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**HEALTHCARE COST AND
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**Agency for Healthcare
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Components of Growth in Inpatient Hospital Costs, 1997–2009

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Introduction

Inpatient hospital costs represent the largest component of health care expenditures in the United States.[1] Between 1997 and 2008, aggregate inflation-adjusted costs of inpatient community hospital stays grew by 4.4 percent annually. The largest component of growth was change in the intensity of services (cost per stay), which accounted for 71 percent of the growth in aggregate costs. Population growth was the next largest contributor to the increase in aggregate costs, accounting for 24 percent, while an increase in the number of discharges per person was only responsible for 5 percent of the growth in aggregate costs.[2]

This Statistical Brief presents updated data from the Healthcare Cost and Utilization Project (HCUP). It also expands prior analyses by examining the growth in costs from 1997–2009 associated with the 20 most common inpatient diagnoses for the elderly (aged 65 or older) and non-elderly populations (younger than 65). All differences between estimates provided in the text are statistically significant at the 0.05 level or lower. Costs for 1997 were inflation adjusted to 2009 dollars.

Findings

General findings
In 2009, there were 39.4 million inpatient stays in U.S. community hospitals (128.4 stays per 1,000 population) which cost $361.5 billion in the aggregate (table 1). The average stay lasted 4.6 days and cost $9,200 ($2,000 per day), slightly shorter and more expensive than the average inpatient stay in 1997 (4.9 days; $6,600 per stay; $1,400 per day).

[1] Hartman, M., Martin, A., McDonnell, P., Catlin, A. National Health Spending in 2007: Slower Drug Spending Contributes to Lowest Rate of Overall Growth Since 1998. Health Affairs. 28(1): 246–261, January 2009.
[2] Wier, L.M. (Thomson Reuters), Levit, K. (Thomson Reuters), Stranges, E. (Thomson Reuters), Ryan, K. (Thomson Reuters), Pfuntner, A. (Thomson Reuters), Vandivort, R. (SAMHSA), Santora, P. (SAMHSA), Owens, P. (AHRQ), Stocks, C. (AHRQ), Elixhauser, A. (AHRQ). HCUP Facts and Figures: Statistics on Hospital-Based Care in the United States, 2008. Rockville, MD: Agency for Healthcare Research and Quality, 2010 (http://www.hcup-us.ahrq.gov/reports.jsp).

Highlights

- In 2009, the average inpatient hospital stay was slightly shorter (by 0.3 days) and more expensive (by $2,600) than the average stay in 1997.

- Between 1997 and 2009, the aggregate cost of stays for non-elderly patients (up 4.4 percent annually) grew more quickly than the cost of stays for elderly patients (up 3.1 percent annually).

- Growth in the aggregate cost of stays for the non-elderly was driven by growth in the cost per day. Growth in the population, the number of stays per population, and the average length of stay accounted for the remainder of the growth in aggregate costs.

- Growth in the aggregate cost of stays for the elderly was also driven by growth in the cost per day; however, it was dampened by a decline in the average length of stay for elderly patients as well as by a decrease in the number of stays per population.

- Costs of non-elderly stays grew faster than average for septicemia (13.1 percent average annual growth), osteoarthritis (12.7 percent average annual growth), skin and subcutaneous tissue infections (8.3 percent average annual growth). These increases were primarily attributable to large increases in the rates of stays per population for those conditions.

- The cost of stays for the elderly grew faster than average for septicemia (10.1 percent average annual growth) and osteoarthritis (6.7 percent average annual growth) due to large increases in the rates of stays per population.

Table 1. Non-elderly and elderly inpatient hospital stays, 1997 and 2009

	Non-elderly stays (Ages 0-64)		Elderly stays (Age 65 and over)		All stays	
	1997*	2009	1997*	2009	1997*	2009
Number of stays (thousands)	22,200	25,900	12,500	13,500	34,700	39,400
Rate of stays per 1,000 population	93.6	96.8	362.7	342.2	127.7	128.4
Aggregate costs (billions)	$ 123.3	$ 207.6	$ 106.1	$ 153.9	$ 229.4	$ 361.5
Average length of stay (days)	4.1	4.1	6.4	5.4	4.9	4.6
Cost per stay ($)	$ 5,600	$ 8,000	$ 8,500	$ 11,400	$ 6,600	$ 9,200
Cost per day ($)	$ 1,400	$ 1,900	$ 1,300	$ 2,100	$ 1,400	$ 2,000

*Aggregate costs, costs per stay and costs per day in 1997 are inflation-adjusted to 2009 dollars.

Source: AHRQ, Center for Delivery, Organization, and Markets, Healthcare Cost and Utilization Project, Nationwide Inpatient Sample, 1997 and 2009
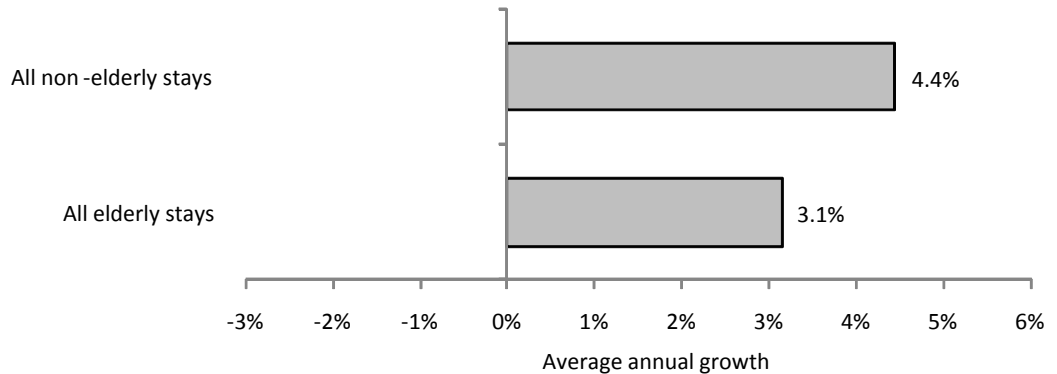
Between 1997 and 2009, the average annual growth in aggregate costs for all stays was 3.9 percent which outpaced the annual growth in number of stays (1.1 percent). Growth in aggregate costs reflects changes in a number of factors—cost per day, average length of stay, number of stays per population, and increases in the population as a whole. As shown in figure 1, the aggregate cost of stays for non-elderly patients grew more quickly than costs for elderly patients—the average annual growth was 4.4 percent for non-elderly and 3.1 percent for elderly patients.

Figure 1 also shows that growth in aggregate cost of stays for the non-elderly was driven largely by growth in the cost per day, or in the intensity of services provided. Growth in the population accounted for much of the remainder of the growth in aggregate costs. Changes in the number of stays per population and in the average length of stay made small contributions to the growth in the aggregate cost of non-elderly stays.

Growth in the aggregate cost of stays for the elderly was also driven by growth in the cost per day; however, it was dampened by a decline in the average length of stay for elderly patients as well as by a decrease in the number of stays per population. Without declines in the average length of stay and the number of stays per population, growth in the aggregate cost of elderly stays would have exceeded that of the non-elderly.

Figure 1. Average annual growth in aggregate costs of elderly and non-elderly stays, 1997–2009

Average annual growth

Components of average annual growth
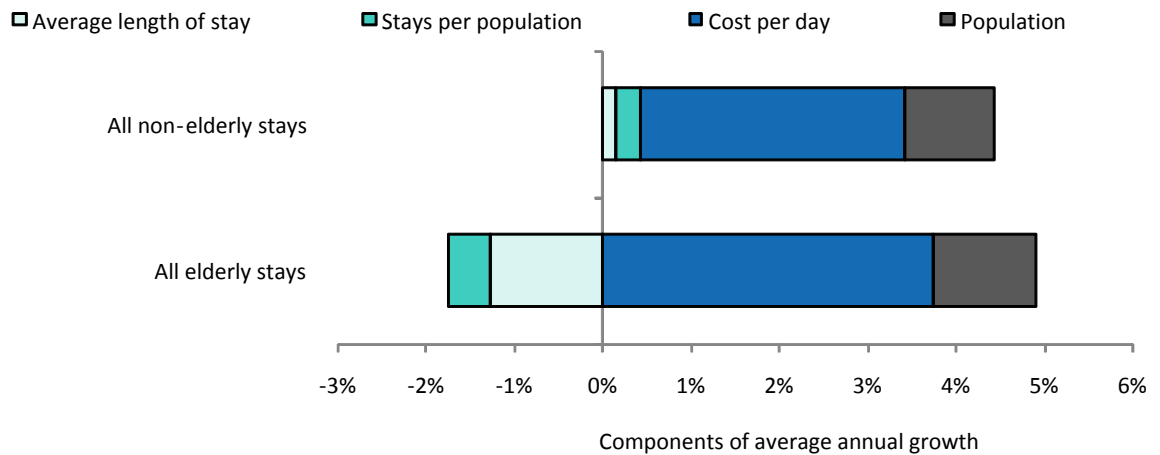
Costs of the most common principal diagnoses, 2009
Table 2 shows the rate of stays per population, total aggregate costs, and average annual growth in aggregate costs for non-elderly and elderly stays in 2009. The conditions shown are the 20 most common reasons for hospital stays across all ages.

Stays per 1,000 for the non-elderly population rose from 93.6 in 1997 to 96.8 in 2009. The most common stays among the non-elderly population in 2009 were for newborn infants (15.6 stays per 1,000 population), mood disorders (3.0 stays per 1,000 population), and OB-related trauma to perineum and vulva (2.8 stays per 1,000 population).

Stays for non-elderly patients cost a total of $207.6 billion in 2009. Newborn infants accounted for $11.6 billion (5.6 percent of the aggregate cost of non-elderly stays). Other costly conditions included septicemia ($6.9 billion), spondylosis and other back problems ($6.6 billion), complication of device, implant or graft ($6.4 billion), and osteoarthritis ($5.9 billion).

The 3 conditions with the most rapidly growing aggregate costs among the non-elderly were septicemia (13.1 percent average annual growth), osteoarthritis (12.7 percent average annual growth), and spondylosis and other back problems (8.6 percent average annual growth).

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Stays per 1,000 for the elderly population fell from 362.7 in 1999 to 342.2 in 2009. The most common reasons for stays among the elderly population in 2009 were congestive heart failure (19.0 stays per 1,000 population), pneumonia (15.5 stays per 1,000 population), and cardiac dysrhythmias (13.7 stays per 1,000 population).

Stays for elderly patients cost a total of $153.9 billion in 2009. The elderly stays with the highest aggregate costs were for septicemia ($8.5 billion), osteoarthritis ($7.7 billion), coronary artherosclerosis and other heart disease ($7.5 billion), congestive heart failure ($7.3 billion) and acute myocardial infarction ($6.3 billion).

Among the top 20 most common reasons for hospitalization, the 3 conditions with the most rapidly growing aggregate costs for the elderly were the same as for among the non-elderly: septicemia (10.1 percent average annual growth among the elderly), spondylosis and other back problems (9.2 percent average annual growth among the elderly), and osteoarthritis (6.7 percent average annual growth among the elderly).

Table 2. Twenty most common reasons for hospital stay in 2009: number of stays, aggregate costs and average annual growth in aggregate costs for non-elderly and elderly stays, 1997–2009

	Non-elderly stays (Ages 0-64)				Elderly stays (Age 65 and over)				
	Stays per 1,000 population		Aggregate costs (billions)		Average annual growth in costs 1997–2009	Stays per 1,000 population		Aggregate costs (billions)		Average annual growth in costs 1997–2009
Principal diagnosis	1997	2009	1997	2009	2009	1997	2009	1997	2009	2009
All stays	93.6	96.8	$123.3	$207.6	4.4%	362.7	342.2	$106.1	$153.9	3.1%
Liveborn (newborn infants)	15.9	15.6	$8.3	$11.6	2.8%	NA	NA	NA	NA	NA
Pneumonia	2.2	2.1	$3.5	$4.6	2.4%	20.7	15.5	$5.9	$5.9	0.1%
Congestive heart failure, nonhypertensive	0.9	1.0	$1.6	$3.3	6.3%	22.8	19.0	$5.4	$7.3	2.6%
Osteoarthritis	0.5	1.5	$1.4	$5.9	12.7%	8.7	13.3	$3.5	$7.7	6.7%
Mood disorders	2.3	3.0	$2.4	$3.7	3.6%	3.1	2.0	$0.8	$0.6	-2.6%
Coronary atherosclerosis and other heart disease	2.5	1.4	$6.1	$5.8	-0.3%	23.6	11.3	$9.3	$7.5	-1.7%
Septicemia	0.6	1.2	$1.6	$6.9	13.1%	7.9	12.9	$2.7	$8.5	10.1%
Cardiac dysrhythmias	0.7	1.0	$1.0	$2.4	7.6%	11.7	13.7	$2.7	$5.2	5.5%
OB-related trauma to perineum and vulva	3.0	2.8	$1.6	$2.2	2.7%	NA	NA	NA	NA	NA
Chronic obstructive pulmonary disease and bronchiectasis	0.8	1.0	$1.1	$1.9	4.6%	10.8	11.8	$2.3	$3.5	3.4%
Nonspecific chest pain	1.5	1.7	$1.1	$2.2	6.0%	5.4	6.0	$0.6	$1.2	5.4%

Complication of device, implant or graft	1.0	1.4	$2.9	$6.4	6.8%	7.1	7.5	$2.9	$4.9	4.6%
Spondylosis, intervertebral disc disorders, other back problems	1.6	1.6	$2.5	$6.6	8.6%	4.6	5.7	$1.1	$3.3	9.2%
Acute myocardial infarction	1.2	1.0	$3.7	$5.3	3.0%	13.0	9.1	$5.9	$6.3	0.5%
Skin and subcutaneous tissue infections	0.9	1.7	$1.0	$2.5	8.3%	3.5	4.7	$0.7	$1.3	5.7%
Urinary tract infections	0.8	0.8	$0.7	$1.3	4.7%	6.6	9.2	$1.2	$2.3	5.6%
Acute cerebrovascular disease	0.6	0.7	$1.9	$3.2	4.5%	13.6	9.3	$3.8	$4.2	0.9%
Previous C-section	1.1	2.0	$0.9	$2.4	8.2%	NA	NA	NA	NA	NA
Diabetes mellitus with complications	1.1	1.4	$1.7	$3.1	5.0%	4.4	3.9	$1.2	$1.5	2.1%
Complications of surgical procedures or medical care	0.8	1.2	$1.6	$3.6	6.8%	4.4	5.0	$1.4	$2.5	4.9%

*Aggregate costs, costs per stay and costs per day in 1997 are inflation-adjusted to 2009 dollars.

Source: AHRQ, Center for Delivery, Organization, and Markets, Healthcare Cost and Utilization Project, Nationwide Inpatient Sample, 1997 and 2009

Components of the growth in costs by principal diagnosis, 1997–2009
Figure 2 shows the average annual growth in aggregate costs for non-elderly stays as well as the components of cost growth for the 20 most common reasons for a hospital stay.

Among non-elderly stays, aggregate costs for 4 conditions grew faster than average because of rapidly increasing hospitalization rates (stays per population):

- septicemia,
- osteoarthritis,
- skin and subcutaneous tissue infections, and
- previous C-section.

Increasing intensity of services (cost per day) was the major driver for growth in the aggregate cost of stays for spondylosis, and would have driven costs for coronary artherosclerosis up as well, were it not for a decrease in the rate of coronary artherosclerosis stays among the non-elderly.

Changes in the length of hospital stays affected cost growth only modestly for the non-elderly overall. However, a decreasing length of stay did dampen the cost growth for some conditions—notably osteoarthritis, chronic obstructive pulmonary disease (COPD), acute cerebrovascular disease, and mood disorders.

Figure 2. Average annual growth in aggregate costs for non-elderly stays among the 20 most common reasons for a hospital stay, 1997–2009
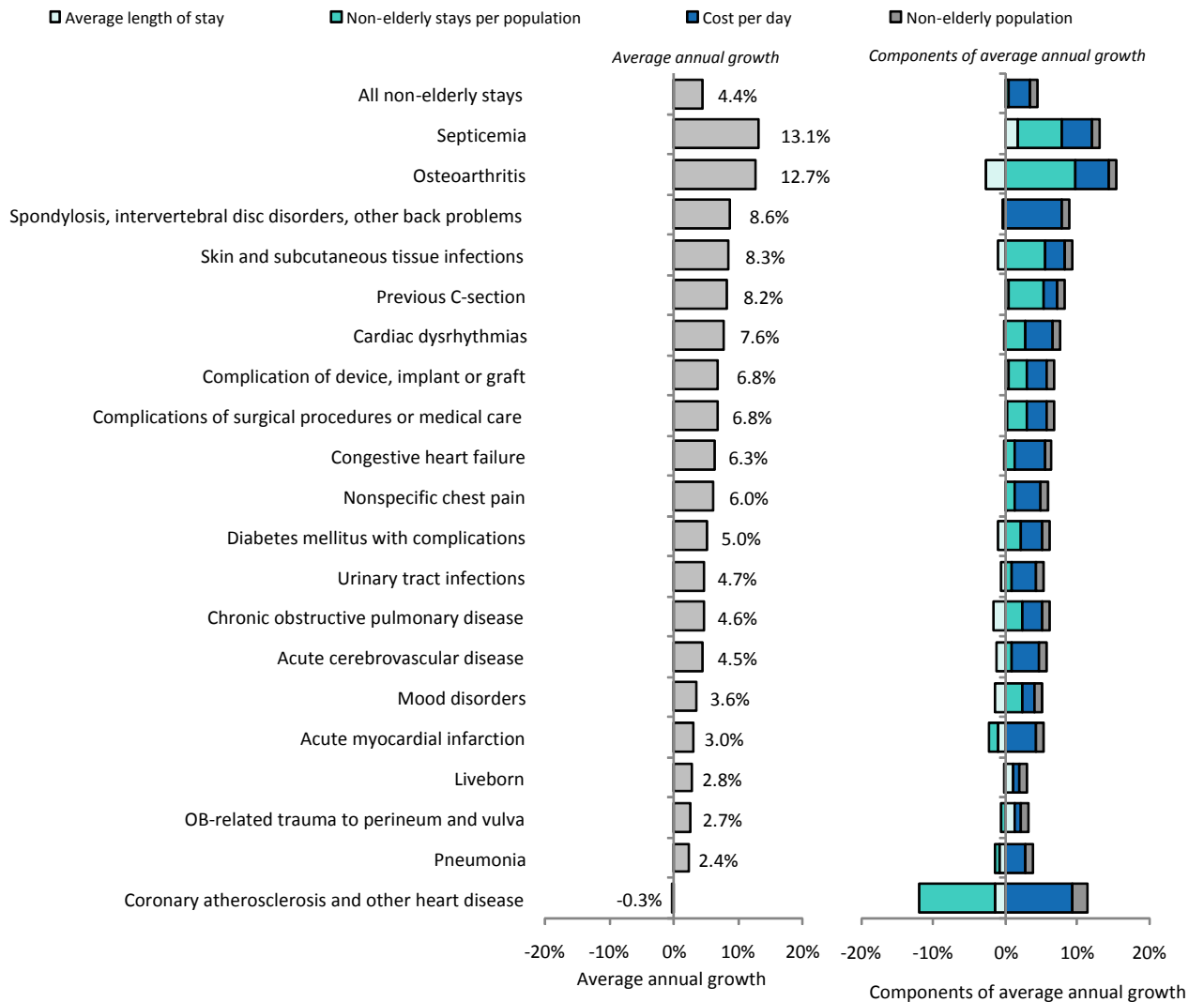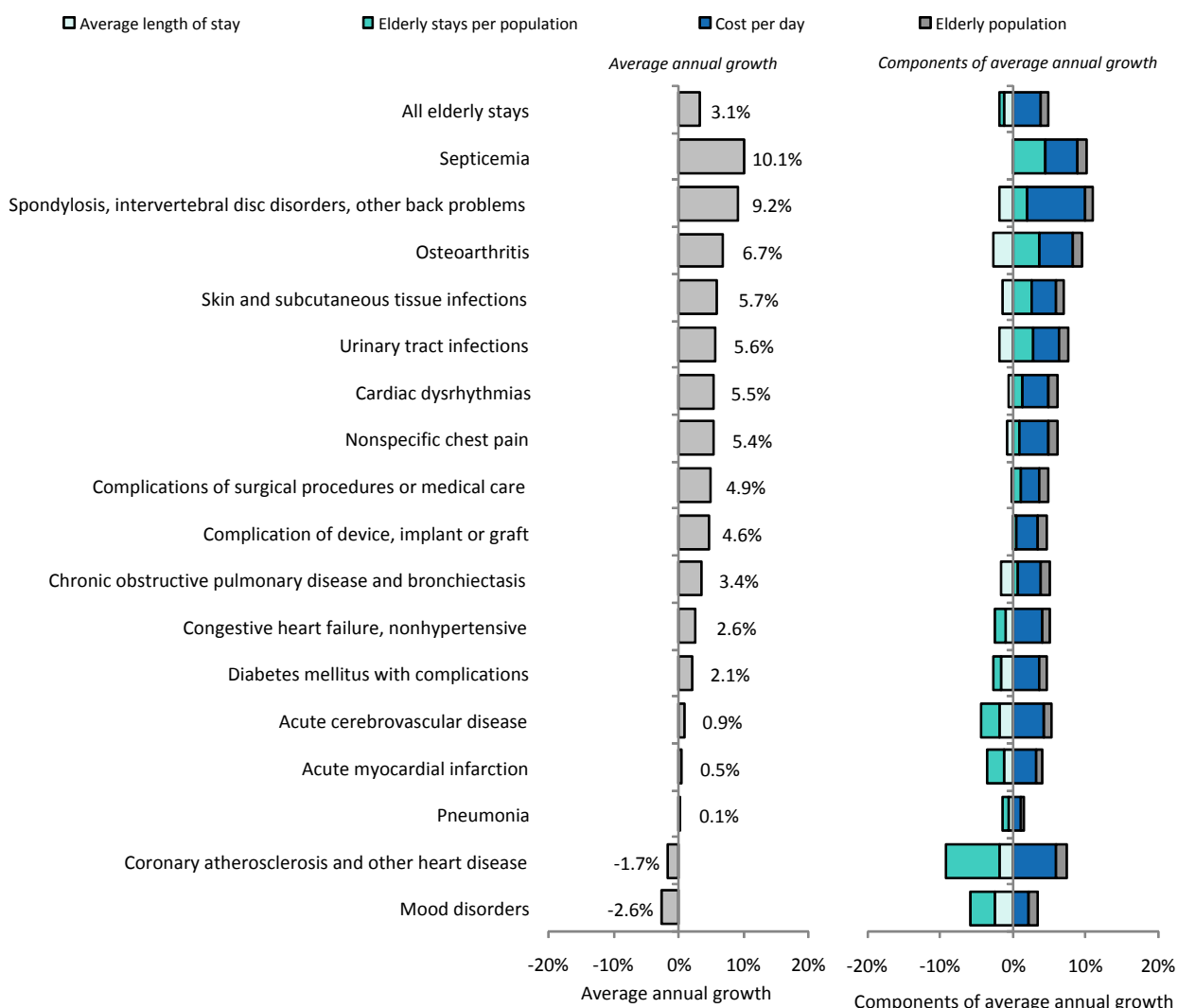

Source: AHRQ, Center for Delivery, Organization, and Markets, Healthcare Cost and Utilization Project, Nationwide Inpatient Sample, 1997 and 2009

Figure 3 shows the average annual growth in the aggregate cost of elderly stays, as well as the components of the cost growth, for the 20 most common reasons for a hospital stay (3 of the top 20 conditions which are related to childbirth are not included in the graphic).

Among elderly stays, costs for septicemia and osteoarthritis grew faster than average due to large increases in hospitalization rates (the rate of stays per population). Aggregate costs for spondylosis and other back problems also grew rapidly; this cost growth was predominantly driven by large increases in the intensity of service (costs per day). The aggregate cost of stays for acute cerebrovascular disease, acute myocardial infarction, coronary artherosclerosis, and mood disorders grew slower than average or decreased largely due to declines in the hospitalization rate for those conditions.

Figure 3. Average annual growth in aggregate costs for elderly stays among the 20 most common reasons for a hospital stay, 1997–2009

Note: Three of the top twenty conditions which are related to childbirth are not included in the graphic.

Source: AHRQ, Center for Delivery, Organization, and Markets, Healthcare Cost and Utilization Project, Nationwide Inpatient Sample, 1997 and 2009

The estimates in this Statistical Brief are based upon data from the HCUP NIS 1997 and 2009. Supplemental source included data on regional population estimates from "Table 1: Annual Estimates of the Resident Population for the United States, Regions, States, and Puerto Rico: April 1, 2000 to July 1, 2009 (NST-EST2009-01)", Population Division, U.S. Census Bureau, Release date: December 2009 (http://www.census.gov/popest/states/NST-ann-est.html).

Definitions

Diagnoses, ICD-9-CM, and Clinical Classifications Software (CCS)
The principal diagnosis is that condition established after study to be chiefly responsible for the patient's admission to the hospital. Secondary diagnoses are concomitant conditions that coexist at the time of admission or that develop during the stay.

ICD-9-CM is the International Classification of Diseases, Ninth Revision, Clinical Modification, which assigns numeric codes to diagnoses. There are about 13,600 ICD-9-CM diagnosis codes.

CCS categorizes ICD-9-CM diagnoses into a manageable number of clinically meaningful categories. This "clinical grouper" makes it easier to quickly understand patterns of diagnoses and procedures.

Procedures and Clinical Classifications Software (CCS)
The principal procedure is the procedure that was performed for definitive treatment rather than performed for diagnostic or exploratory purposes (i.e., the procedure that was necessary to take care of a complication). If two procedures appear to meet this definition, the procedure most related to the principal diagnosis was selected as the principal procedure.

CCS categorizes procedure codes into clinically meaningful categories.[3] This "clinical grouper" makes it easier to quickly understand patterns of procedure use.

Types of hospitals included in HCUP
HCUP is based on data from community hospitals, defined as short-term, non-federal, general and other hospitals, excluding hospital units of other institutions (e.g., prisons). HCUP data include OB-GYN, ENT, orthopedic, cancer, pediatric, public, and academic medical hospitals. Excluded are long-term care, rehabilitation, psychiatric, and alcoholism and chemical dependency hospitals. Please note, a discharge of this nature will be included in the NIS if it occurred in a community hospital.

Unit of analysis
The unit of analysis is the hospital discharge (i.e., the hospital stay), not a person or patient. This means that a person who is admitted to the hospital multiple times in one year will be counted each time as a separate "discharge" from the hospital.

Costs and charges
Total hospital charges were converted to costs using HCUP Cost-to-Charge Ratios based on hospital accounting reports from the Centers for Medicare and Medicaid Services (CMS).[4] Costs will tend to reflect the actual costs of production, while charges represent what the hospital billed for the case. For each hospital, a hospital-wide cost-to-charge ratio is used because detailed charges are not available across all HCUP States. Hospital charges reflect the amount the hospital charged for the entire hospital stay and does not include professional (physician) fees. For the purposes of this Statistical Brief, costs are reported to the nearest hundred.

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[3] HCUP CCS. Healthcare Cost and Utilization Project (HCUP). December 2009. U.S. Agency for Healthcare Research and Quality, Rockville, MD. www.hcup-us.ahrq.gov/toolssoftware/ccs/ccs.jsp
[4] HCUP Cost-to-Charge Ratio Files (CCR). Healthcare Cost and Utilization Project (HCUP). 2001–2008. U.S. Agency for Healthcare Research and Quality, Rockville, MD. www.hcup-us.ahrq.gov/db/state/costtocharge.jsp.

HCUP is a family of powerful health care databases, software tools, and products for advancing research. Sponsored by the Agency for Healthcare Research and Quality (AHRQ), HCUP includes the largest all-payer encounter-level collection of longitudinal health care data (inpatient, ambulatory surgery, and emergency department) in the United States, beginning in 1988. HCUP is a Federal-State-Industry Partnership that brings together the data collection efforts of many organizations—such as State data organizations, hospital associations, private data organizations, and the Federal government—to create a national information resource.

HCUP would not be possible without the contributions of the following data collection Partners from across the United States:

Alaska State Hospital & Nursing Home Association (ASHNA)
Arizona Department of Health Services
Arkansas Department of Health
California Office of Statewide Health Planning and Development
Colorado Hospital Association
Connecticut Hospital Association
Florida Agency for Health Care Administration
Georgia Hospital Association
Hawaii Health Information Corporation
Illinois Department of Public Health
Indiana Hospital Association
Iowa Hospital Association
Kansas Hospital Association
Kentucky Cabinet for Health and Family Services
Louisiana Department of Health and Hospitals
Maine Health Data Organization
Maryland Health Services Cost Review Commission
Massachusetts Division of Health Care Finance and Policy
Michigan Health & Hospital Association
Minnesota Hospital Association
Missouri Hospital Industry Data Institute
Montana MHA – An Association of Montana Health Care Providers
Nebraska Hospital Association
Nevada Department of Health and Human Services
New Hampshire Department of Health & Human Services
New Jersey Department of Health and Senior Services
New Mexico Health Policy Commission
New York State Department of Health
North Carolina Department of Health and Human Services
Ohio Hospital Association
Oklahoma State Department of Health
Oregon Association of Hospitals and Health Systems
Pennsylvania Health Care Cost Containment Council
Rhode Island Department of Health
South Carolina State Budget & Control Board
South Dakota Association of Healthcare Organizations
Tennessee Hospital Association
Texas Department of State Health Services
Utah Department of Health
Vermont Association of Hospitals and Health Systems
Virginia Health Information
Washington State Department of Health
West Virginia Health Care Authority

Wisconsin Department of Health Services
Wyoming Hospital Association

About the NIS

The HCUP Nationwide Inpatient Sample (NIS) is a nationwide database of hospital inpatient stays. The NIS is nationally representative of all community hospitals (i.e., short-term, non-federal, non-rehabilitation hospitals). The NIS is a sample of hospitals and includes all patients from each hospital, regardless of payer. It is drawn from a sampling frame that contains hospitals comprising about 95 percent of all discharges in the United States. The vast size of the NIS allows the study of topics at both the national and regional levels for specific subgroups of patients. In addition, NIS data are standardized across years to facilitate ease of use.

For More Information

For more information about HCUP, visit www.hcup-us.ahrq.gov.

For additional HCUP statistics, visit HCUPnet, our interactive query system, at www.hcup.ahrq.gov.

For information on other hospitalizations in the U.S., download HCUP Facts and Figures: Statistics on Hospital-Based Care in the United States in 2008, located at http://www.hcup-us.ahrq.gov/reports.jsp.

For a detailed description of HCUP, more information on the design of the NIS, and methods to calculate estimates, please refer to the following publications:

Introduction to the HCUP Nationwide Inpatient Sample, 2008. Online. May 2010. U.S. Agency for Healthcare Research and Quality. http://hcup-us.ahrq.gov/db/nation/nis/NIS_2008_INTRODUCTION.pdf

Houchens, R., Elixhauser, A. *Final Report on Calculating Nationwide Inpatient Sample (NIS) Variances, 2001.* HCUP Methods Series Report #2003-2. Online. June 2005 (revised June 6, 2005). U.S. Agency for Healthcare Research and Quality. http://www.hcup-us.ahrq.gov/reports/CalculatingNISVariances200106092005.pdf

Houchens R.L., Elixhauser A. *Using the HCUP Nationwide Inpatient Sample to Estimate Trends. (Updated for 1988–2004).* HCUP Methods Series Report #2006-05 Online. August 18, 2006. U.S. Agency for Healthcare Research and Quality. http://www.hcup-us.ahrq.gov/reports/2006_05_NISTrendsReport_1988-2004.pdf

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AHRQ welcomes questions and comments from readers of this publication who are interested in obtaining more information about access, cost, use, financing, and quality of health care in the United States. We also invite you to tell us how you are using this Statistical Brief and other HCUP data and tools, and to share suggestions on how HCUP products might be enhanced to further meet your needs. Please e-mail us at hcup@ahrq.gov or send a letter to the address below:

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