

STATISTICAL BRIEF #192

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Potentially Preventable Pediatric Hospital Inpatient Stays for Asthma and Diabetes, 2003–2012

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Introduction

Asthma is a chronic inflammatory condition affecting the airways. Episodes can be triggered by a range of factors, from allergies to air pollution, leading to swelling, tightening, and secretion of mucus in the airways, which causes wheezing, coughing, chest tightness, and shortness of breath.¹ Asthma is one of the most common chronic conditions in childhood, affecting 6.8 million, or 9 percent of, children aged 17 years or younger in 2012.²

Although pediatric asthma is more prevalent than diabetes, diabetes is becoming an increasingly common chronic condition among children. Children with diabetes most often have type 1 diabetes, which destroys pancreatic cells that make insulin, preventing normal regulation of blood sugar. Type 2 diabetes occurs when the body develops resistance to insulin and is more often associated with obesity. Both types of diabetes have increased among children in recent years. From 2001 to 2009, the prevalence of type 1 diabetes among youth aged 0–19 years increased from 1.5 to 1.9 per 1,000 children. Type 2 diabetes increased from 0.3 to 0.5 per 1,000 children aged 10–19 years during the same time period.³

Without proper treatment, asthma and diabetes can lead to hospitalization. Many hospital stays are potentially avoidable through regular ambulatory care by specialty and primary care physicians. Potentially preventable hospitalizations among children have declined in recent years. The rate of hospital inpatient stays for acute and chronic conditions, including asthma and diabetes, among children aged 0–17 years declined by 18 percent from 2000 to 2007, which may be a result of efforts to improve clinical guidelines and establish medical homes, as well

Highlights

- In 2012, the rate of potentially preventable pediatric inpatient stays was 142.9 for asthma and 32.4 for diabetes per 100,000 children aged 0–17 years.
- Between 2003 and 2008, the rate of potentially preventable pediatric stays decreased by 34 percent for asthma and 16 percent for diabetes but then increased 21 percent from 2008 to 2012 for both conditions.
- By 2012, aggregate hospital costs totaled \$417.2 million for asthma and \$89.4 million for diabetes. This represents over a 50 percent increase from 2008, which is attributable to increases in the number of stays and average cost per stay.
- Between 2003 and 2012, the rate of potentially preventable stays for asthma per 100,000 children aged 0–17 years decreased for all age groups, with a nearly 50 percent decrease for children aged 15–17 years (from 72.8 to 38.7). The rate in 2012 was over 7 times lower than the rate for children aged 0–4 years (290.4).
- Rates of potentially preventable pediatric stays per 100,000 were more than twice as high in the lowest income quartile as in the highest for diabetes (43.0 vs. 18.9) and asthma (214.1 vs. 89.5) in 2012, although asthma stays declined the most among children from the poorest areas.
- Medicaid was the leading payer of potentially preventable pediatric stays for asthma (58.1 percent) and for diabetes (47.2 percent) in 2012, reflecting a 10-year decline in privately insured hospital stays.

¹ American Lung Association. Asthma & Children Fact Sheet. September 2014. <http://www.lung.org/lung-disease/asthma/resources/facts-and-figures/asthma-children-fact-sheet.html>. Accessed May 26, 2015.

² Bloom B, Jones LI, Freeman G. Summary health statistics for U.S. children: National Health Interview Survey, 2012. National Center for Health Statistics. Vital and Health Statistics 10(258). 2013.

³ Dabelea D, Mayer-Davis EJ, Saydah S, et al. Prevalence of type 1 and type 2 diabetes among children and adolescents from 2001 to 2009. JAMA. 2014;311(17):1778–86.

as other initiatives.⁴ Despite these improvements, asthma and diabetes remain more common in certain racial and ethnic minority groups and among poor and underserved populations, who may have limited access to preventive care.^{5,6} Pediatric hospital inpatient stays for asthma and diabetes may have increased in more recent years because of the recession, which officially lasted from December 2007 through June 2009.⁷

This Healthcare Cost and Utilization Project (HCUP) Statistical Brief presents data on potentially preventable inpatient hospitalizations for asthma and diabetes with short-term complications among children aged 0–17 years, estimated using the Agency for Healthcare Research and Quality (AHRQ) Pediatric Quality Indicators (PDIs) software version 4.4. The PDIs were developed to identify hospitalizations that are potentially amenable to prevention through regular ambulatory care. We examined trends in the rates of potentially preventable pediatric visits for asthma and diabetes per 100,000 population, overall and by select patient and hospital characteristics, from 2003 to 2012. Differences greater than 10 percent are noted in the text.

Findings

Trends in potentially preventable pediatric hospital inpatient stays for asthma and diabetes, 2003–2012
Figure 1 presents the rate of potentially preventable hospitalizations for asthma and diabetes per 100,000 population aged 0–17 years from 2003 through 2012.

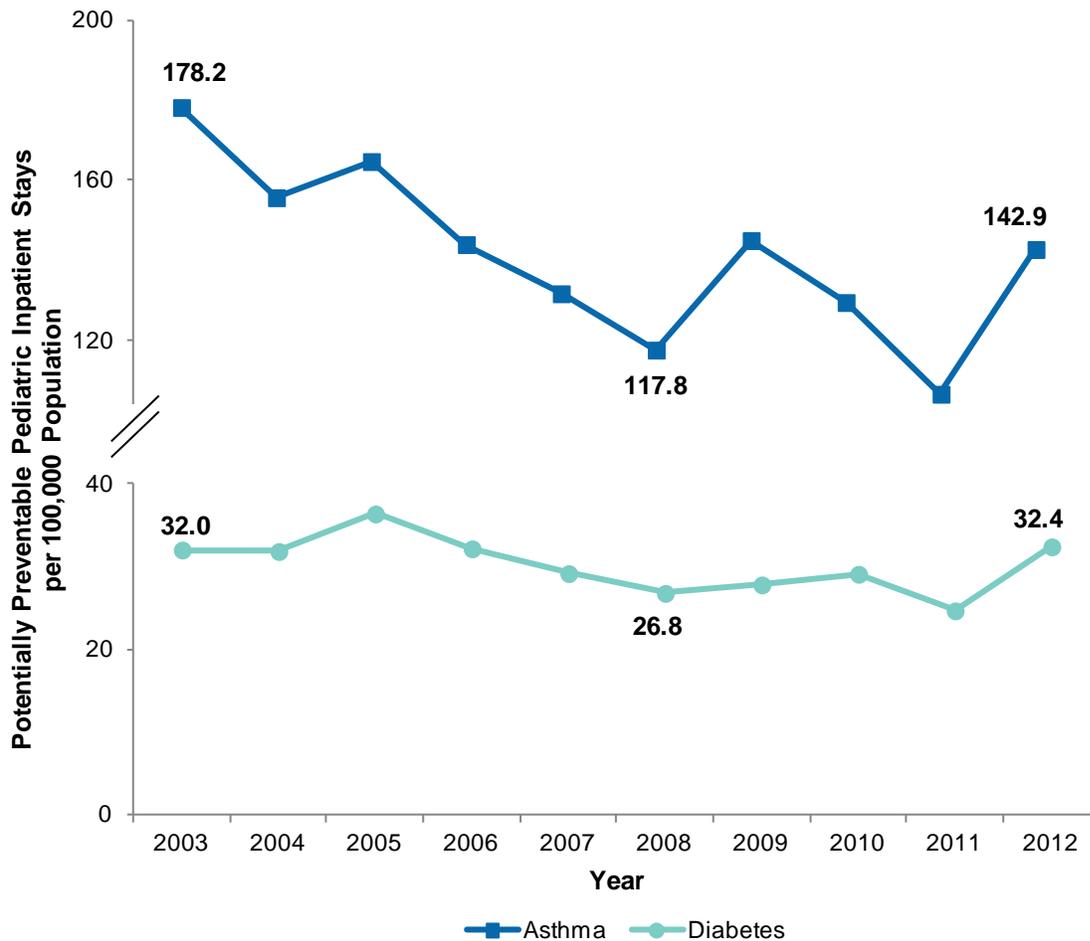
⁴ Friedman B, Berdahl T, Simpson LA, et al. Annual Report on Health Care for Children and Youth in the United States: Focus on Trends in Hospital Use and Quality. *Academic Pediatrics*. 2011;11:263–79.

⁵ Ibid.

⁶ Berdahl T, Friedman B, McCormick MC, et al. Annual Report on Health Care for Children and Youth in the United States: Trends in Racial/Ethnic, Income, and Insurance Disparities Over Time, 2002–2009. *Academic Pediatrics*. 2013;13:191–203.

⁷ Ibid.

Figure 1. Rate of potentially preventable pediatric inpatient stays for asthma and diabetes, 2003–2012



Notes: Rates were adjusted by age and sex using the total U.S. resident population for 2010 as the standard population. Rates are per 100,000 children aged 0–17 years.

Source: Agency for Healthcare Research and Quality (AHRQ), Center for Delivery, Organization, and Markets, Healthcare Cost and Utilization Project (HCUP), Nationwide Inpatient Sample (NIS), 2003–2011; State Inpatient Databases (SID), 2012, weighted to provide national estimates using the same methodology as the 2003–2011 NIS; and the AHRQ Quality Indicators, version 4.4

- **Potentially preventable pediatric stays were more common for asthma than for diabetes, with asthma-related stays occurring at over 4 times the rate of diabetes-related stays.**

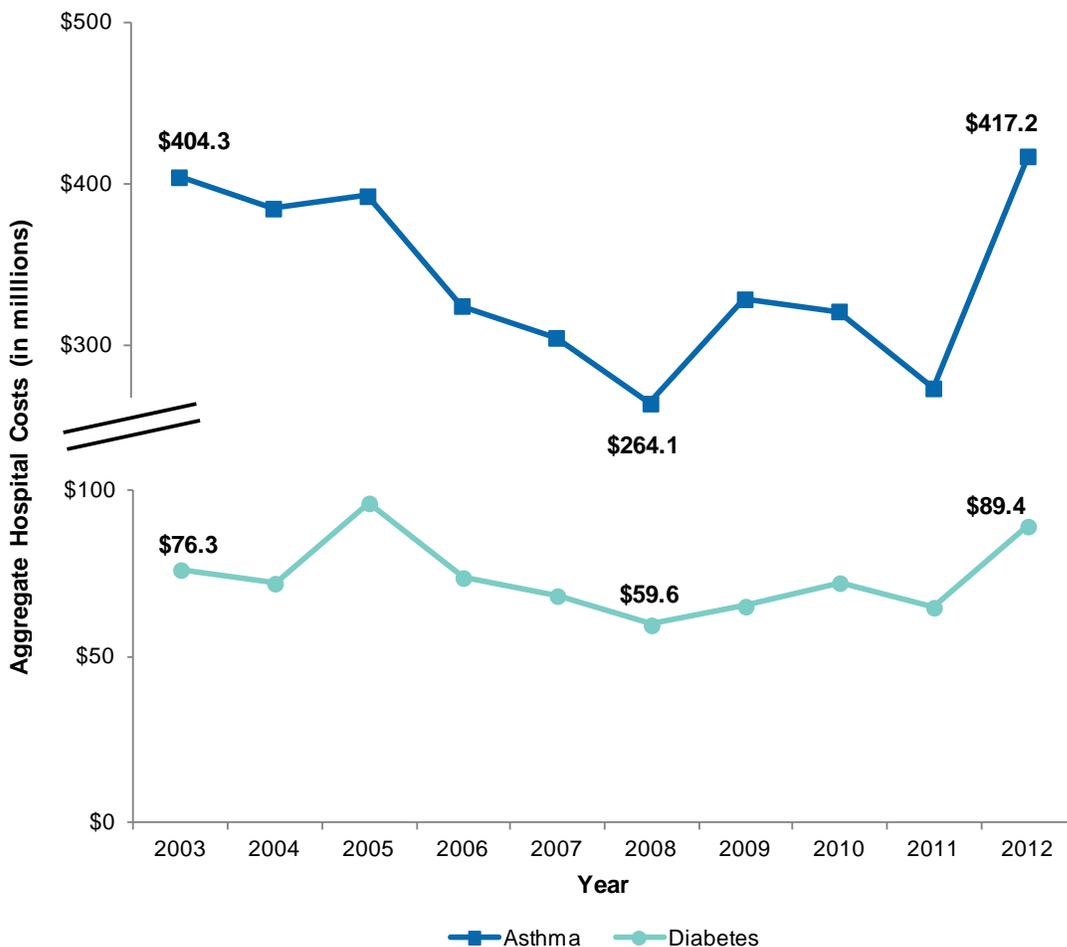
In 2012, the rate of pediatric stays for asthma was 142.9 per 100,000 population aged 0–17 years. This was over 4 times the rate of stays for diabetes (32.4 per 100,000 population).

- **Rates of potentially preventable pediatric stays for asthma and diabetes decreased between 2003 and 2008 but increased by 21 percent between 2008 and 2012.**

Between 2003 and 2008, the rate of pediatric stays for asthma decreased by 34 percent from 178.2 to 117.8 per 100,000 population, and the rate of stays for diabetes decreased by 16 percent from 32.0 to 26.8. Subsequently, the rate of stays for asthma and diabetes initially rose after 2008 and then fluctuated. By 2012, the rate of stays for asthma increased to 142.9 per 100,000 population, and the rate of stays for diabetes increased to 32.4 per 100,000—both increases of 21 percent compared with 2008.

Figure 2 presents the aggregate inflation-adjusted total costs of potentially preventable inpatient stays for asthma and diabetes among children from 2003 through 2012.

Figure 2. Aggregate inflation-adjusted costs of potentially preventable pediatric inpatient stays for asthma and diabetes, 2003–2012



Notes: All costs were inflation adjusted using the price index for the gross domestic product and are expressed in 2012 dollars. Source: Agency for Healthcare Research and Quality (AHRQ), Center for Delivery, Organization, and Markets, Healthcare Cost and Utilization Project (HCUP), Nationwide Inpatient Sample (NIS), 2003–2011; State Inpatient Databases (SID), 2012, weighted to provide national estimates using the same methodology as the 2003–2011 NIS; and the AHRQ Quality Indicators, version 4.4

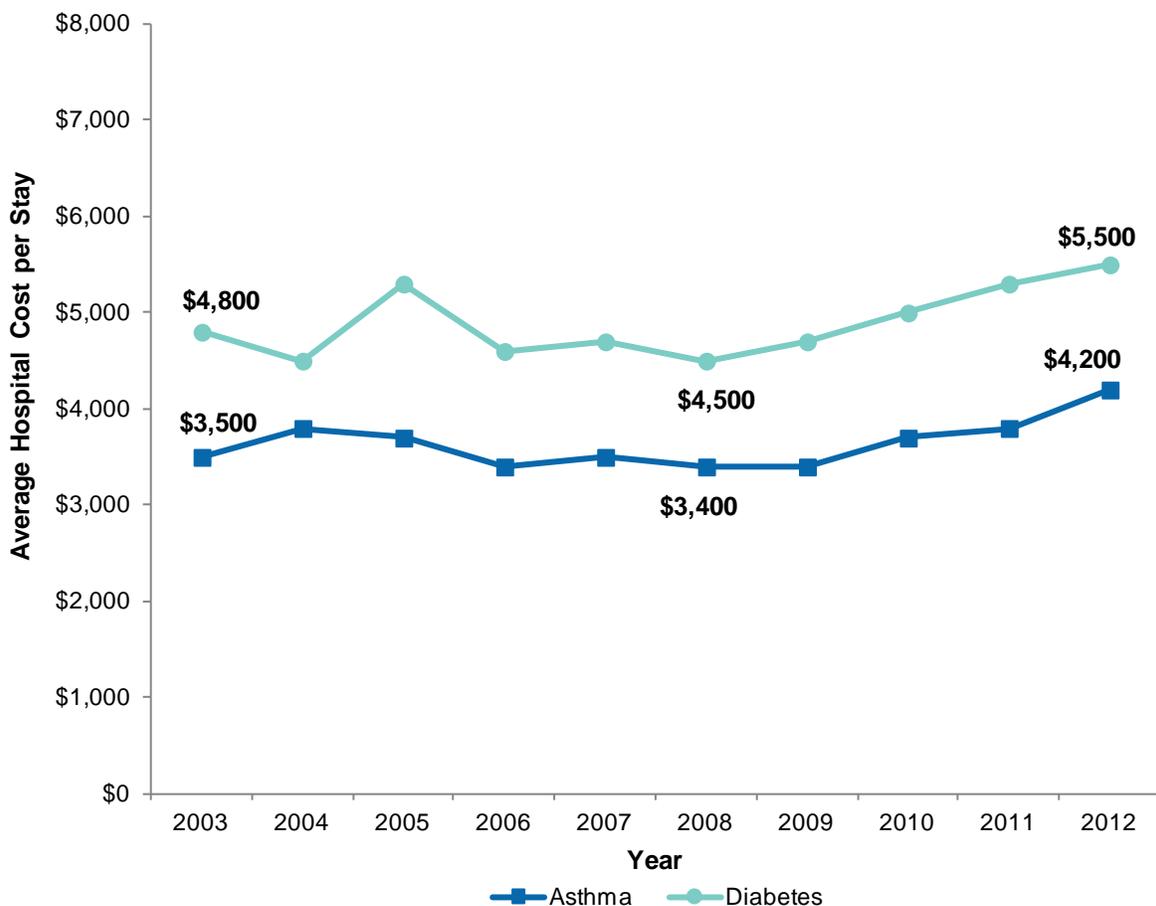
- **Similar to the trend in rates, aggregate inflation-adjusted costs of potentially preventable pediatric hospitalizations for asthma and diabetes generally decreased between 2003 and 2008 but subsequently increased.**

Between 2003 and 2008, aggregate inflation-adjusted costs of asthma hospitalizations among children decreased by 35 percent, from \$404.3 to \$264.1 million (expressed in 2012 dollars). But costs subsequently increased to \$417.2 million in 2012 (an increase of 58 percent from 2008).

Similarly, aggregate costs of diabetes hospitalizations decreased by 22 percent between 2003 and 2008, from \$76.3 to \$59.6 million. Subsequently, costs increased by 50 percent, reaching \$89.4 million in 2012.

Figure 3 presents the mean cost per stay of potentially preventable hospitalizations among children for asthma and diabetes from 2003 through 2012.

Figure 3. Average inflation-adjusted hospital cost per stay for potentially preventable pediatric inpatient stays for asthma and diabetes, 2003–2012



Notes: All costs were inflation adjusted using the price index for the gross domestic product and are expressed in 2012 dollars. Source: Agency for Healthcare Research and Quality (AHRQ), Center for Delivery, Organization, and Markets, Healthcare Cost and Utilization Project (HCUP), Nationwide Inpatient Sample (NIS), 2003–2011; State Inpatient Databases (SID), 2012, weighted to provide national estimates using the same methodology as the 2003–2011 NIS; and the AHRQ Quality Indicators, version 4.4

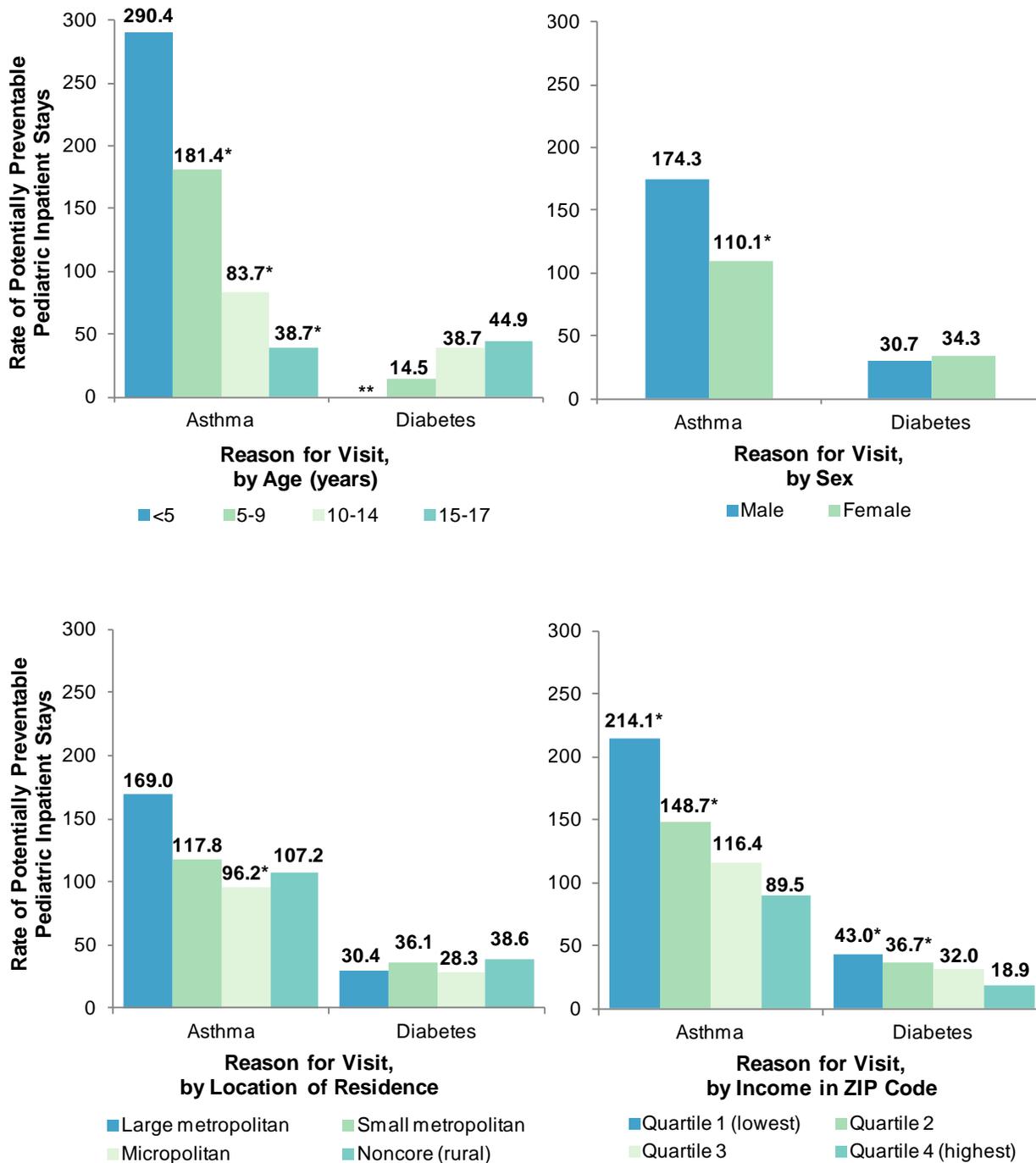
■ **The average inflation-adjusted cost per stay for potentially preventable asthma and diabetes hospitalizations remained relatively stable between 2003 and 2008 but subsequently increased.**

Between 2003 and 2008, the average inflation-adjusted cost per stay for asthma hospitalizations among children remained stable at around \$3,400 per stay (expressed in 2012 dollars). Subsequently, costs increased 25 percent, reaching \$4,200 per stay in 2012.

Similarly, the average cost per stay for diabetes hospitalizations generally remained stable between 2003 and 2008 at around \$4,500–\$4,800 per stay. Costs subsequently increased from \$4,500 in 2008 to \$5,500 per stay in 2012 (an increase of 22 percent).

Characteristics of potentially preventable pediatric hospital inpatient stays for asthma and diabetes, 2012
 Figure 4 presents the rate of pediatric hospitalizations for asthma and diabetes by select patient characteristics: age, sex, patient’s location of residence, and median household income in the patient’s ZIP Code of residence.

Figure 4. Rate of potentially preventable pediatric inpatient stays for asthma and diabetes by patient characteristic, 2012



* p-value < 0.01, when compared with the reference group: age < 5 years, males, large metropolitan location, income quartile 4.

** Data were not calculated for children aged 0–4 years; because this was the reference group, p-values were not calculated for differences in diabetes rates across age groups.

Notes: Rates were adjusted by age and sex using the total U.S. resident population for 2010 as the standard population; when reporting is by age, the adjustment was by sex only; when reporting is by sex, the adjustment was by age only. Stratified rates are per 100,000 children aged 0–17 years in a particular age group, sex, location of residence, or income quartile.

Source: Agency for Healthcare Research and Quality (AHRQ), Center for Delivery, Organization, and Markets, Healthcare Cost and Utilization Project (HCUP) State Inpatient Databases (SID), 2012, weighted to provide national estimates using the same methodology as the 2003–2011 Nationwide Inpatient Sample (NIS); and the AHRQ Quality Indicators, version 4.4

- **The rate of potentially preventable stays for asthma was highest for children younger than 5 years, males, and those living in large metropolitan areas.**

The highest rate of potentially preventable inpatient stays for asthma in 2012 was among children younger than 5 years, at 290.4 per 100,000 children aged less than 5 years. The rate was significantly lower for older children, ranging from 181.4 per 100,000 children aged 5–9 years to 38.7 per 100,000 children aged 15–17 years.

The rate of stays for asthma was higher for male (174.3 per 100,000 population) than for female children (110.1 per 100,000 population).

Children living in large metropolitan areas had a higher rate of hospitalization for asthma than did children living in micropolitan areas (169.0 vs. 96.2 per 100,000 population). Rates did not differ significantly between children living in large metropolitan versus small metropolitan or noncore (rural) areas.

- **Among children in the lowest income areas, the rates of potentially preventable stays for asthma and diabetes were more than twice as high as the rates in the highest income areas.**

In 2012, the rate of potentially preventable inpatient stays for asthma in the lowest income quartile was 2.4 times the rate of stays in the highest income quartile: 214.1 versus 89.5 per 100,000 population. Similarly, the rate of stays for diabetes in the lowest income quartile was 2.3 times the rate of stays in the highest income quartile: 43.0 versus 18.9 per 100,000 population.

Table 1 presents the cumulative percentage change in the rate of hospitalizations for asthma and diabetes among children from 2003 through 2012 by select patient and hospital characteristics.

Table 1. Rate of potentially preventable pediatric inpatient stays for asthma and diabetes by patient and hospital characteristics, 2003 and 2012

Characteristic	Asthma			Diabetes			
	Inpatient stays per 100,000 population ^a		Cumulative change in rate, 2003–2012, %	Inpatient stays per 100,000 population ^a		Cumulative change in rate, 2003–2012, %	
	2003	2012		2003	2012		
Overall total	178.2	142.9	–19.8	32.0	32.4	1.2	
Patient characteristics							
Age group, years	<5	380.3	290.4	–23.6	DNC	DNC	N/A
	5–9	195.3	181.4	–7.1	13.3	14.5	9.3
	10–14	109.1	83.7	–23.3	37.6	38.7	2.9
	15–17	72.8	38.7	–46.9	46.8	44.9	–4.0
Sex	Male	213.1	174.3	–18.2	26.0	30.7	17.7
	Female	141.9	110.1	–22.4	38.4	34.3	–10.6
Location (patient's residence)	Large metropolitan	215.5	169.0	–21.6	31.7	30.4	–4.1
	Small metropolitan	130.5	117.8	–9.8	30.6	36.1	18.0
	Micropolitan	132.2	96.2	–27.2	32.0	28.3	–11.7
	Noncore	152.4	107.2	–29.7	40.8	38.6	–5.5
Median household income (patient's ZIP Code)	Quartile 1 (lowest)	281.7	214.1	–24.0	39.8	43.0	8.1
	Quartile 2	174.2	148.7	–14.6	36.7	36.7	0.1
	Quartile 3	143.3	116.4	–18.8	31.3	32.0	2.4
	Quartile 4 (highest)	114.5	89.5	–21.8	20.6	18.9	–8.5
Hospital characteristics							
Hospital region	Northeast	290.9	179.3	–38.4	29.4	DSU	N/A
	Midwest	157.6	185.5	17.8	33.6	55.5	65.4
	South	179.0	153.0	–14.5	36.9	31.9	–13.5
	West	114.1	66.4	–41.8	25.4	14.6	–42.5

Abbreviations: DNC, data not collected; DSU, data statistically unreliable because of a relative standard error greater than 30 percent

^a Rates were adjusted by age and sex using the total U.S. resident population for 2010 as the standard population; when reporting is by age, the adjustment was by sex only; when reporting is by sex, the adjustment was by age only. Stratified rates are per 100,000 children aged 0–17 years in a particular age group, sex, location of residence, income quartile, or region.

Note: Although the cumulative change from 2003–2012 is presented, the trend may not be linear across intervening years.

Source: Agency for Healthcare Research and Quality (AHRQ), Center for Delivery, Organization, and Markets, Healthcare Cost and Utilization Project (HCUP), Nationwide Inpatient Sample (NIS), 2003; State Inpatient Databases (SID), 2012, weighted to provide national estimates using the same methodology as the 2003 NIS; and the AHRQ Quality Indicators, version 4.4

- **Between 2003 and 2012, the rate of potentially preventable stays for asthma decreased by nearly half among children aged 15–17 years.**

The rate of potentially preventable inpatient stays for asthma decreased for all age groups between 2003 and 2012. However, the largest decrease occurred among children aged 15–17 years: a 47 percent decrease.

- **Although the rate of potentially preventable stays for diabetes increased among male children but decreased among females from 2003 to 2012, females still had a higher rate than males in 2012.**

Between 2003 and 2012, the rate of potentially preventable inpatient stays for diabetes among children increased by 18 percent among males, from 26.0 to 30.7 per 100,000 population. At the

same time, the rate decreased by 11 percent among females, from 38.4 to 34.3 per 100,000 population. Despite this decrease, the rate among females was 12 percent higher than the rate among males in 2012.

- **Small metropolitan areas showed the least improvement in the rate of potentially preventable hospitalization for asthma and diabetes among children.**

The rate of potentially preventable inpatient stays for asthma decreased across all patient residence areas between 2003 and 2012. However, the decrease in rate was less than 10 percent in small metropolitan areas and more than 20 percent in large metropolitan, micropolitan, and noncore areas. For diabetes, the rate decreased for these latter three areas but increased by 18 percent for small metropolitan areas.

- **The rate of potentially preventable stays for asthma decreased among children in all income categories, although the same was not seen for diabetes.**

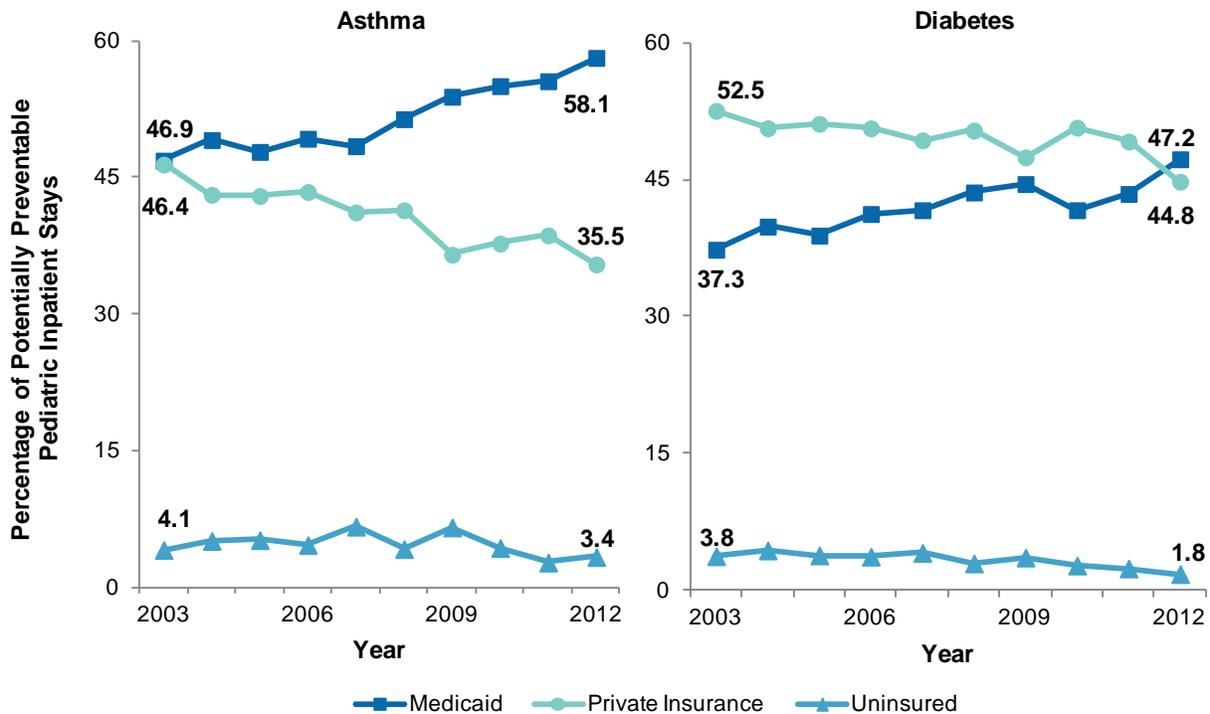
The rate of potentially preventable inpatient stays for asthma decreased in all income categories. The largest decrease was among children from the lowest income areas (quartile 1), where the rate decreased by 24 percent. Despite this decrease, in 2012, the rate remained highest among children from the poorest communities. The rate of stays for diabetes did not change by more than 10 percent in any income category.

- **The rate of potentially preventable pediatric inpatient stays for asthma and diabetes increased in the Midwest but decreased in all other regions.**

Between 2003 and 2012 in the Midwest, the rate of potentially preventable inpatient stays among children increased by 18 percent for asthma and by 65 percent for diabetes. In contrast, the rates decreased during the same time period in all other regions.

Figure 5 presents trends in the expected source of payment for asthma and diabetes potentially preventable hospitalizations among children, from 2003 through 2012.

Figure 5. Potentially preventable pediatric inpatient stays for asthma and diabetes by primary expected payer, 2003–2012



Source: Agency for Healthcare Research and Quality (AHRQ), Center for Delivery, Organization, and Markets, Healthcare Cost and Utilization Project (HCUP), Nationwide Inpatient Sample (NIS), 2003–2011; State Inpatient Databases (SID), 2012, weighted to provide national estimates using the same methodology as the 2003–2011 NIS; and the AHRQ Quality Indicators, version 4.4

- **The expected source of payment for potentially preventable pediatric stays for asthma and diabetes shifted between 2003 and 2012 toward Medicaid and away from private insurance.**

Between 2003 and 2012, the proportion of potentially preventable pediatric inpatient stays with Medicaid as the expected payment source increased from 46.9 to 58.1 percent for asthma and from 37.3 to 47.2 percent for diabetes. In contrast, the proportion of stays expected to be paid by private insurance decreased from 46.4 to 35.5 percent for asthma and from 52.5 to 44.8 percent for diabetes. The proportion of these stays that were uninsured also decreased over the 10-year period. By 2012, Medicaid was the leading payment source for potentially preventable pediatric inpatient stays for asthma and diabetes.

Data Source

The estimates in this Statistical Brief are based upon an analysis done for the National Healthcare Quality and Disparities Reports (NHQR/NHDR). Data came from the Healthcare Cost and Utilization Project (HCUP) 2003–2011 Nationwide Inpatient Sample (NIS). For data year 2012, we used an analysis file derived from the HCUP State Inpatient Databases (SID) that was designed to provide national estimates using weighted records from a sample of hospitals from 44 States using the same methodology employed for the 2003–2011 NIS. We did not use the 2012 National Inpatient Sample (NIS) because the sampling design and universe definition was revised. At the time of this analysis, NIS trend weights to make national estimates compatible between 2003–2011 and 2012 were unavailable. Supplemental sources included population denominator data from Nielsen, a vendor that compiles and adds value to the U.S. Bureau of Census data. Nielsen uses intercensal methods to estimate household and demographic statistics for geographic areas.⁸

Definitions

Case definition

Potentially preventable pediatric admissions for asthma and diabetes were defined using the AHRQ Quality Indicators (QIs) software, version 4.4. Further information on the AHRQ QIs, including documentation and free software downloads, is available at <http://www.qualityindicators.ahrq.gov/>. This includes information on the Pediatric Quality Indicators (PDIs, formerly known as PedQIs) used in this Statistical Brief. The PDIs contain measures of potentially preventable hospitalizations for children with asthma, gastroenteritis, diabetes short-term complications, and perforated appendix. Additional information on how the QI software was applied to the HCUP data for the statistics reported in this Statistical Brief is available in Coffey et al., 2012.⁹

Consistent with the AHRQ PDI software, preventable stays for asthma were defined as stays where asthma was the principal diagnosis and the following cases were excluded: admissions with cystic fibrosis or anomalies of the respiratory system, transfers from other institutions, and obstetric admissions. Preventable stays for diabetes were defined as stays for which the principal diagnosis was diabetes, and short-term complications included ketoacidosis, hyperosmolarity, or coma; transfers from other institutions and obstetric admissions are excluded.

Types of hospitals included in the HCUP Nationwide Inpatient Sample

The Nationwide Inpatient Sample (NIS) is based on data from community hospitals, which are defined as short-term, non-Federal, general, and other hospitals, excluding hospital units of other institutions (e.g., prisons). The NIS includes obstetrics and gynecology, otolaryngology, orthopedic, cancer, pediatric, public, and academic medical hospitals. Excluded are long-term care facilities such as rehabilitation, psychiatric, and alcoholism and chemical dependency hospitals.

Types of hospitals included in HCUP State Inpatient Databases

This analysis used State Inpatient Databases (SID) limited to data from community hospitals, which are defined as short-term, non-Federal, general, and other hospitals, excluding hospital units of other institutions (e.g., prisons). Community hospitals include obstetrics and gynecology, otolaryngology, orthopedic, cancer, pediatric, public, and academic medical hospitals. Excluded for this analysis are long-term care facilities such as rehabilitation, psychiatric, and alcoholism and chemical dependency hospitals. However, if a patient received long-term care, rehabilitation, or treatment for psychiatric or chemical dependency conditions in a community hospital, the discharge record for that stay was included in the analysis.

⁸ Barrett M, Lopez-Gonzalez L, Coffey R, Levit K. Population Denominator Data for Use with the HCUP Databases (Updated with 2013 Population Data). HCUP Methods Series Report #2014-02. August 18, 2014. U.S. Agency for Healthcare Research and Quality. <http://www.hcup-us.ahrq.gov/reports/methods/2014-02.pdf>. Accessed January 7, 2015.

⁹ Coffey R, Barrett M, Houchens R, et al. Methods Applying AHRQ Quality Indicators to Healthcare Cost and Utilization Project (HCUP) Data for the Eleventh (2013) National Healthcare Quality Report (NHQR) and National Healthcare Disparities Report (NHDR). HCUP Methods Series Report #2012-03. Online. November 12, 2012. U.S. Agency for Healthcare Research and Quality. http://www.hcup-us.ahrq.gov/reports/methods/2012_03.pdf. Accessed January 7, 2015.

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 1 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 & Medicaid Services (CMS).¹⁰ Costs will reflect the actual expenses incurred in the production of hospital services, such as wages, supplies, and utility costs; charges represent the amount a hospital billed for the case. For each hospital, a hospital-wide cost-to-charge ratio is used. Hospital charges reflect the amount the hospital billed for the entire hospital stay and do not include professional (physician) fees. For the purposes of this Statistical Brief, costs are reported to the nearest hundred.

Annual costs were inflation adjusted using the Gross Domestic Product (GDP) Price Index from the U.S. Department of Commerce, Bureau of Economic Analysis (BEA), with 2012 as the index base. That is, all costs are expressed in 2012 dollars.

How HCUP estimates of costs differ from National Health Expenditure Accounts

There are a number of differences between the costs cited in this Statistical Brief and spending as measured in the National Health Expenditure Accounts (NHEA), which are produced annually by the Centers for Medicare & Medicaid Services (CMS).¹¹ The largest source of difference comes from the HCUP coverage of inpatient treatment only in contrast to the NHEA inclusion of outpatient costs associated with emergency departments and other hospital-based outpatient clinics and departments as well. The outpatient portion of hospitals' activities has been growing steadily and may exceed half of all hospital revenue in recent years. On the basis of the American Hospital Association Annual Survey, 2012 outpatient gross revenues (or charges) were about 44 percent of total hospital gross revenues.¹²

Smaller sources of differences come from the inclusion in the NHEA of hospitals that are excluded from HCUP. These include Federal hospitals (Department of Defense, Veterans Administration, Indian Health Services, and Department of Justice [prison] hospitals) as well as psychiatric, substance abuse, and long-term care hospitals. A third source of difference lies in the HCUP reliance on billed charges from hospitals to payers, adjusted to provide estimates of costs using hospital-wide cost-to-charge ratios, in contrast to the NHEA measurement of spending or revenue. HCUP costs estimate the amount of money required to produce hospital services, including expenses for wages, salaries, and benefits paid to staff as well as utilities, maintenance, and other similar expenses required to run a hospital. NHEA spending or revenue measures the amount of income received by the hospital for treatment and other services provided, including payments by insurers, patients, or government programs. The difference between revenues and costs include profit for for-profit hospitals or surpluses for nonprofit hospitals.

Location of patients' residence

Place of residence is based on the 2003 version of the Urban Influence Codes:

- Large Metropolitan: Metropolitan areas with 1 million or more residents
- Small Metropolitan: Metropolitan areas with fewer than 1 million residents
- Micropolitan: Micropolitan areas adjacent and nonadjacent to metropolitan areas
- Noncore (rural): Nonmetropolitan and nonmicropolitan counties.

¹⁰ Agency for Healthcare Research and Quality. HCUP Cost-to-Charge Ratio (CCR) Files. Healthcare Cost and Utilization Project (HCUP). 2001–2011. Rockville, MD: Agency for Healthcare Research and Quality. Updated December 2014. <https://www.hcup-us.ahrq.gov/db/state/costtocharge.jsp>. Accessed January 7, 2015.

¹¹ For additional information about the NHEA, see Centers for Medicare & Medicaid Services (CMS). National Health Expenditure Data. CMS Web site May 2014. <http://www.cms.gov/Research-Statistics-Data-and-Systems/Statistics-Trends-and-Reports/NationalHealthExpendData/index.html?redirect=NationalHealthExpendData/>. Accessed January 7, 2015.

¹² American Hospital Association. TrendWatch Chartbook, 2014. Table 4.2. Distribution of Inpatient vs. Outpatient Revenues, 1992–2012. <http://www.aha.org/research/reports/tw/chartbook/2014/table4-2.pdf>. Accessed January 7, 2015.

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 are determined using ZIP Code demographic data obtained from the Nielsen Company. The income quartile is missing for patients who are homeless or foreign.

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

About HCUP

The Healthcare Cost and Utilization Project (HCUP, pronounced "H-Cup") is a family of health care databases and related software tools and products developed through a Federal-State-Industry partnership and sponsored by the Agency for Healthcare Research and Quality (AHRQ). HCUP databases bring together the data collection efforts of State data organizations, hospital associations, and private data organizations (HCUP Partners) and the Federal government to create a national information resource of encounter-level health care data. HCUP includes the largest collection of longitudinal hospital care data in the United States, with all-payer, encounter-level information beginning in 1988. These databases enable research on a broad range of health policy issues, including cost and quality of health services, medical practice patterns, access to health care programs, and outcomes of treatments at the national, State, and local market levels.

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

Alaska State Hospital and Nursing Home Association
Arizona Department of Health Services
Arkansas Department of Health
California Office of Statewide Health Planning and Development
Colorado Hospital Association
Connecticut Hospital Association
District of Columbia 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 Center for Health Information and Analysis
Michigan Health & Hospital Association
Minnesota Hospital Association
Mississippi Department of Health
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
New Mexico Department of Health
New York State Department of Health
North Carolina Department of Health and Human Services
North Dakota (data provided by the Minnesota Hospital Association)
Ohio Hospital Association
Oklahoma State Department of Health
Oregon Association of Hospitals and Health Systems
Oregon Office of Health Analytics
Pennsylvania Health Care Cost Containment Council
Rhode Island Department of Health
South Carolina Revenue and Fiscal Affairs Office
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 Statistical Briefs

HCUP Statistical Briefs are descriptive summary reports presenting statistics on hospital inpatient and emergency department use and costs, quality of care, access to care, medical conditions, procedures, patient populations, and other topics. The reports use HCUP administrative health care data.

About the NIS

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

The 2012 NIS was redesigned to optimize national estimates. The redesign incorporates two critical changes:

- Revisions to the sample design—starting with 2012, the NIS is a *sample of discharge records from all HCUP-participating hospitals*, rather than a sample of hospitals from which all discharges were retained (as is the case for NIS years before 2012).
- Revisions to how hospitals are defined—the NIS now uses the *definition of hospitals and discharges supplied by the statewide data organizations* that contribute to HCUP, rather than the definitions used by the American Hospital Association (AHA) Annual Survey of Hospitals.

The new sampling strategy is expected to result in more precise estimates than those that resulted from the previous NIS design by reducing sampling error: for many estimates, confidence intervals under the new design are about half the length of confidence intervals under the previous design. The change in sample design for 2012 necessitates recomputation of prior years' NIS data to enable analysis of trends that uses the same definitions of discharges and hospitals.

About the SID

The HCUP State Inpatient Databases (SID) are hospital inpatient databases from data organizations participating in HCUP. The SID contain the universe of the inpatient discharge abstracts in the participating HCUP States, translated into a uniform format to facilitate multistate comparisons and analyses. Together, the SID encompass more than 95 percent of all U.S. community hospital discharges in 2009. The SID can be used to investigate questions unique to one State, to compare data from two or more States, to conduct market-area variation analyses, and to identify State-specific trends in inpatient care utilization, access, charges, and outcomes.

For More Information

For more information about HCUP, visit <http://www.hcup-us.ahrq.gov/>.

For additional HCUP statistics, visit HCUPnet, our interactive query system, at <http://hcupnet.ahrq.gov/>.

For information on other hospitalizations in the United States, refer to the following HCUP Statistical Briefs located at <http://www.hcup-us.ahrq.gov/reports/statbriefs/statbriefs.jsp>:

- Statistical Brief #180, Overview of Hospital Stays in the United States, 2012
- Statistical Brief #181, Costs for Hospital Stays in the United States, 2012
- Statistical Brief #186, Most Frequent Operating Room Procedures Performed in U.S. Hospitals, 2012
- Statistical Brief #165, Most Frequent Procedures Performed in U.S. Hospitals, 2011

For a detailed description of HCUP, more information on the design of the National (Nationwide) Inpatient Sample (NIS) and the State Inpatient Databases (SID), and methods to calculate estimates, please refer to the following publications:

Agency for Healthcare Research and Quality. Overview of the National (Nationwide) Inpatient Sample (NIS). Healthcare Cost and Utilization Project (HCUP). Rockville, MD: Agency for Healthcare Research and Quality. Updated November 2014. <http://www.hcup-us.ahrq.gov/nisoverview.jsp>. Accessed January 7, 2015.

Agency for Healthcare Research and Quality. Overview of the State Inpatient Databases (SID). Healthcare Cost and Utilization Project (HCUP). Rockville, MD: Agency for Healthcare Research and Quality. Updated November 2014. <http://www.hcup-us.ahrq.gov/sidoverview.jsp>. Accessed January 7, 2015.

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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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