

STATISTICAL BRIEF #93

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Hospital Stays for Patients with Diabetes, 2008

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Introduction

Diabetes is a major public health concern in the United States. Between 2004 and 2007, the number of Americans diagnosed with diabetes increased from 14.7 million in 2004 to 17.9 million in 2007, affecting 7.8% of the U.S. population.^{1,2} Diabetes is a potentially debilitating illness resulting from the body's improper use and production of insulin and results in elevated levels of blood glucose. Poorly controlled diabetes can cause severe complications including blindness, kidney damage, cardiovascular disease, and lower-limb amputations due to peripheral vascular disease.

This Statistical Brief presents data from the Healthcare Cost and Utilization Project (HCUP) on hospital utilization by patients with diabetes in 2008. Characteristics of hospital stays are compared between patients with diabetes and patients without diabetes in terms of length of stay, average and total hospital costs, payer, and comorbidities. Hospitalization rates for patients with diabetes per 100,000 persons are examined by region and income quartile at the patient ZIP Code level. All differences between estimates noted in the text are statistically significant at the 0.05 level or better.

Findings

In 2008, there were over 7.7 million hospital stays for patients with diabetes (i.e., diabetes as either a principal diagnosis for hospitalization or as a secondary diagnosis, coexisting condition). There were over 540,000 hospital stays for patients with diabetes as a primary diagnosis. These counts may include multiple hospitalizations by the same individuals, which is common among patients with diabetes³. The mean cost of

¹ Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, National Diabetes Surveillance System, 2007. <http://apps.nccd.cdc.gov/ddtstrs/> (Accessed on August 9, 2010)

² Russo A., Jiang J. *HCUP Statistical Brief #17: Hospital Stays among Patients with Diabetes, 2004*. Rockville, MD: Agency for Healthcare Research and Quality, November 2006 (<http://www.hcup-us.ahrq.gov/reports/statbriefs/sb17.pdf>).

³ Jiang H.J., Stryer D., Friedman B., Andrews R. *Multiple Hospitalizations for Patients with Diabetes*. *Diabetes Care* 26(5): 1421-26, 2003.

Highlights

- In 2008, nearly one in five hospitalizations were related to patients with diabetes, totaling over 7.7 million stays and \$83 billion in hospital costs.
- Hospital stays for patients with diabetes were longer, more costly, and more likely to originate in the emergency department than stays for patients without diabetes.
- Among hospitalized patients, the number of comorbidities was twice as high for patients with diabetes as for patients without diabetes (2.6 comorbid conditions for patients with diabetes vs. 1.3 for those without diabetes). Hypertension was the most common comorbidity and was present in 69 percent of hospital stays for patients with diabetes.
- Diabetes was the most common principal diagnosis, or reason for hospital admission among patients with diabetes. Five of the top 10 principal diagnoses among patients with diabetes were circulatory disorders: congestive heart failure, coronary atherosclerosis (hardening of the arteries), acute myocardial infarction (heart attack), nonspecific chest pain, and cardiac dysrhythmias.
- Medicare covered almost 60 percent of total hospital costs for patients with diabetes, followed by private health insurance which covered 23 percent of total diabetes-related hospital costs.
- The rates of hospital stays for patients with diabetes increased as the income level of the patient ZIP Code decreased—there were 3,232 diabetes-related stays out of every 100,000 persons from the lowest income quartile compared with 1,762 stays out of every 100,000 persons from the highest income quartile.
- The South had the highest rate of hospital stays for patients with diabetes (2,829 stays per 100,000 persons in the region) while the West had the lowest rate (1,866 stays per 100,000 persons in the region).

hospitalization for patients with diabetes was \$10,937 in 2008 compared with \$8,746 for patients without diabetes.

The mean length of stay for patients with diabetes was almost one day longer than for patients without diabetes (5.3 versus 4.4 days). Stays involving patients with diabetes (as a principal or secondary diagnosis) contributed almost \$83 billion or 23 percent of the total hospital costs in the United States.

General characteristics of hospital stays for patients with diabetes

Table 1 presents findings for hospital stays for patients with diabetes (as a principal or secondary diagnosis), those with diabetes as a principal diagnosis, and stays without diabetes in 2008. While patients with a principal diagnosis of diabetes accounted for only 1.4 percent of all hospital stays, almost 20 percent of all hospitalizations involved patients with diabetes. This is significant because diabetes increases length of stay and therefore increases cost regardless of whether it is the primary reason for admission. Patients with diabetes were, on average, much older than patients without diabetes (65 vs. 45 years old). Females comprised nearly 53 percent of hospital stays for patients with diabetes, and 60 percent of hospital stays for patients without diabetes.

Further, hospital stays for patients with diabetes as a principal or any diagnosis were more likely to originate from the emergency department compared with those for patients without diabetes (72 percent for diabetes with a principal diagnosis, 61 for all diabetes patients, and 42 percent for non-diabetes stays). Patients with diabetes as a principal or any diagnosis had a higher number of comorbidities with a mean of 2.6 for diabetes patients with any diagnosis and 2.4 for diabetes patients as a principal diagnosis compared to 1.3 for patients without diabetes.

All remaining analyses focus on all hospitalizations involving diabetes—those cases with diabetes as the principal reason for hospitalization as well as stays that involved diabetes as a secondary or comorbid condition.

Most common principal reasons for hospitalization of patients with diabetes

Table 2 shows diabetes as the most common principal reason for hospitalization among patients with diabetes recorded in the medical record. Most of the top 10 reasons for hospitalization were chronic conditions except for pneumonia and sepsis. Circulatory disorders represented five of the top 10 reasons for hospital admission: congestive heart failure, coronary atherosclerosis (hardening of the arteries), acute myocardial infarction (heart attack), nonspecific chest pain, and cardiac dysrhythmias. It is worth noting that diabetes was a coexisting condition (i.e., a comorbidity) for 42 percent of hospital stays for congestive heart failure, 38 percent of stays for hardening of the arteries, and 34 percent of stays for heart attack.

Most common comorbidities for hospitalized patients with diabetes

Table 3 shows the 10 most common comorbidities for hospitalized patients with diabetes in 2008. Hypertension was the most common comorbidity, present among 69 percent of hospital stays for patients with diabetes compared with 30 percent of stays for patients without diabetes. Other common comorbidities included fluid and electrolyte disorders (25 percent), chronic pulmonary disease (21 percent), deficiency anemias (21 percent), renal failure (18 percent), and obesity (16 percent). Patients with diabetes experienced these comorbidities more frequently than patients without diabetes.

Hospital stays for patients with diabetes by payer

Medicare was the most common expected payer for hospital stays for patients with diabetes (60 percent), followed by private insurance (23 percent; Table 1). For patients without diabetes, private insurance was the most common expected payer, closely followed by Medicare, and Medicaid (38, 32, and 20 percent, respectively). Figure 1 shows the percentage of total hospital stays involving patients with diabetes by expected payer. More than 30 percent of hospital stays covered by Medicare involved patients with diabetes. In contrast, patients with diabetes comprised only 10 percent of hospital stays covered by private insurance, 13 percent of stays covered by Medicaid, and 15 percent of stays by the uninsured.

Hospital stays for patients with diabetes by income quartile

Figure 2 shows the rates of hospitalization for patients with diabetes per 100,000 individuals in each income quartile⁴. Rates decrease as income quartile increases. There were 3,232 diabetes stays per

⁴ Claritas Population Estimates 2008.

100,000 persons in the lowest income quartile, compared with 1,762 stays per 100,000 persons in the highest income quartile.

Hospitalizations for patients with diabetes by region

Figure 3 shows differences in hospitalization rates for patients with diabetes per 100,000 persons in each U.S. region.⁴ The South had the highest rate of hospitalizations related to patients with diabetes (2,829 hospitalizations per 100,000 persons), followed by the Midwest (2,742 hospitalizations per 100,000 persons) and the Northeast (2,565 hospitalizations per 100,000 persons). The West had the lowest rate of hospital stays for patients with diabetes (1,866 hospitalizations per 100,000 persons).

Data Source

The estimates in this Statistical Brief are based upon data from the HCUP 2008 Nationwide Inpatient Sample. Population bases for rates were obtained from Claritas, a vendor that compiles data from the U.S. Census Bureau. Claritas uses intra-census methods to estimate population subgroups.

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.⁵ 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 one 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.⁵ This "clinical grouper" makes it easier to quickly understand patterns of procedure use.

Case Definition

For this report diabetes hospitalizations were defined as CCS diagnosis categories:

- 49: Diabetes without complication
- 50: Diabetes with complications

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. They exclude long-term care, rehabilitation, psychiatric, and alcoholism and chemical dependency hospitals, but these types of discharges are included if they are from community hospitals.

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.

⁴ Claritas Population Estimates 2008.

⁵ HCUP CCS. Healthcare Cost and Utilization Project (HCUP). June 2009. U.S. Agency for Healthcare Research and Quality, Rockville, MD. www.hcup-us.ahrq.gov/toolssoftware/ccs/ccs.jsp

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).⁶ 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 hundreds.

Median community-level income

Median community-level income is the median household income of the patient's ZIP Code of residence. The cut-offs for the quartile designation is determined using ZIP Code demographic data obtained from Claritas. The income quartile is missing for homeless and foreign patients.

Payer

Payer is the expected primary payer for the hospital stay. To make coding uniform across all HCUP data sources, payer combines detailed categories into more general groups:

- Medicare includes fee-for-service and managed care Medicare patients.
- Medicaid includes fee-for-service and managed care Medicaid patients. Patients covered by the State Children's Health Insurance Program (SCHIP) may be included here. Because most state data do not identify SCHIP patients specifically, it is not possible to present this information separately.
- Private insurance includes Blue Cross, commercial carriers, and private HMOs and PPOs.
- Other includes Worker's Compensation, TRICARE/CHAMPUS, CHAMPVA, Title V, and other government programs.
- Uninsured includes an insurance status of "self-pay" and "no charge."

When more than one payer is listed for a hospital discharge, the first-listed payer is used.

Region

Region is one of the four regions defined by the U.S. Census Bureau:

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

Admission source or Point of Origin

Admission source (now known as patient's Point of Origin) indicates where the patient was located prior to admission to the hospital. Emergency admission indicates the patient was admitted to the hospital through the emergency department. Admission from another hospital indicates the patient was admitted to this hospital from another short-term, acute-care hospital. This usually signifies that the patient required the transfer in order to obtain more specialized services that the originating hospital could not provide. Admission from long-term care facility indicates the patient was admitted from a long-term facility such as a nursing home.

Discharge status

Discharge status indicates the disposition of the patient at discharge from the hospital, and includes the following six categories: routine (to home), transfer to another short-term hospital, other transfers

⁶ HCUP Cost-to-Charge Ratio Files (CCR). Healthcare Cost and Utilization Project (HCUP). 2001–2007. U.S. Agency for Healthcare Research and Quality, Rockville, MD. www.hcup-us.ahrq.gov/db/state/costtocharge.jsp

(including skilled nursing facility, intermediate care, and another type of facility such as a nursing home), home health care, against medical advice (AMA), or died in the hospital.

About HCUP

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:

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
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 90 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 2007*, 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:

Steiner, C., Elixhauser, A., Schnaier, J. The Healthcare Cost and Utilization Project: An Overview. *Effective Clinical Practice* 5(3):143–51, 2002.

Introduction to the HCUP Nationwide Inpatient Sample, 2007. Online. June 16, 2009. U.S. Agency for Healthcare Research and Quality. http://www.hcup-us.ahrq.gov/db/nation/nis/NIS_2007_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>

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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:

Irene Fraser, Ph.D., Director
Center for Delivery, Organization, and Markets
Agency for Healthcare Research and Quality
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Rockville, MD 20850

Table 1. Hospitals stays of patients with diabetes compared to those without diabetes, 2008

	Hospital stays for patients with diabetes*	Hospital stays for patients without diabetes*	Hospital stays for patients with diabetes as principal diagnosis**
Total number of discharges	7,726,600	32,158,600	540,317
Percentage of total discharges	19.4%	80.6%	1.4%
Mean age	64.9	44.6	52.7
Percentage female	52.9%	59.9%	48.4%
Mean length of stay (days)	5.3	4.4	5.0
Mean cost of hospitalization	\$10,937	\$8,746	\$8,612
Aggregate costs for US (in billions)	\$82.8	\$274.99	\$4.6
Percentage of total costs	23.1%	76.9%	1.3%
Percentage admitted through the Emergency Department	61.3%	41.7%	72.4%
Mean number of comorbidities	2.6	1.3	2.4
Payer (%)			
Medicare	59.7%	32.0%	41.8%
Medicaid	9.9%	20.4%	18.2%
Private Insurance	23.4%	38.2%	26.0%
Uninsured	4.0%	5.6%	10.1%

*Based on all-listed diagnoses.

**Based on records with diabetes as a primary diagnosis.

Source: AHRQ, Center for Delivery, Organization, and Markets, Healthcare Cost and Utilization Project, Nationwide Inpatient Sample, 2008

Table 2. Top 10 most common principal reasons for hospitalization among patients with diabetes, 2008

Rank	Principal diagnosis	Number of hospital stays among patients with diabetes*	For each principal diagnosis, percentage of hospital stays with diabetes as a coexisting condition**
1	Diabetes	519,522 (6.7%)	N/A
2	Congestive heart failure (nonhypertensive)	424,147 (5.5%)	41.6%
3	Coronary atherosclerosis (hardening of the arteries)	346,054 (4.5%)	37.7%
4	Pneumonia	290,709 (3.8%)	25.1%
5	Septicemia	224,842 (2.9%)	28.4%
6	Acute myocardial infarction (heart attack)	220,760 (2.9%)	34.2%
7	Chronic obstructive pulmonary disease and bronchiectasis	219,743 (2.8%)	30.7%
8	Nonspecific chest pain	212,706 (2.8%)	29.3%
9	Cardiac dysrhythmias	196,293 (2.5%)	24.6%
10	Complication of device, implant, or graft	194,516 (2.5%)	28.4%

*Based on all-listed diagnoses.

**Based on records with diabetes as a secondary diagnosis. For example, for hospitalizations with a principal diagnosis of congestive heart failure, 41.6 percent have diabetes as a coexisting condition. Source: AHRQ, Center for Delivery, Organization, and Markets, Healthcare Cost and Utilization Project, Nationwide Inpatient Sample, 2008

Table 3. Top 10 most common comorbidities for hospitalization among patients with diabetes, 2008

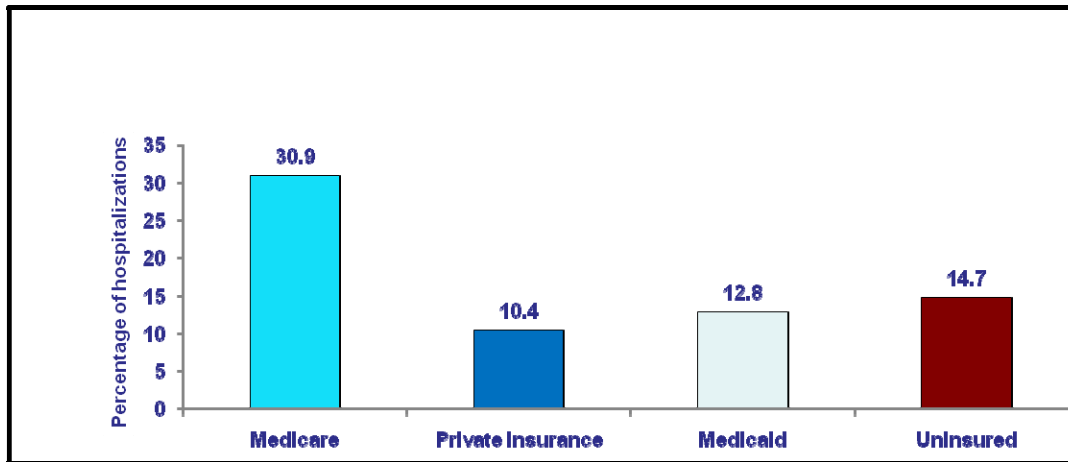
Rank	Comorbidity	Number of hospital stays among patients with diabetes	Number of hospital stays for patients without diabetes
1	Hypertension	5,316,881 (68.8%)	9,709,282 (30.2%)
2	Fluid and electrolyte disorders	1,912,018 (24.7%)	4,644,232 (14.4%)
3	Chronic pulmonary disease	1,606,352 (20.8%)	4,064,227 (12.6%)
4	Deficiency anemias	1,586,034 (20.5%)	3,477,918 (10.8%)
5	Renal failure	1,417,301 (18.3%)	1,606,505 (5.8%)
6	Obesity	1,218,623 (15.8%)	1,571,851 (4.9%)
7	Congestive heart failure	986,192 (12.8%)	1,522,888 (4.7%)
8	Hypothyroidism	919,041 (11.9%)	2,245,515 (7.0%)
9	Depression	813,417 (10.5%)	2,223,302 (6.9%)
10	Peripheral vascular disorders	704,136 (9.1%)	1,005,318 (3.1%)

*Based on all-listed diagnoses.

Source: AHRQ, Center for Delivery, Organization, and Markets, Healthcare Cost and Utilization Project, Nationwide Inpatient Sample, 2008



Figure 1. Percentage of hospitalizations for patients with diabetes by payer, 2008*

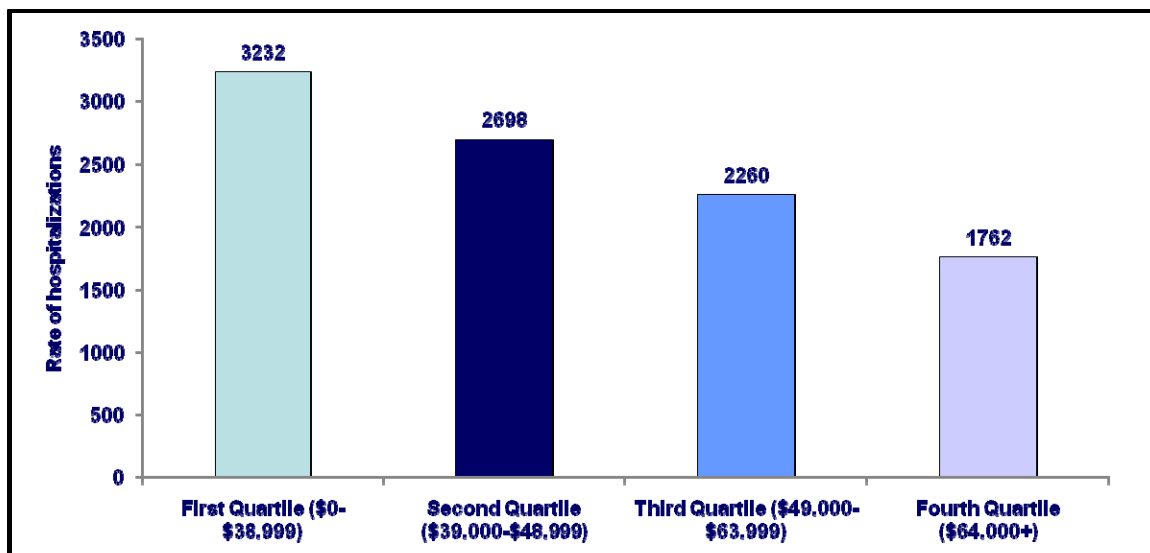


*Diagnosis for diabetes was either a principal reason or coexisting reason for hospitalization.

Source: AHRQ, Center for Delivery, Organization, and Markets, Healthcare Cost and Utilization Project, Nationwide Inpatient Sample, 2008



Figure 2. Rate of hospitalizations for patients with diabetes per 100,000 persons by income quartile, 2008*

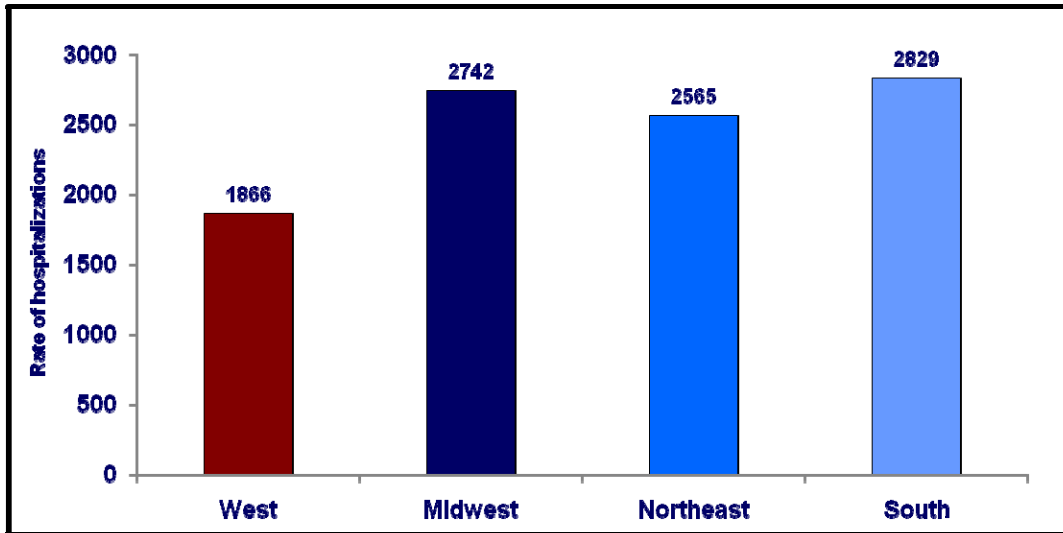


*Diagnosis for diabetes was either a principal reason or coexisting reason for hospitalization.

Source: AHRQ, Center for Delivery, Organization, and Markets, Healthcare Cost and Utilization Project, Nationwide Inpatient Sample, 2008. The number of persons in each income quartile is based on data from Claritas Population Estimates, 2008.



Figure 3. Rate of hospitalizations for patients with diabetes per 100,000 persons by geographic region, 2008*



*Diagnosis for diabetes was either a principal reason or coexisting reason for hospitalization.

Source: AHRQ, Center for Delivery, Organization, and Markets, Healthcare Cost and Utilization Project, Nationwide Inpatient Sample, 2008. The number of persons in each income quartile is based on data from Claritas Population Estimates, 2008.