The Relationship Between the Ratio of Primary Care Inputs to Medical Specialist Inputs and the Composite Quality Score Among States (Deaths Occurring 2000-03)



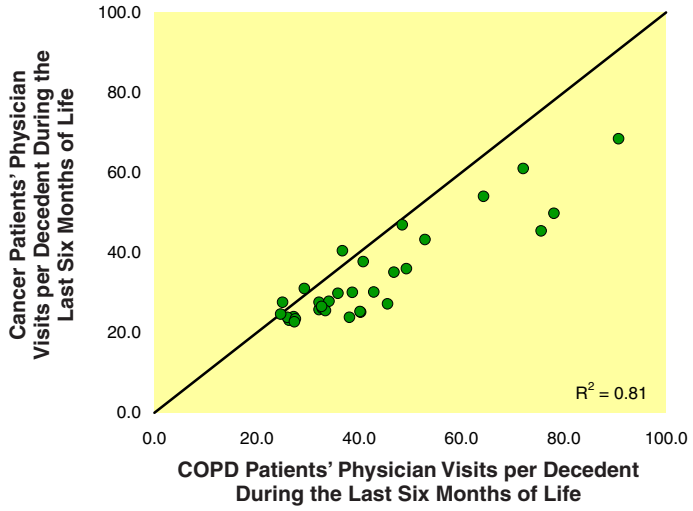
Appendix Figure 3A. The Relationship Between Hospital Days per Decedent with Chronic Obstructive Pulmonary Disease and Hospital Days per Decedent with Congestive Heart Failure Among COTH Integrated Academic Medical Centers (1999-2003)



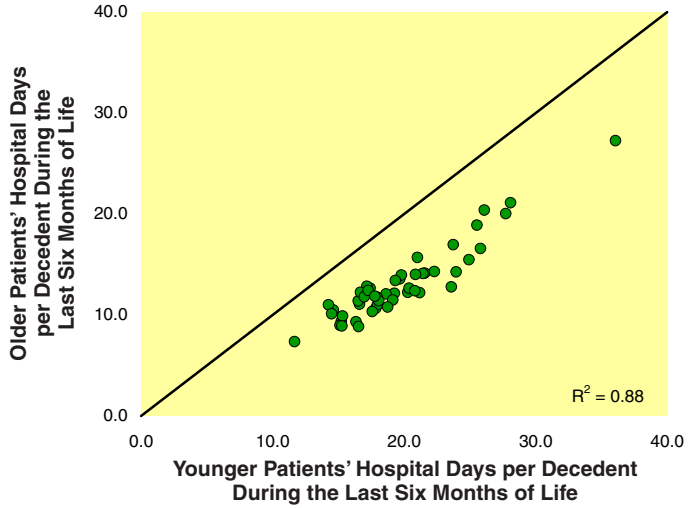
Appendix Figure 3B. The Relationship Between Physician Visits per Decedent with Chronic Obstructive Pulmonary Disease and Physician Visits per Decedent with Congestive Heart Failure Among COTH Integrated Academic Medical Centers (2000-03)



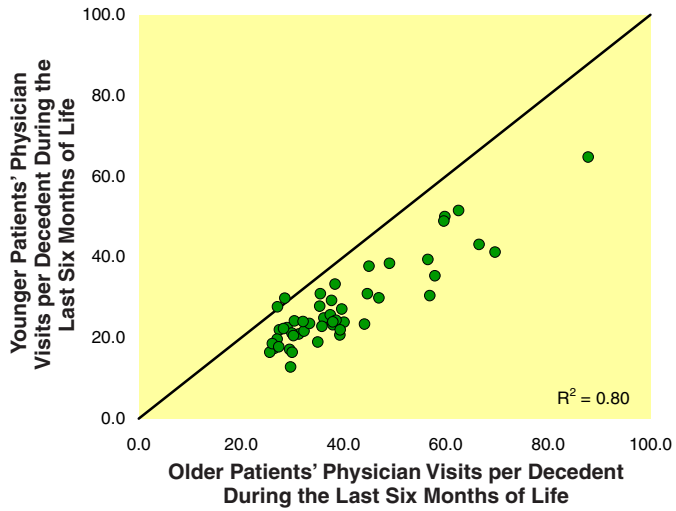
Appendix Figure 3C. The Relationship Between Hospital Days per Decedent with Chronic Obstructive Pulmonary Disease and Hospital Days per Decedent with Cancer Among COTH Integrated Academic Medical Centers (1999-2003)



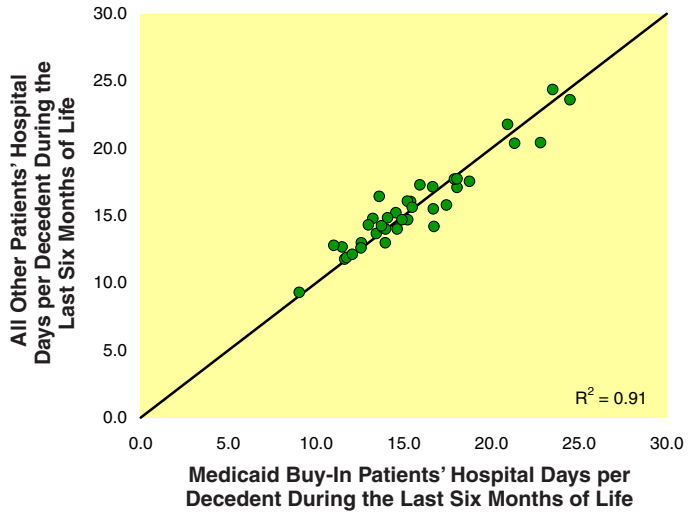
Appendix Figure 3D. The Relationship Between Physician Visits per Decedent with Chronic Obstructive Pulmonary Disease and Physician Visits per Decedent with Cancer Among COTH Integrated Academic Medical Centers (2000-03)



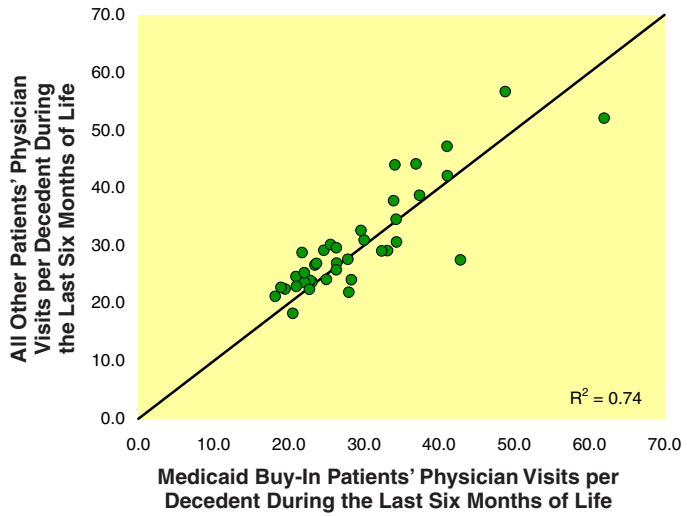
Appendix Figure 3E. The Relationship Between Hospital Days per Decedent for Younger and Older Medicare Patients During the Last Six Months of Life Among COTH Integrated Academic Medical Centers (1999-2003)



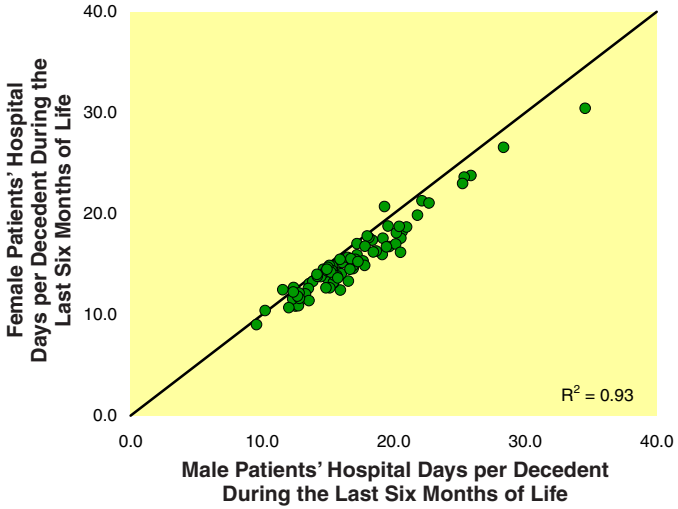
Appendix Figure 3F. The Relationship Between Physician Visits per Decedent for Younger and Older Medicare Patients During the Last Six Months of Life Among COTH Integrated Academic Medical Centers (2000-03)



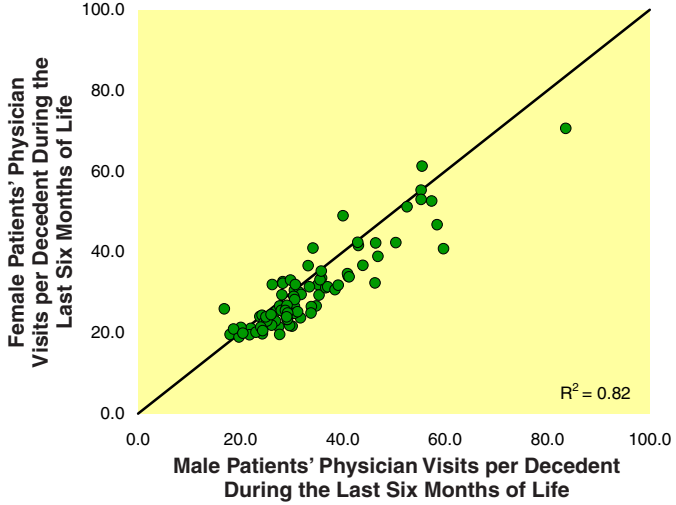
Appendix Figure 3G. The Relationship Between Hospital Days per Decedent for Medicaid Buy-in and All Other Medicare Patients During the Last Six Months of Life Among COTH Integrated Academic Medical Centers (1999-2003)



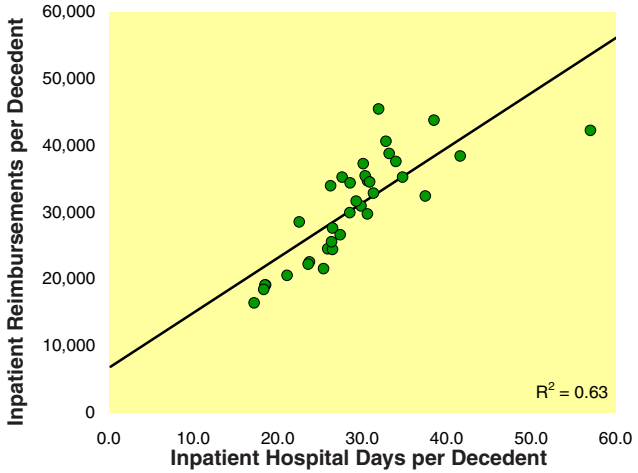
Appendix Figure 3H. The Relationship Between Physician Visits per Decedent for Medicaid Buy-in and All Other Medicare Patients During the Last Six Months of Life Among COTH Integrated Academic Medical Centers (2000-03)



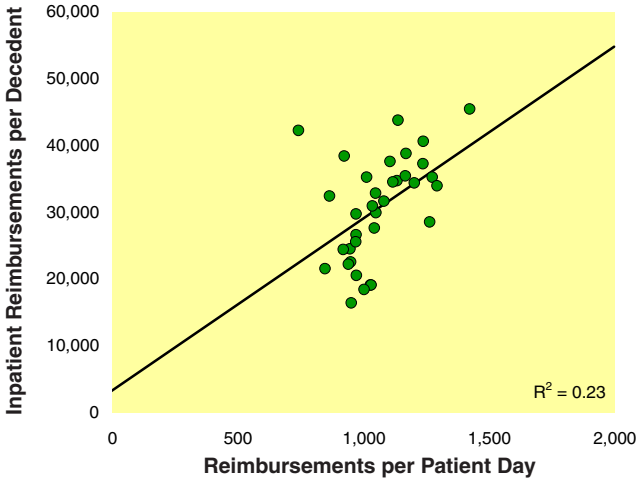
Appendix Figure 3I. The Relationship Between Hospital Days per Decedent for Male and Female Medicare Patients During the Last Six Months of Life Among COTH Integrated Academic Medical Centers (1999-2003)



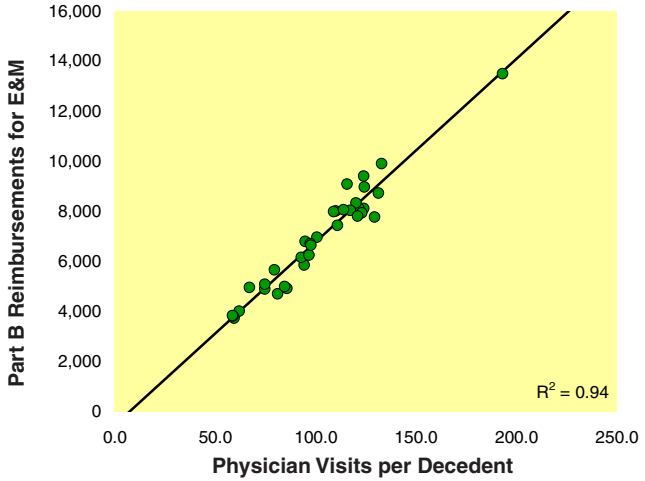
Appendix Figure 3J. The Relationship Between Physician Visits per Decedent for Male and Female Medicare Patients During the Last Six Months of Life Among COTH Integrated Academic Medical Centers (2000-03)



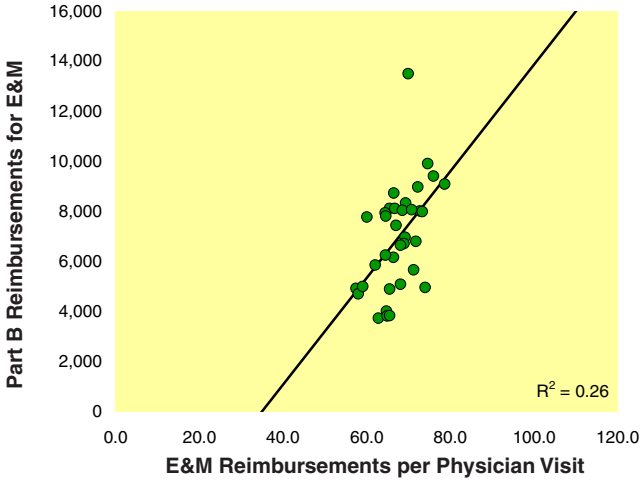
Appendix Figure 4A. Relationship Between Inpatient Days and Reimbursements per Decedent During the Last Two Years of Life (Deaths Occurring 1999-2003) Among Selected Hospitals in the Miami and Fort Myers Hospital Referral Regions



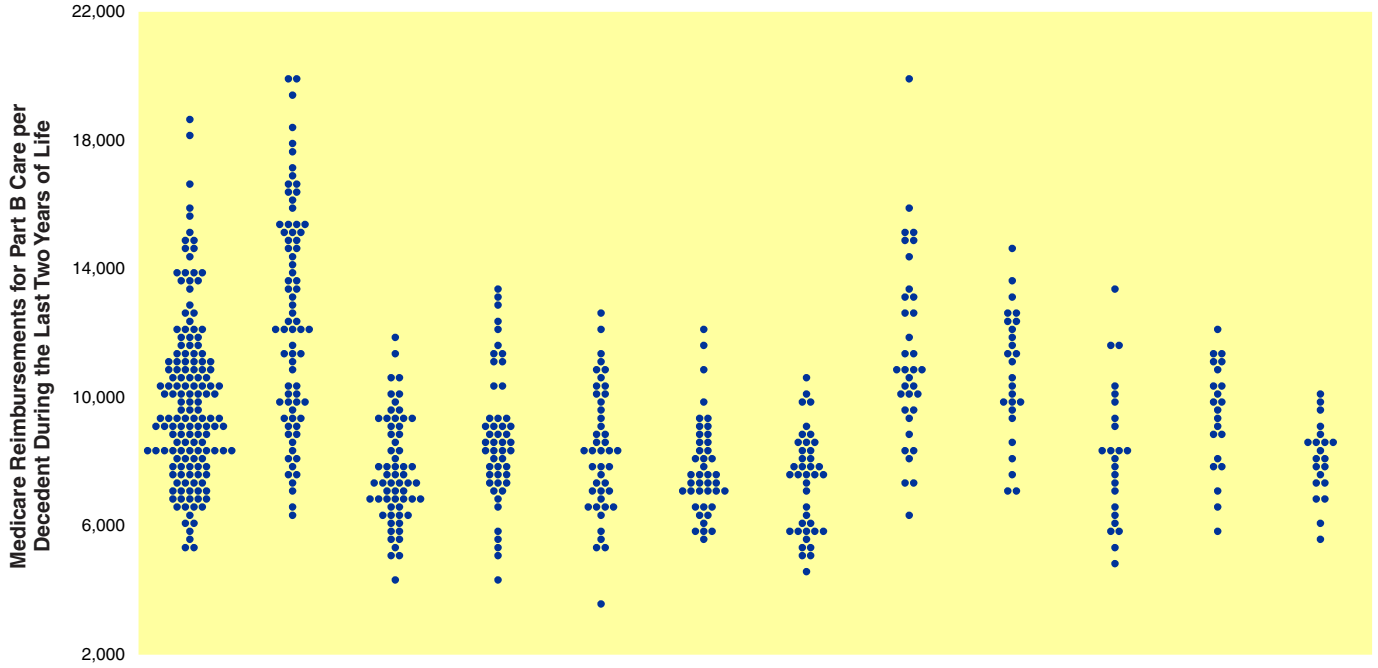
Appendix Figure 4B. Relationship Between Reimbursements per Patient Day and Inpatient Reimbursements per Decedent During the Last Two Years of Life (Deaths Occurring 1999-2003) Among Selected Hospitals in the Miami and Fort Myers Hospital Referral Regions



Appendix Figure 4C. Relationship Between Physician Visits and Part B Reimbursements for Evaluation and Management per Decedent During the Last Two Years of Life (Deaths Occurring 2000-03) Among Selected Hospitals in the Miami and Fort Myers Hospital Referral Regions



Appendix Figure 4D. Relationship Between E&M Reimbursements per Physician Visit and E&M Reimbursements per Decedent During the Last Two Years of Life (Deaths Occurring 2000-03) Among Selected Hospitals in the Miami and Fort Myers Hospital Referral Regions



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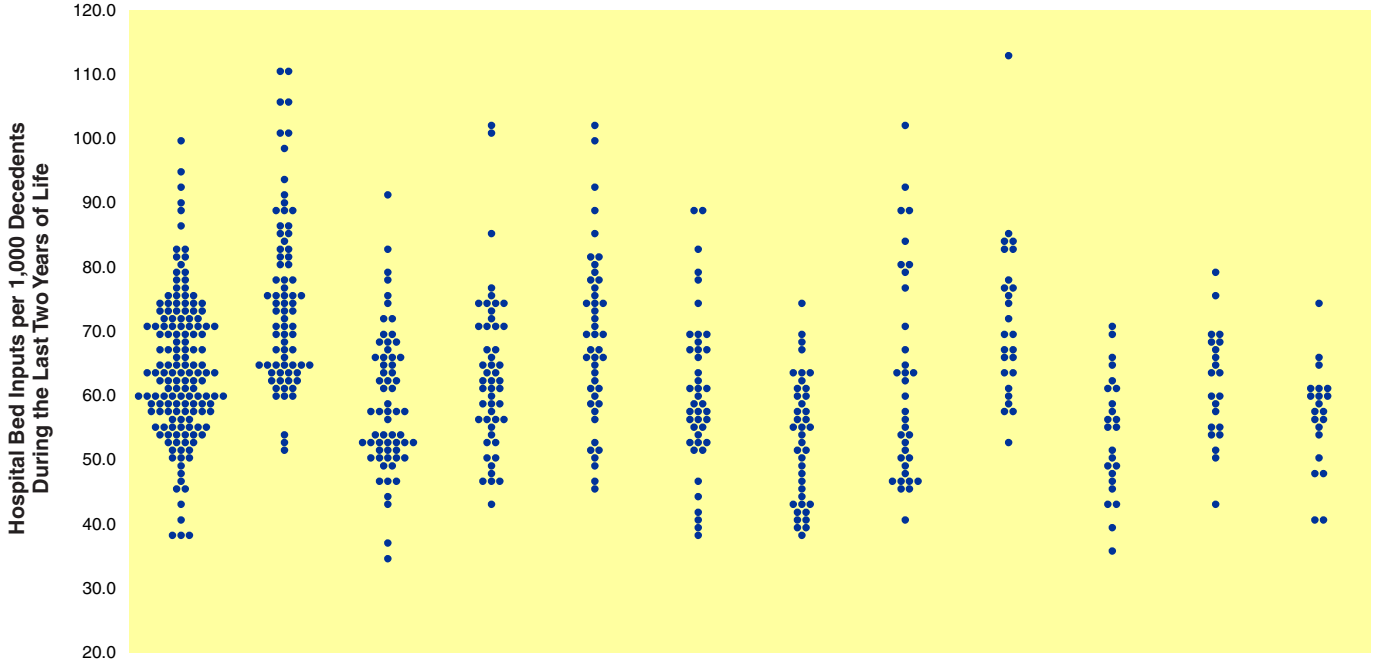
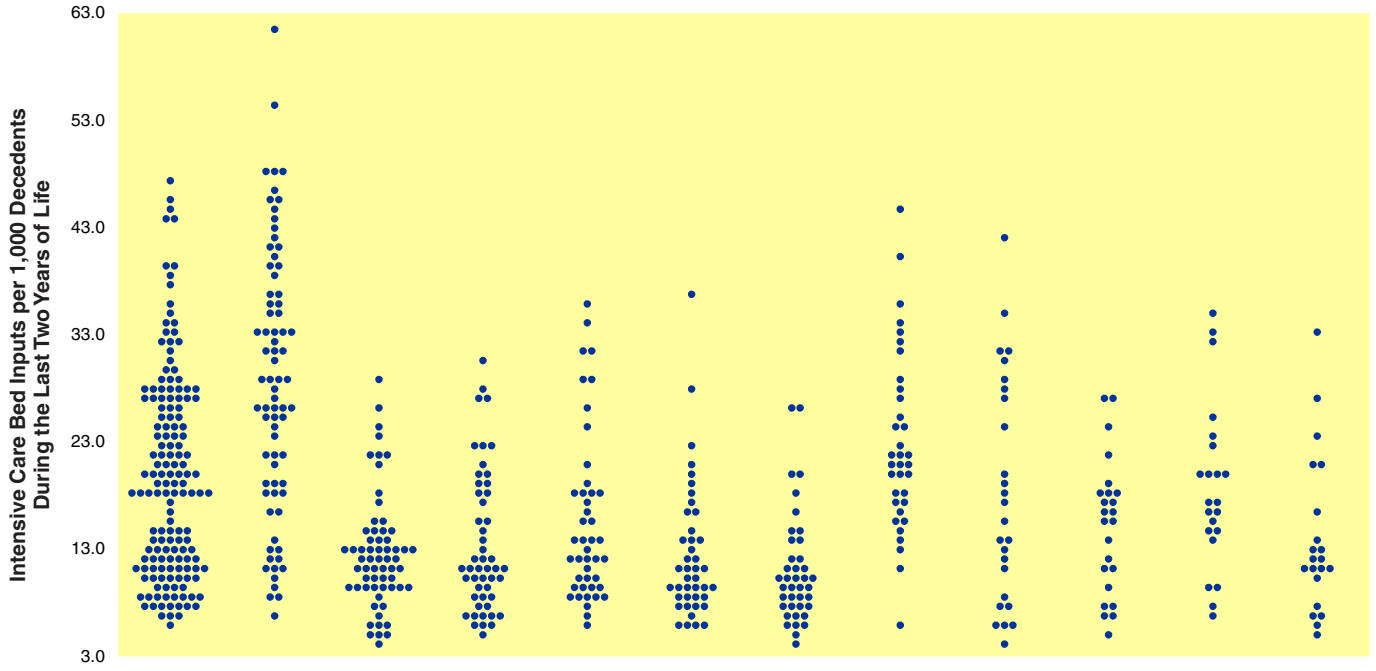
Maximum	18,672	19,896	11,816	13,423	12,674	12,017	10,483	20,032	14,751	13,275	12,063	10,003
75th percentile	11,214	15,089	9,046	9,379	9,801	8,634	8,341	13,118	12,237	9,415	10,667	8,649
System average	10,469	12,267	8,047	9,334	8,637	7,783	8,023	11,236	11,030	8,935	10,241	8,490
25th percentile	8,197	9,741	6,701	7,525	7,001	6,981	5,927	9,537	9,697	6,422	8,242	7,461
Minimum	5,250	6,413	4,328	4,438	3,443	5,669	4,647	6,409	7,015	4,758	5,943	5,516

Appendix Figure 4E. Medicare Reimbursements for Part B Care During the Last Two Years of Life (Deaths Occurring in 2000-03)



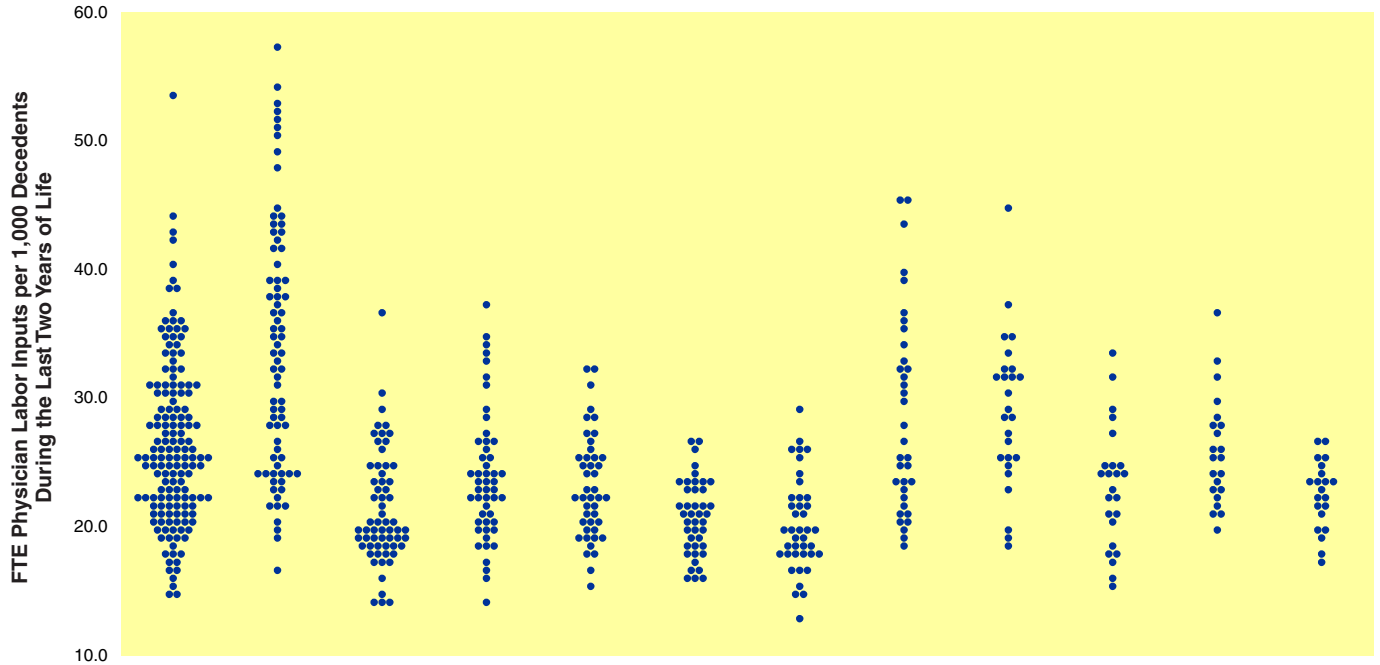
	HCA	Tenet Healthcare Corporation	Community Health Systems, Inc.	Ascension Health	Health Manage-ment Associates	Triad Hospitals, Inc.	Catholic Health Initiatives	Catholic Healthcare West	Catholic Health East	Trinity Health	Adventist Health System Sunbelt	Catholic Healthcare Partners
Maximum	99.8	110.9	91.0	102.0	102.2	89.3	74.7	101.8	113.5	70.5	79.3	74.9
75th percentile	71.4	82.9	65.6	70.9	77.1	67.5	60.1	74.3	77.5	61.4	68.1	60.9
System average	64.6	74.4	60.8	64.6	67.8	61.6	57.2	62.0	71.4	56.8	62.0	57.6
25th percentile	57.3	64.7	51.6	55.8	60.0	53.4	43.8	50.0	63.3	47.7	55.2	53.6
Minimum	38.1	51.7	34.1	43.4	45.5	38.9	38.6	40.2	53.2	35.8	43.7	40.4

Appendix Figure 4F. Hospital Bed Inputs During the Last Two Years of Life (Deaths Occurring in 1999-2003)



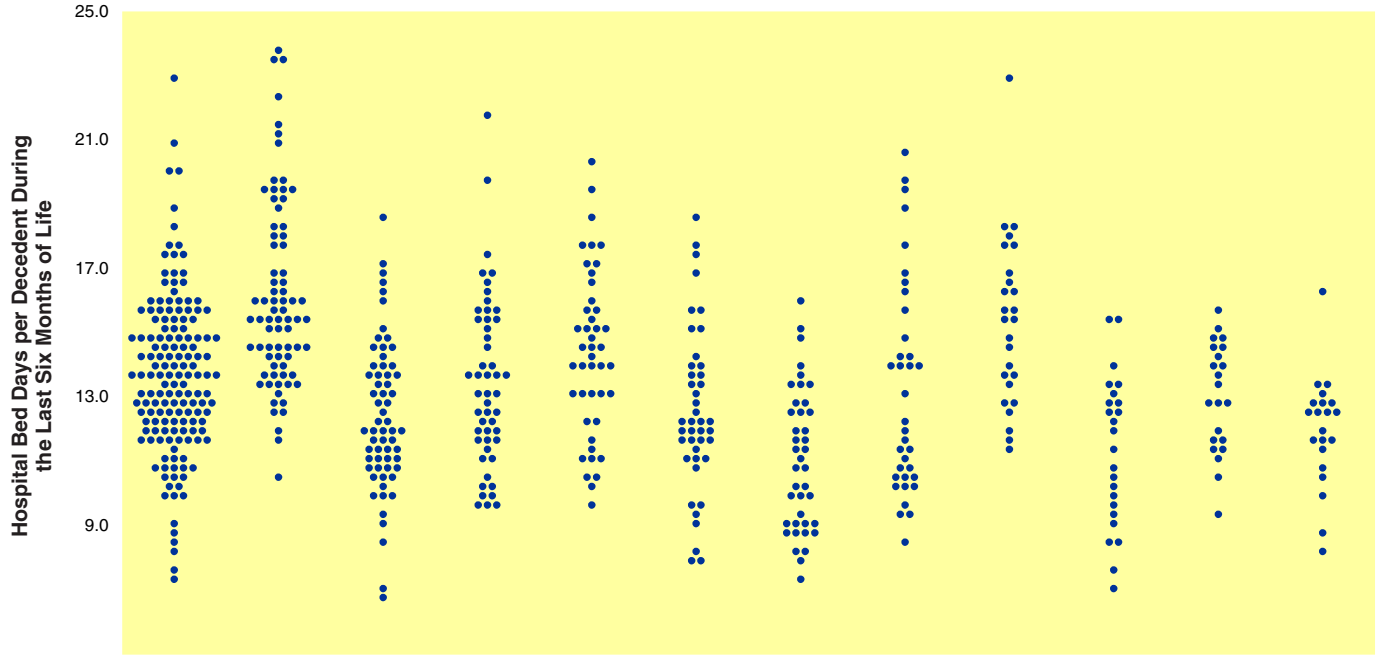
	HCA	Tenet Healthcare Corporation	Community Health Systems, Inc.	Ascension Health	Health Manage-ment Associates	Triad Hospitals, Inc.	Catholic Health Initiatives	Catholic Healthcare West	Catholic Health East	Trinity Health	Adventist Health System Sunbelt	Catholic Healthcare Partners
Maximum	47.5	61.9	28.6	30.2	35.9	36.5	26.2	44.5	42.1	27.3	34.6	33.1
75th percentile	26.8	36.5	14.3	18.5	18.5	14.2	12.4	27.5	27.6	18.1	22.0	16.8
System average	20.9	28.3	13.7	14.1	16.2	12.2	11.8	22.4	18.5	16.4	22.1	14.7
25th percentile	11.5	19.0	9.6	8.5	9.6	8.4	7.8	17.4	9.5	11.0	15.0	10.1
Minimum	6.0	6.6	3.7	4.9	6.1	5.5	4.4	5.7	4.4	4.6	6.9	5.2

Appendix Figure 4G. ICU Bed Inputs During the Last Two Years of Life (Deaths Occurring in 1999-2003)



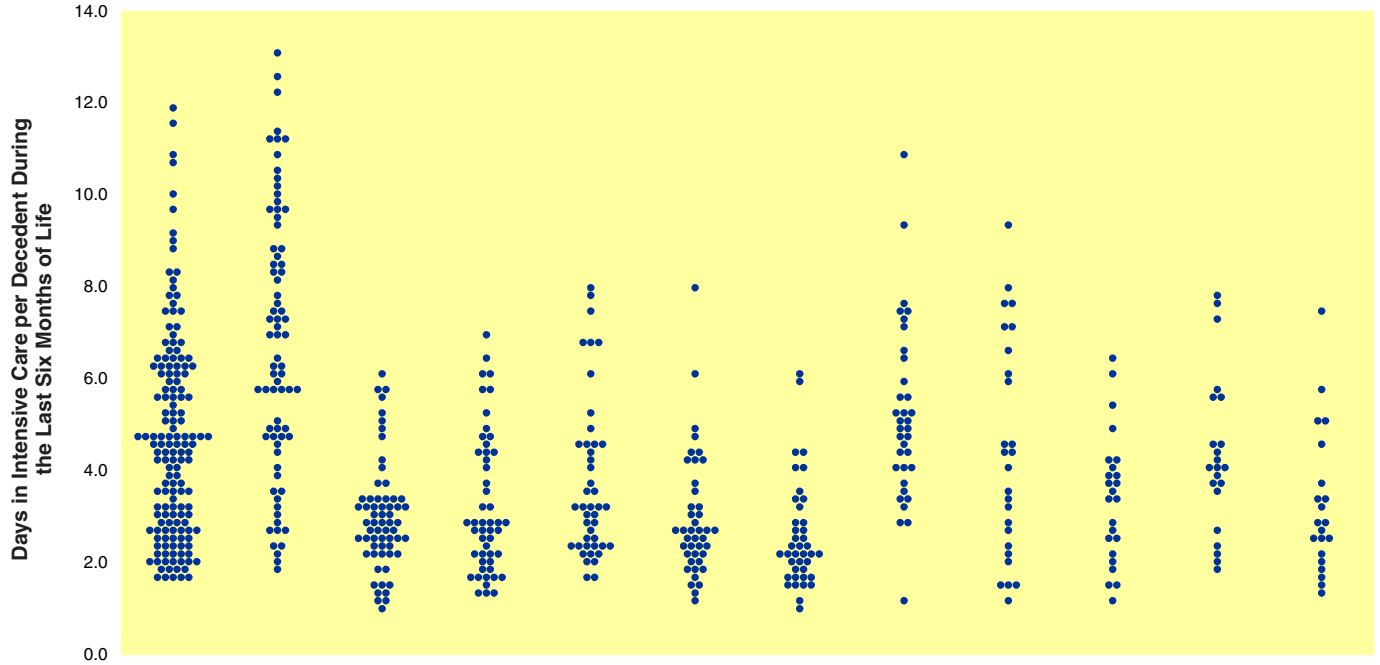
	HCA	Tenet Healthcare Corporation	Community Health Systems, Inc.	Ascension Health	Health Manage-ment Associates	Triad Hospitals, Inc.	Catholic Health Initiatives	Catholic Healthcare West	Catholic Health East	Trinity Health	Adventist Health System Sunbelt	Catholic Healthcare Partners
Maximum	53.4	57.6	36.4	37.0	32.0	26.8	29.0	45.6	45.0	33.8	36.9	26.9
75th percentile	30.3	40.9	24.0	26.4	25.5	22.8	22.1	33.3	32.0	25.0	27.9	24.3
System average	27.5	33.3	22.3	25.0	23.5	20.9	22.1	28.4	29.2	24.3	27.9	23.3
25th percentile	21.7	24.9	18.7	20.5	20.1	18.7	17.8	22.4	25.2	19.8	22.9	20.9
Minimum	14.7	16.9	14.1	14.1	15.5	16.0	12.6	18.6	18.4	15.6	19.6	17.3

Appendix Figure 4H. Standardized FTE Physician Labor Inputs During the Last Two Years of Life (Deaths Occurring 2000-03)



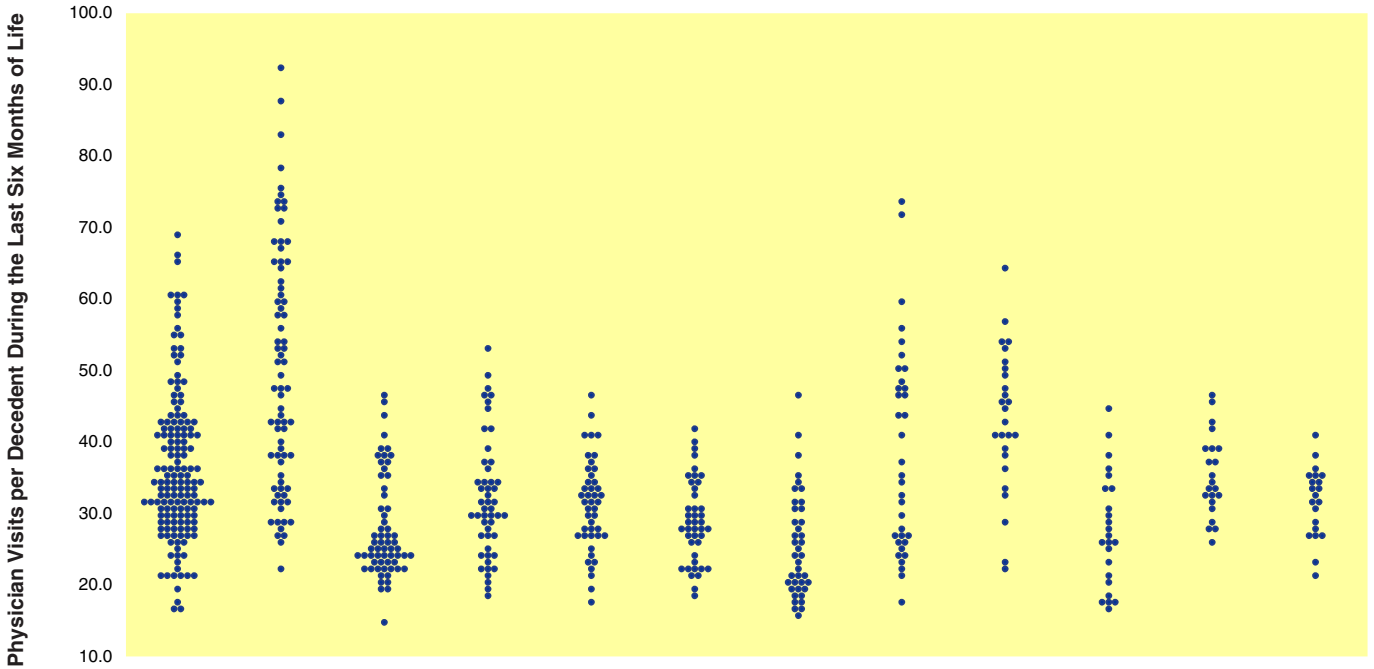
	HCA	Tenet Healthcare Corporation	Community Health Systems, Inc.	Ascension Health	Health Manage-ment Associates	Triad Hospitals, Inc.	Catholic Health Initiatives	Catholic Healthcare West	Catholic Health East	Trinity Health	Adventist Health System Sunbelt	Catholic Healthcare Partners
Maximum	23.0	23.9	18.6	21.9	20.3	18.7	16.0	20.6	23.0	15.4	15.8	16.4
75th percentile	15.1	18.0	13.9	15.5	15.8	14.0	12.7	15.3	16.7	13.0	14.4	12.7
System average	13.8	16.0	12.8	13.9	14.3	12.8	12.0	13.1	15.3	12.1	13.3	12.1
25th percentile	12.1	14.2	10.9	11.7	12.9	11.3	9.1	10.6	13.6	9.6	11.5	11.3
Minimum	7.3	10.4	6.6	9.6	9.6	7.8	7.4	8.6	11.5	7.0	9.4	8.2

Appendix Figure 4I. Hospital Days per Decedent During the Last Six Months of Life (Deaths Occurring 1999-2003)



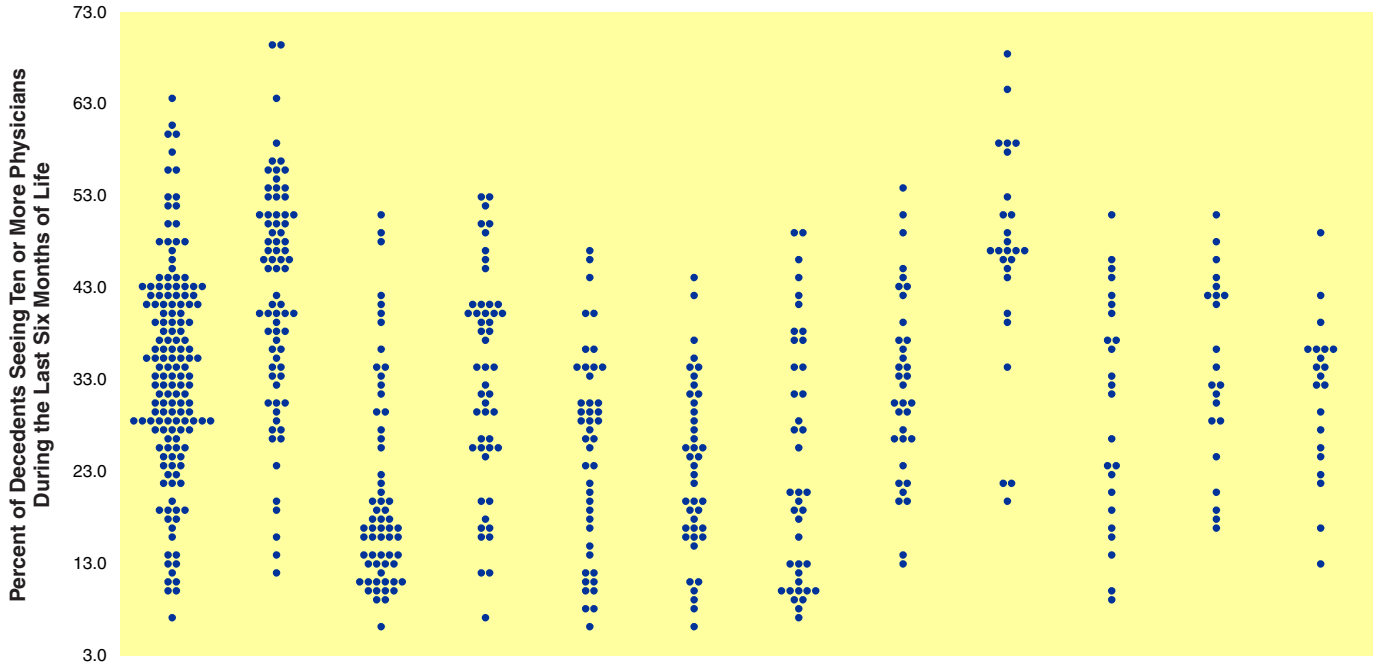
	HCA	Tenet Healthcare Corporation	Community Health Systems, Inc.	Ascension Health	Health Manage-ment Associates	Triad Hospitals, Inc.	Catholic Health Initiatives	Catholic Healthcare West	Catholic Health East	Trinity Health	Adventist Health System Sunbelt	Catholic Healthcare Partners
Maximum	11.8	13.2	6.1	6.9	8.0	8.0	6.1	10.9	9.3	6.4	7.8	7.5
75th percentile	6.2	8.8	3.4	4.4	4.6	3.5	3.0	6.2	6.5	4.1	5.3	3.8
System average	5.0	6.7	3.2	3.4	3.9	2.9	2.8	5.1	4.5	3.7	5.1	3.4
25th percentile	2.8	4.7	2.4	2.0	2.4	2.2	1.8	4.1	2.4	2.4	3.6	2.1
Minimum	1.6	1.9	1.0	1.3	1.6	1.2	0.9	1.2	1.2	1.1	1.8	1.4

Appendix Figure 4J. Days in Intensive Care per Decedent During the Last Six Months of Life (Deaths Occurring 1999-2003)



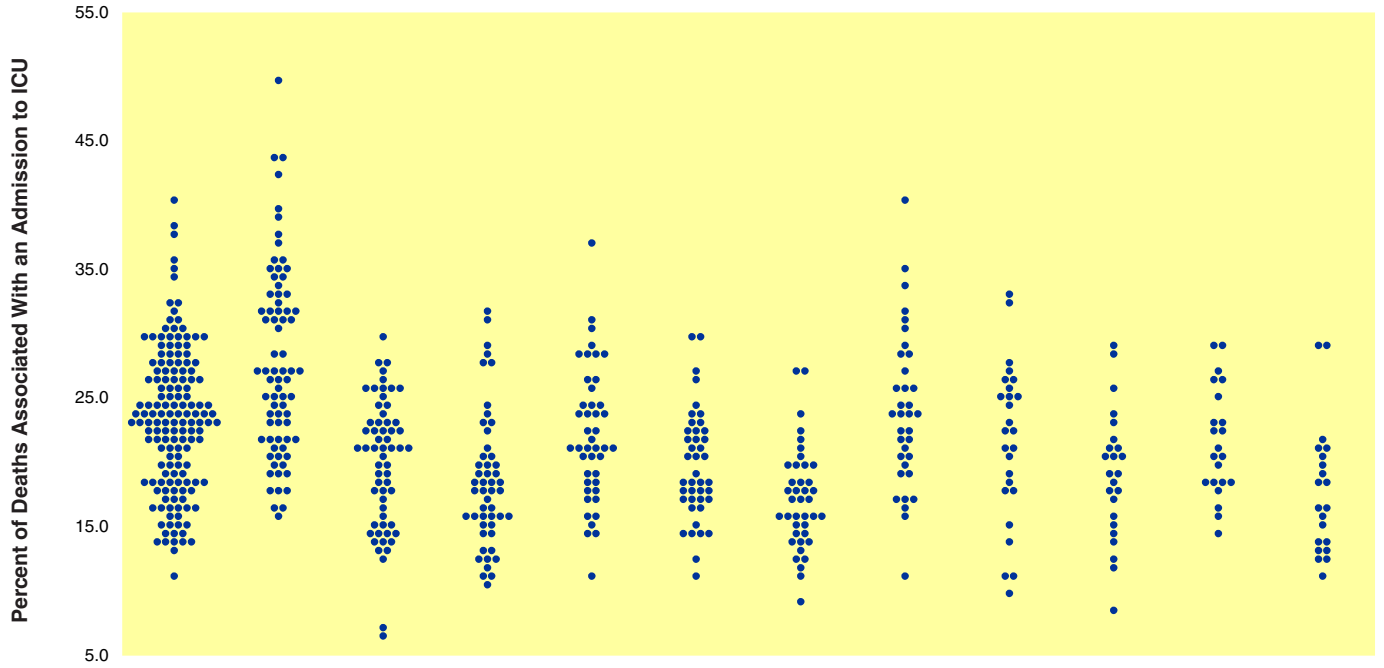
	HCA	Tenet Healthcare Corporation	Community Health Systems, Inc.	Ascension Health	Health Manage-ment Associates	Triad Hospitals, Inc.	Catholic Health Initiatives	Catholic Healthcare West	Catholic Health East	Trinity Health	Adventist Health System Sunbelt	Catholic Healthcare Partners
Maximum	69.3	92.8	46.2	53.4	46.8	42.3	46.1	74.0	64.5	44.5	46.8	40.6
75th percentile	42.2	63.4	32.3	35.9	34.8	33.5	30.5	48.1	49.7	33.6	39.1	35.0
System average	38.0	48.9	30.0	33.8	32.3	29.5	28.9	38.2	43.8	30.0	38.4	33.2
25th percentile	29.4	34.8	23.4	26.7	27.1	24.8	19.9	26.2	38.6	20.8	31.5	27.6
Minimum	16.3	21.9	14.3	18.3	17.9	18.9	16.0	17.4	22.7	16.3	25.6	21.5

Appendix Figure 4K. Physician Visits per Decedent During the Last Six Months of Life (Deaths Occurring 2000-03)



	HCA	Tenet Healthcare Corporation	Community Health Systems, Inc.	Ascension Health	Health Manage-ment Associates	Triad Hospitals, Inc.	Catholic Health Initiatives	Catholic Healthcare West	Catholic Health East	Trinity Health	Adventist Health System Sunbelt	Catholic Healthcare Partners
Maximum	64.1	69.9	50.9	53.2	47.2	44.0	49.4	54.0	68.3	51.2	51.0	49.1
75th percentile	41.5	50.8	27.1	40.8	33.5	30.3	35.4	37.9	52.6	40.7	42.2	36.4
System average	36.8	42.6	24.6	36.5	27.0	24.8	31.3	31.9	48.7	34.9	39.0	34.1
25th percentile	27.5	34.2	13.2	25.4	16.0	16.7	11.7	26.5	44.6	20.2	28.8	25.4
Minimum	7.2	12.3	6.2	7.1	6.4	5.6	7.1	13.4	20.2	9.2	16.9	13.2

Appendix Figure 4L. Percent of Decedents Seeing Ten or More Physicians During the Last Six Months of Life (Deaths Occurring 2000-03)



	HCA	Tenet Healthcare Corporation	Community Health Systems, Inc.	Ascension Health	Health Manage-ment Associates	Triad Hospitals, Inc.	Catholic Health Initiatives	Catholic Healthcare West	Catholic Health East	Trinity Health	Adventist Health System Sunbelt	Catholic Healthcare Partners
Maximum	40.2	50.0	29.7	31.8	37.1	29.6	27.3	40.3	33.3	29.2	29.4	29.2
75th percentile	27.2	32.6	23.0	20.2	24.9	22.4	19.7	27.5	25.5	21.1	24.6	20.4
System average	23.4	27.2	20.4	19.1	21.9	19.9	17.7	23.5	21.6	19.9	22.3	17.7
25th percentile	18.8	22.0	15.4	15.3	18.6	17.1	14.7	19.9	18.1	15.8	18.3	13.5
Minimum	11.2	16.1	6.2	10.7	11.5	11.5	9.3	11.2	10.1	8.5	14.3	11.0

Appendix Figure 4M. Percent of Deaths Associated with an Admission to Intensive Care Unit (Deaths Occurring 1999-2003)

Appendix Table 3A. Medicare Spending and Utilization per Decedent During the Last Two Years of Life Among Chronically Ill Patients Receiving Most of Their Inpatient Care at Hospitals in the New York-Presbyterian Healthcare System

Hospital Name	Number of deaths	Inpatient reimbursements	Hospital days	Inpatient reimbursements per patient day	Part B payments for evaluation & management	Physician visits	E&M payments per physician visit
Wyckoff Heights Hospital	1,093	69,734	49.3	1,413	7,967	112.4	71
Brooklyn Hospital Center	1,710	66,605	45.3	1,470	5,831	87.2	67
New York-Presbyterian Hospital	6,072	57,079	41.0	1,392	5,927	84.2	70
New York Methodist Hospital	3,208	56,978	48.4	1,178	7,753	112.5	69
New York Community Hospital of Brooklyn	974	50,115	44.2	1,135	9,339	139.2	67
New York Hospital Medical Center of Queens	3,360	44,582	36.1	1,235	5,751	85.9	67
Palisades General Hospital	1,516	39,751	43.5	914	6,883	109.4	63
New York Westchester Square Medical Center	1,478	35,910	39.2	915	8,470	119.1	71
New York United Hospital Medical Center	916	31,902	32.9	970	6,434	93.4	69
New York-Presbyterian Healthcare System average	20,327	52,179	42.0	1,242	6,730	98.2	69
United States average	**4,692,623**	**24,491**	**23.9**	**1,023**	**3,901**	**66.7**	**58**

The data are for Medicare decedents with one or more hospitalizations for chronic illness during the last two years of life who received most of their inpatient care from a hospital listed in the table. The data for inpatient reimbursements, hospital days, and reimbursements per day in hospital are for deaths occurring 1999-2003. The data for Part B payments for evaluation and management services, physician visits, and payments per physician visit are for deaths occurring 2000-03.

Appendix Table 3B. Disaggregation of Part B Payments for Evaluation & Management Services per Decedent During the Last Two Years of Life into Contributions of Volume and Price.

Hospital Name	Ratios to U.S. average					Ratios to New York-Presbyterian Healthcare System average				
	E&M reimb.	=	Physician visits	x	Reimb. per visit	E&M reimb.	=	Physician visits	x	Reimb. per visit
New York Community Hospital of Brooklyn	2.39	=	2.09	x	1.15	1.39	=	1.42	x	0.98
New York Westchester Square Medical Center	2.17	=	1.79	x	1.22	1.26	=	1.21	x	1.04
Wyckoff Heights Hospital	2.04	=	1.68	x	1.21	1.18	=	1.14	x	1.03
New York Methodist Hospital	1.99	=	1.69	x	1.18	1.15	=	1.15	x	1.01
Palisades General Hospital	1.76	=	1.64	x	1.08	1.02	=	1.11	x	0.92
New York United Hospital Medical Center	1.65	=	1.40	x	1.18	0.96	=	0.95	x	1.00
New York-Presbyterian Hospital	1.52	=	1.26	x	1.20	0.88	=	0.86	x	1.03
Brooklyn Hospital Center	1.49	=	1.31	x	1.14	0.87	=	0.89	x	0.98
New York Hospital Medical Center of Queens	1.47	=	1.29	x	1.14	0.85	=	0.87	x	0.98

The data are for Medicare decedents with one or more hospitalizations for chronic illness during the last two years of life who received most of their inpatient care from a hospital listed in the table. The data are for deaths occurring January 1, 2000 to December 21, 2003.

Appendix Two

Methods

The methods used in the current report, "Variations in the Management of Severe Chronic Illness: A Report on the Medicare Program," were developed over the course of several years and have been described in detail in peer-reviewed publications.[a,b] This appendix provides a summary of these methods.

Databases used in the Analysis

The primary database is derived from five CMS research files for traditional (fee-for-service) Medicare: the Denominator File (which provides information on all Medicare beneficiaries' demographic data, eligibility status, and date of death); the MEDPAR File (which contains a record for each acute care discharge for Medicare beneficiaries); and three Standard Analytic Files (SAFs): Physician/Supplier Part B (a 20% sample of claims submitted by physicians), Outpatient (which contains a record for each bill submitted by an outpatient facility), and Hospice.

Study Populations

The follow-back from death studies reported in this edition of the Atlas are for two study populations, one based on assignment of decedents to the hospital they most frequently used in the last two years of life (Chapters Three and Four), the other on place of residence at time of death (Chapters Two and Five). To allow for two years of follow-back for all patients, the populations are restricted to those whose age on the date of death was 67 to 99 years.

Populations assigned to specific hospitals. We used claims data for Medicare beneficiaries who died over the five-year period 1999-2003 and who were hospitalized at least once during the last two years of life for a medical (non-surgical) condition. The reason we did not rely on surgical admissions to assign patients to hospitals is that we wanted to avoid the effect of selective referral on assignment to hospital; for example, patients with elective bypass surgery who might not use that specific hospital as their usual source of care. (This also served to reduce the likelihood that a surgical complication was the cause of death.) We further restricted the analysis to patients who had one or more of 12 chronic illnesses associated with a high probability of death.[c] Claims data were used to assign each patient to the hospital the patient used most often during the last

two years of life. In the case of a tie, patients were assigned to the hospital associated with the discharge closest to date of death. Because seriously ill patients are highly loyal to the hospital where they receive their care – as is shown elsewhere [d] – utilization rates reflect the approach to chronic disease management of the physicians who practice in association with that hospital. Missing data for a specific hospital and specific measure indicate that there were too few deaths at that hospital to support measurement. The minimum population size for reporting measures at the hospital level is 80 deaths for the MEDPAR and Hospice files. For the Part B file the minimum sample size is 64 deaths. We arrived at this number according to the following method. Each hospital must have had 400 deaths reported in the denominator file during the entire period 1999-2003. Since we had only a 20% sample (80 deaths) and were missing data for the year 1999 (losing approximately 16 deaths) we were left with a minimum of 64.

Populations grouped by place of residence. The allocation rules for assigning patients to state or hospital referral region are much simpler than those for hospitals, because they are based on the patient's ZIP code of residence rather than the hospital to which they were admitted. The sample is limited to those who were residents of a given geographic area at the date of death. Data are a 20% sample of deaths occurring over a four-year period, January 1, 2000 to December 31, 2003 (i.e., those deaths that were included in the CMS 20% sample of Part B claims). While the hospital-specific analysis excludes isolated surgical procedures (as noted above), these are included in the state and regional analysis because these procedures typically take place within the geographic area. The analysis is similar to the hospital-specific study in that the sample is limited to patients who had one or more of the 12 chronic illnesses. However, we were also able to include non-hospitalized patients living in the region, those identified with one or more of the 12 chronic conditions who had two or more encounters with health providers more than two weeks apart.

Note that the sample size of the hospital-specific database is larger than for the region-based data. This is because the hospital-specific measures are limited only to those who were actually admitted to the hospital in question, allowing us to use the larger 100% inpatient sample. In order to identify non-hospitalized patients with chronic illness (as we do for the regional analysis), the Part B data on diagnoses associated with physician visits are necessary, which requires the 20% sample.

Appendix Table A provides information on the number of decedents according to diagnosis for the hospital-specific chronic illness cohort and the geographic chronic illness cohort. Appendix Table B describes the characteristics of all decedents who were hospitalized, according to their cause of hospitalization (and thus whether they are included in the hospital-specific chronic illness cohort). Appendix Table C describes the characteristics of all decedents with chronic illness and their hospitalization status.

Appendix Table A. Number of Decedents According to Diagnosis and Database.

Diagnosis	Hospital-Specific Chronic Illness Cohort	Geographic Chronic Illness Cohort
	Decedents 1999-2003	Decedents 2000-2003
Cancer (solid tumors)	1,102,381	356,277
Lymphoma and Leukemia	196,384	45,114
Chronic Pulmonary Disease	1,559,954	435,529
Coronary Artery Disease	2,014,793	422,613
Congestive Heart Failure	2,484,373	565,371
Peripheral Vascular Disease	564,389	328,963
Severe Chronic Liver Disease	94,981	20,458
Diabetes w/ End Organ Damage	109,513	125,329
Chronic Renal Failure	330,115	148,753
Nutritional Deficiencies	748,756	194,176
Dementia	1,310,840	371,708
Functional Impairment	454,753	149,127
Total Number of Decedents	**4,692,623**	**1,003,554**

Note: The Geographic Database is smaller in size than the Hospital-Specific Database because it relies exclusively on the Part B (20%) data sample.

Appendix Table B. Hospitalized Decedents (1999-2003) According to Cohort Membership Status.

	1999-2003 Hospitalized Decedents	
	Number of Decedents	Percent of Decedents
Hospital Specific Cohort	4,692,623	69.7
Chronic Illness, Surgery Only	371,678	5.52
Other Medical Illness	442,625	6.57
Other Surgery	89,202	1.33
(Assigned to non-US hospitals)	-608	-0.01
All Hospitalized Decedents	**5,596,736**	**83.13**

The hospitalized chronic illness cohort includes only those hospitalized with at least one medical admission and a diagnosis of one of the 12 chronic illnesses listed in Appendix Table A on at least one admission. Data are based on a 100% sample of Medicare enrollees.

Appendix Table C. Decedents (2000-2003) According to Cohort Membership Status.

	2000-03 Geographic Database		
	Number of Decedents	Percent of Decedents	
		% of Chronically Ill	% of All Decedents
Chronic Illness Cohort	**1,003,554**		**93.26**
Hospital Specific Cohort*	753,878	75.12	70.06
Chronic Illness, Surgery Only	58,884	5.87	5.47
Other Medical Illness	52,755	5.26	4.9
Other Surgery	10,343	1.03	0.96
Not Hospitalized	127,694	12.72	11.87
All Other Decedents			
Hospitalized Decedents	20,620		1.92
Not Hospitalized	51,887		4.82
Total Decedents	**1,076,061**		**100**

The chronic illness cohort includes all decedents with one of the 12 chronic illnesses listed in Appendix Table A. The hospital-specific chronic illness cohort corresponds to the cohorts described in Table A and B, but is smaller due to (a) the use of a 20% sample of beneficiaries, and (b) restriction to the period 2000-2003 rather than the 1999-2003 database.

Measures of Resource Inputs

Measures of resource inputs, including physician labor, hospital beds, intensive care beds and Medicare program spending (reimbursements) are presented as summary measures over the last two years of life. Bed input rates were calculated by summing patient days and dividing by 365. Physician labor inputs were measured by summing the work relative value units (RVUs) on a specialty-specific basis and dividing by the average annual number of work RVUs produced by that specialty per physician. The measure was used to estimate the standardized full-time equivalent (FTE) physician labor input. Both bed and FTE physician resources are expressed as inputs per 1,000 decedents. Inpatient reimbursements were calculated by summing Medicare reimbursements from the MEDPAR record and reflect total reimbursements, including indirect costs for medical education, disproportionate share payments and outlier payments. Part B payments were for all services included in the Part B Physician Supplier File. Inpatient reimbursements and Part B payments were measured as spending per decedent. All resource input rates were calculated based on the total experience of the population over the given period of time, not only from the care received at the assigned hospital or physicians associated with that hospital. In the case of the geographic studies, it includes care given by providers located out of region as well as within region.

Measures of Utilization

The measures of utilization are for inpatient care and physician services. We calculated hospital days, intensive care unit days, and physician visits (overall and separately for primary care physicians and medical specialists) for each patient over the last six months of life. Utilization rates were calculated on the total experience of the cohort, not just the services provided by the hospital and the physicians associated with the hospital to which the decedent was assigned. The proportion of total hospital care provided by the assigned hospital (loyalty) was high, so the variations in utilization among hospital cohorts primarily reflect clinical choices made by physicians associated with that hospital. Similarly, in the geographic studies, most care was provided by hospitals and physicians located within the state or region. The measures of utilization — patient days in hospital, patient days in intensive care units and physician visits — are traditional epidemiologic, population-based rates of events occurring over a designated period of time.

Quality of Care Indicators

Two claims-based quality of care measures were used. The percent of patients seeing ten or more physicians is a measure of the propensity to refer patients. High scores on this measure could indicate lack of continuity of care. The percent of deaths occurring during a hospitalization that involved one or more stays in an ICU is an indicator of the aggressiveness with which terminal patients were treated. In light of the evidence that more aggressive care in managing patient populations with chronic illness does not lead to longer length of life or improved quality of life, higher scores on this measure can be viewed as an indicator of lower quality of death.

We also report quality measures regarding the processes of care, specifically the under-use of effective care derived from the consensus measures set of the Hospital Quality Alliance (HQA), the first initiative to routinely report data on U.S. hospitals nationally. Data are posted on the CMS web site.[e] We provide summary scores on five measures for managing acute myocardial infarction (AMI); two for congestive heart failure (CHF); and three for pneumonia, for all reporting hospitals located within each hospital referral region. In addition, we report a composite score, which is the weighted average of the three condition-specific summary scores. For individual hospitals, summary scores are based on measures for which there were 25 or more eligible patients.[f] In this edition of the Dartmouth Atlas the data are for the CMS release covering the first two quarters of 2004.

Statistical methods

We compared measures of resource inputs, utilization and quality at fixed intervals prior to death among geographic regions and hospitals. All utilization and resource input measures were further adjusted for differences in age, sex, race and the relative predominance of the 12 chronic conditions, using ordinary least squares for Medicare spending variables and over-dispersed Poisson regression models for all other variables. 95th percentile confidence limits were calculated for all variables. The HQA technical process quality of care measures were not adjusted for differences in case mix among hospitals, as they are specifically restricted to those patients eligible for the specific treatment and do not, therefore, need adjustment.

Caveats and Limitations

Certain limitations of our measures need to be mentioned.

Sample sizes and data issues. The data are for traditional Medicare (Part A and Part B) program and do not include Medicare enrollees enrolled in managed care organizations under Medicare Part C. The measures of physician resource input and utilization are based on a 20% sample, reducing the precision of our estimates. For hospital-specific cohorts, we addressed this by limiting reporting for these services to hospitals with 400 decedents (expected 20% sample size for four years = 64 deaths). Data fields for measures based on Part B are left blank for hospitals with less than 400 decedents. Approximately 6% of hospitals failed to report on their use of intensive care beds and for these hospitals, this measure is left blank. Our measure of the propensity to use multiple physicians —the percent of decedents seeing ten or more physicians — depends on the accuracy of the coding of individual physician encounters using the UPIN number. If a given patient was seen by multiple physicians but only one UPIN was recorded, this would have resulted in an underestimate of the number of individual physicians seen.

Denominator for hospital-specific cohorts. The hospital-specific studies are based on Medicare decedents with one or more medical hospitalizations during the last two years of life (as shown in Appendix Table B). Because we had no reliable method for assigning non-hospitalized patients with chronic illness to hospitals, decedents who were not hospitalized were not included in the denominator used in calculating population-based resource input and utilization rates for the hospital-specific cohort. This limitation does not exist at the regional level, where patients were assigned to regions on the basis of their place of residence, making it possible to identify patients who were not hospitalized.

To estimate the impact of not including non-hospitalized patients with chronic illness in the denominator for calculating rates for the hospital-specific cohort, we compared rates for regions calculated without the inclusion of non-hospitalized chronically ill decedents in the denominator (Hospitalized Cohort Denominator Method) to rates calculated with the inclusion of non-hospitalized decedents (Full Cohort Denominator Method). This analysis compared rates under each of these two methods, which were calculated for the 306 hospital referral regions for deaths occurring in 2000-03. The key findings were:

- The proportion of Medicare decedents with severe chronic illness who were not hospitalized at least once for a medical (non-surgical) admission varied substantially from region to region — from less than 15% to more than 35% among regions.

- Regions with *lower* percentages not hospitalized tended to have *higher* per capita utilization rates. The correlation among regions between the percent of chronically ill decedents who were not hospitalized during the last two years of life and patient days per decedent calculated under the Hospitalized Cohort Denominator Method had an $R^2 = .39$ (Appendix Figure A); and the same correlation using the patient days calculated under the Full Cohort Denominator Method had an $R^2 = .49$ (Appendix Figure B).

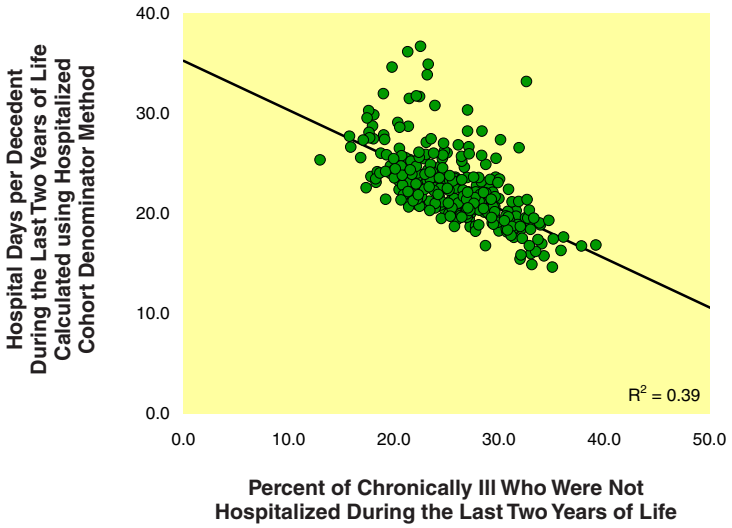


Figure A. The Relationship Between the Percent Not Hospitalized and Hospital Days per Decedent During the Last Two Years of Life (Hospitalized Cohort Denominator Method) Among Hospital Referral Regions (Deaths Occurring 2000-03)

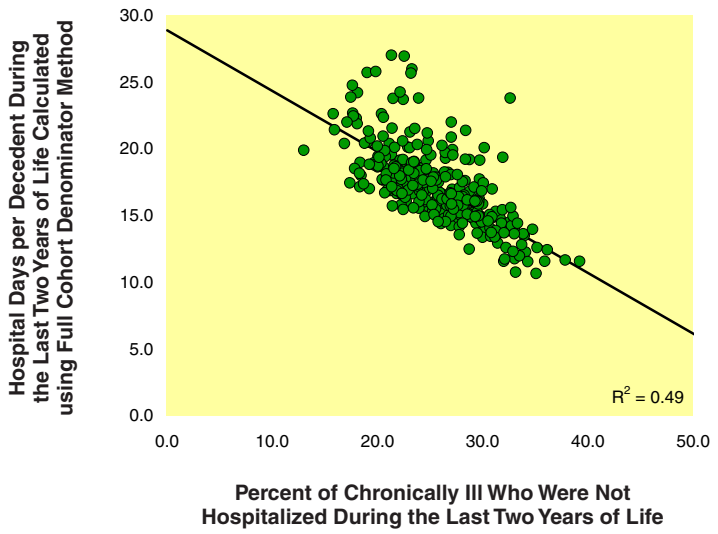


Figure B. The Relationship Between the Percent Not Hospitalized and Hospital Days per Decedent During the Last Two Years of Life (Full Cohort Denominator Method) Among Hospital Referral Regions (Deaths Occurring 2000-03)

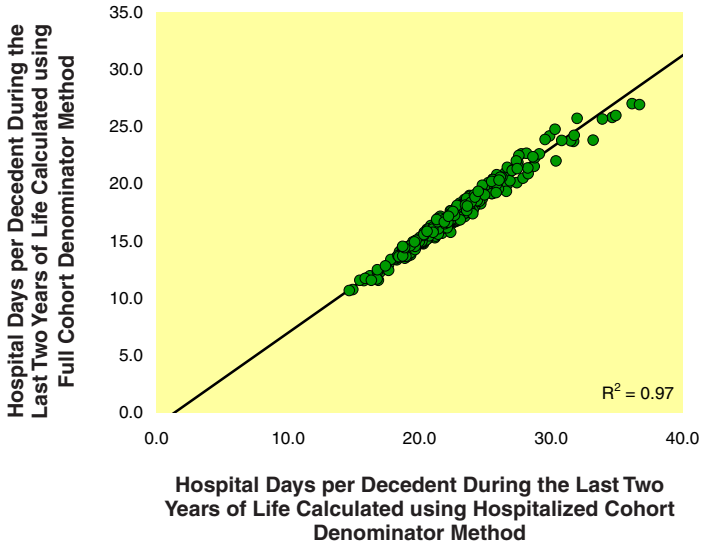
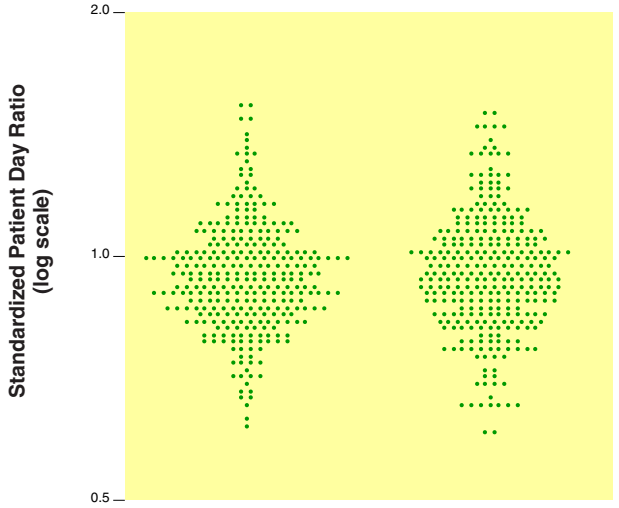


Figure C. The Relationship Between Hospital Days per Decedent During the Last Two Years of Life Among Hospitalized Cohort and Full Denominator Cohort Among Hospital Referral Regions (Deaths Occurring 2000-03)

- In examining the estimates of patient days per decedent obtained by the two methods, it became apparent that (1) the correlation between rates generated using the two methods was very high: R^2 = .97 (Appendix Figure C); and (2) variation was less (measured by the extremal range, interquartile ratio and coefficient of variation) when the rates were calculated using the Hospitalized Cohort Denominator Method (Appendix Figure D).



	Hospitalized Cohort Denominator Method	Full Cohort Denominator Method
Extremal ratio	2.50	2.53
Interquartile ratio	1.19	1.23
Coefficient of variation	15.9	17.2

Figure D. Hospital Days per Decedent During the Last Two Years of Life Among Hospitalized Cohort and Full Denominator Cohort Among Hospital Referral Regions (Deaths Occurring 2000-03)

These studies show that the Hospitalized Cohort Denominator Method (which we use for our hospital-specific analyses) underestimates the "true" population-based rates to a greater extent in regions with lower utilization rates. A reasonable inference would be that our hospital-specific analyses underestimate the variations among hospitals, and that those hospitals with lower patient day rates would actually be even more conservative (have even lower rates) than we report if we were able to include all decedents cared for by the hospital and its associated physicians.

Exclusion of isolated surgical hospitalizations. The hospital-specific follow-back studies of the chronically ill were designed to require at least one medical (non-surgical) hospitalization to qualify for inclusion. This was done to avoid confusing (1) a surgical referral as evidence that a given hospital was involved in the medical management of chronic illness and (2) a surgical death as a death from chronic illness. In the regional analyses, our interest in accounting for all Medicare spending and utilization in patients with chronic illness led us to include all Medicare hospitalizations (and Part B services) in the rates. A surgical edition of the Dartmouth Atlas now under development will provide details on the variations in the use of surgery during the last two years of life.

Limitations of spending data. The data in the current release are restricted to inpatient reimbursements and Part B physician services. Data from the remaining CMS files (e.g., home health care, long term care) are currently being added to the hospital-specific and regional databases; upon completion of this work, estimates of total Medicare spending, resource inputs and utilization under the Part A and B programs for the chronically ill during last two years of life will be available.

Endnotes

[a] Wennberg JE, Fisher ES, Stukel TA, Skinner JS, Sharp SM, Bronner KK. Use of hospitals, physician visits, and hospice care during last six months of life among cohorts loyal to highly respected hospitals in the United States. BMJ. 2004;328:607-610.

[b] Wennberg JE, Fisher ES, Baker L, Sharp SM, Bronner KK. Evaluating the efficiency of California providers in caring for patients with chronic illness. Health Affairs web exclusive, 16 November 2005.

[c] See L.I. Iezzoni, T. Heeren, S.M. Foley, J. Daley, J. Hughes, and G.A. Coffman, "Chronic Conditions and Risk of In-Hospital Death. Health Serv Res 29(1994):435-60. Over the five-year period, 6,741,645 deaths

occurred among Medicare beneficiaries who were enrolled in Medicare Parts A and B. The vast majority (87.2%) had serious chronic illnesses, defined as the presence of one or more of the 12 conditions specified by Iezzoni. Almost 90% of these were hospitalized at least once (86.5%). Our study population for the hospital-specific analyses was comprised of 4,692,598 beneficiaries who had one or more non-surgical admissions for chronic illness during the five-year period.

[d] J.E. Wennberg, E.S. Fisher, T.A. Stukel, and S.M. Sharp, "Use of Medicare Claims Data to Monitor Provider-Specific Performance Among Patients with Severe Chronic Illness," Health Affairs 2004;Suppl Web Exclusive:VAR5-18.

[e] http://new.cms.hhs.gov/HospitalQualityInits/25_HospitalCompare.asp

[f] The five performance measures for acute myocardial infarction are the percent of eligible patients receiving (1) aspirin at time of admission; (2) aspirin at time of discharge; (3) ACE inhibitor for left ventricular dysfunction; (4) Beta-blocker at admission; and (5) beta-blocker at discharge. The two congestive heart failure measures are percent of patients with (1) assessment of left ventricular function and (2) ACE inhibitor for left ventricular dysfunction. For pneumonia, the three measures are percent of patients with (1) oxygenation assessment; (2) pneumococcal vaccination; and (3) timing of initial antibiotic therapy. The summary scores are equally weighted average for the items in each category. Hospital-specific summary scores are given only for those hospitals for which 4 of the 5 heart attack and all of the congestive heart failure and pneumonia measures were based on 25 or more patients. See A.K. Jha, Z. Li, E.J. Orav, and A.M. Epstein, "Care in U.S. Hospitals–the Hospital Quality Alliance program," N Engl J Med 353, no. 3(2005 Jul 21):265-74. (Regional scores in this study are based on the average for each measure, obtained by summing numerator and denominator information across all reporting hospitals.)