

STATISTICAL BRIEF #58

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Hospital Stays Related to Asthma for Children, 2006

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Introduction

In 2006, nearly 10 percent of children had a current diagnosis of asthma and 14 percent had a diagnosis at some point in their lives.¹ The prevalence of pediatric asthma reached this level after growing at remarkable rates throughout the 1980s and early 1990s. Despite significant efforts to address the disease, through advances in medicine and interventions in public health, asthma continues to burden children, families and communities. Furthermore, it disproportionately affects low-income and minority children. Disparities in treatment contribute to higher rates of asthma morbidity and mortality among these groups.²

This Statistical Brief presents data from the Healthcare Cost and Utilization Project (HCUP) on asthma-related stays for children at U.S. community hospitals in 2006. Variation in the characteristics of hospitalizations principally for asthma, stays with a secondary diagnosis of asthma, and those with no mention of asthma are examined.³ The differing rates of asthma-related hospitalization across income level and regions are also presented.

This brief is the second report in a two-part series on asthma-related hospitalizations. Because characteristics of hospital stays for asthma differ for adults and children, discussion of adult asthma-related stays was presented in a separate brief ([HCUP Statistical Brief #54](#)).

Findings

General findings

In 2006, there were approximately 335,000 asthma-related hospitalizations among children, comprising 13.6 percent of all pediatric hospitalizations (excluding newborns) (table 1). Asthma

Highlights

- There were 335,000 asthma-related pediatric stays in 2006; these stays accounted for 13.5 percent of all pediatric hospitalizations (excluding newborns).
- The rate of hospitalization principally for asthma among children living in the poorest communities was 76 percent greater than it was among children living in wealthier communities.
- Pediatric asthma-related hospital stays were 1.6 times more common among boys than girls, while adult asthma-related stays were more common among women.
- There were 8.0 asthma-related hospital stays per 1,000 children under one year of age. This age group had the highest rate of asthma-related hospitalizations; rates declined with increasing age.
- Rates of pediatric hospital stays principally for asthma were highest in the Northeast at 2.7 stays per 1,000 children.
- The most common principal diagnosis among pediatric stays with a secondary diagnosis of asthma was pneumonia: 27.0 percent of pediatric asthma-related stays were principally for pneumonia.

¹ Bloom B, Cohen R.A. Summary Health Statistics for U.S. Children: National Health Interview Survey, 2006. National Center for Health Statistics. Vital Health Stat 10(234). 2007. http://www.cdc.gov/nchs/data/series/sr_10/sr10_234.pdf

² Akinbami LJ. The State of Childhood Asthma, United States, 1980–2005. Advance data from vital and health statistics; no. 381, Hyattsville, MD: National Center for Health Statistics. 2006.

³ Newborn records were excluded from this analysis.

was listed as the principal reason for hospitalization (i.e., the principal diagnosis) in about 41 percent of these stays, and was listed as the secondary reason in about 59 percent of these stays. Between 1997 and 2006, overall hospitalizations for pediatric asthma remained relatively steady, although asthma more commonly was listed as a secondary condition rather than as the principal condition: the number of stays principally for asthma declined by almost 60,000 stays (30 percent) while the number of stays with asthma noted as a secondary reason for hospitalization rose by about 69,700 (54 percent) (figure 1). In comparison to adult asthma-related hospitalization rates, rates of pediatric hospitalization principally for asthma were about 1.5 times higher among children. However, rates of hospital stays with asthma noted as a secondary diagnosis were more than 2.5 times higher among adults than children.

Charges for pediatric hospitalizations principally for asthma were less than half as much as non-newborn pediatric stays with no mention of asthma (\$9,100 compared to \$22,600, respectively). Likewise, the mean length of stay for pediatric asthma stays was significantly shorter compared to non-asthma stays—2.2 days versus 4.6 days, respectively. In terms of resource utilization, stays with a secondary diagnosis of asthma more closely resembled stays with no mention of asthma.

A much greater percent of children hospitalized for asthma were admitted through the emergency department (ED) compared to non-asthma pediatric stays (64.6 percent versus 44.1 percent, respectively). While pediatric asthma stays originated in the ED more often, the in-hospital death rate for these children was much lower (.03 percent or about 40 children in 2006) compared to children with no mention of asthma (0.56 percent or about 12,000 children in 2006). Secondary cases of asthma also originated in the ED more frequently (52.3 percent of stays) and resulted in fewer in-hospital deaths (0.16 percent or 321 children in 2006) compared to non-asthma stays.

Pediatric asthma-related hospital stays, by median income

In 2006, the rate of asthma-related hospitalizations was 76 percent higher among children living in the poorest communities than it was among children living in wealthier communities (2.7 stays versus 1.5 stays per 1,000 children, respectively) (figure 2).⁴ The magnitude of difference in the rate of stays between the two income groups decreased for secondary diagnoses of asthma: the hospitalization rate for children living in the poorest communities was 54 percent higher than for those living in wealthier communities (3.5 stays versus 2.3 stays per 1,000 children, respectively).

Pediatric asthma-related hospital stays, by age and gender

Characteristics of children hospitalized principally for asthma and those hospitalized with a secondary diagnosis of asthma varied by age and gender (table 1). Overall rates of asthma-related hospitalizations were highest among the youngest age groups, and declined with increasing age (figure 3). Altogether, there were 8.0 asthma-related hospitalizations for every 1,000 children under one year of age, the majority of which were stays in which asthma was a secondary condition. Older children, ages 15-17, had the lowest rates of hospitalization for asthma, with a total of 2.2 asthma-related hospitalizations per 1,000 children; the majority was also for stays in which asthma was a secondary condition. This pattern is in contrast to pediatric non-asthma stays for which the highest rate of hospitalization was for the youngest age group (less than one year) at 149.0 stays per 1,000 children with lower hospitalization rates for the remaining pediatric age groups.

Hospital stays principally for asthma were 1.6 times more common in boys than girls (2.3 stays versus 1.4 stays per 1,000 children, respectively), but secondary cases of asthma and stays with no mention of asthma did not vary significantly by gender. This finding is in contrast to adult asthma stays for which hospitalization rates were higher for females than males.

Pediatric asthma-related hospital stays, by region

After adjusting for regional population differences, rates of hospitalization principally for asthma were highest in the Northeast (2.7 stays per 1,000 children) and lower in the Midwest, South and West (between 1.4 and 1.9 stays per 1,000 children) (figure 4). Likewise, the percentage of children who had

⁴Poorer communities were defined as ZIP Codes with a median income of less than \$36,000, while wealthier communities were defined as ZIP Codes with a median income of \$36,000 or more.

asthma at some point in their lives was also significantly higher in the Northeast (16.8 percent) compared to other regions of the country.⁵

For pediatric hospital stays with asthma noted as a secondary condition, rates were comparable in the Northeast, Midwest and South (about 3 stays per 1,000 children), but lower in the West (2.0 stays per 1,000 children). In contrast, the rate hospital stays for children with no mention of asthma was similar across the four regions at about 30 stays per 1,000 children.

Most common principal diagnoses for pediatric hospital stays with asthma noted as a secondary condition

In 2006, asthma was more often a secondary reason for hospitalization rather than the principal reason. Among those stays with asthma noted as a secondary diagnosis, table 2 shows the five most common principal reasons why children were hospitalized. Like adults, the most common principal reason for hospitalization in asthma-related stays was pneumonia: about 53,200 stays, or 27.0 percent of pediatric asthma-related stays, were principally for pneumonia. In contrast, only 5.1 percent of stays with no mention of asthma noted pneumonia as a principal diagnosis.

Acute bronchitis and mood disorders⁶ were the next two most common principal reasons for hospitalization among pediatric asthma-related stays and, like pneumonia, they were more common among asthma-related stays. About 9 percent of pediatric asthma-related stays noted acute bronchitis as the principal reason for admission and 5.4 percent noted mood disorders – compared to 5.7 percent and 3.5 percent of non-asthma childrens' stays, respectively.

Appendicitis and fluid and electrolyte disorders were the principal reasons for 2.7 and 2.4 percent of pediatric stays with a secondary diagnosis of asthma, respectively. However, both of these diagnoses were more common in stays with no mention of asthma.

Data Source

The estimates in this Statistical Brief are based upon data from the HCUP 2006 Kids' Inpatient Database (KID). Historical data were drawn from the 1997, 2000, and 2003 NIS. Supplemental sources, used to derive denominator data for population rates included:

- 1) 2006 Claritas data
- 2) Current Population Survey (CPS) Table Creator in the 2006 data year (http://www.census.gov/hhes/www/cpstc/cps_table_creator.html).

Definitions

Diagnoses, Procedures, 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. All-listed procedures include all procedures performed during the hospital stay.

ICD-9-CM is the International Classification of Diseases, Ninth Revision, Clinical Modification, which assigns numeric codes to diagnoses. There are about 12,000 ICD-9-CM diagnosis codes.

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

Case Definition

The CCS code used to identify asthma cases is "128."

⁵ Bloom B, Cohen RA. Summary Health Statistics for U.S. Children: National Health Interview Survey, 2006. National Center for Health Statistics. Vital Health Stat 10(234). 2007. http://www.cdc.gov/nchs/data/series/sr_10/sr10_234.pdf

⁶ Associations between asthma severity and psychiatric disorders in pediatric and adult populations have been documented elsewhere: Eisner M, Katz P, Lactao G, Iribarren C. *Impact of depressive symptoms on adult asthma outcomes*. Annals of Allergy, Asthma and Immunology. Volume 94, May 2005.; Ortega A, Huertas S, Canino G, Ramirez R, Rubio-Stipec M. *Childhood Asthma, Chronic Illness, and Psychiatric Disorders*. The Journal of Nervous and Mental Disease. 190 (5), May, 2002.

Pediatric hospitalizations excluding newborns were identified by selecting records in which the AGE code was less than 18 and which did not contain a CCS code for liveborns ("218").

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.

Charges

Charges represent what the hospital billed for the case. Hospital charges reflect the amount the hospital charged for the entire hospital stay and do not include professional (physician) fees. For the purposes of this Statistical Brief, charges are rounded to the nearest hundred dollars.

Admission source

Admission source 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.

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 (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.

Median community-level income

Median community-level income is the median household income of the patient's ZIP Code of residence. The income value is missing for homeless and foreign patients.

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

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 & Human Services
California Office of Statewide Health Planning & Development
Colorado Hospital Association
Connecticut Integrated Health Information (Chime, Inc.)
Florida Agency for Health Care Administration
Georgia Hospital Association
Hawaii Health Information Corporation
Illinois Health Care Cost Containment Council and Department of Public Health
Indiana Hospital & Health Association
Iowa Hospital Association
Kansas Hospital Association
Kentucky Cabinet for Health and Family Services
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 Division of Health Care Financing and Policy, Department of Health and Human Services
New Hampshire Department of Health & Human Services
New Jersey Department of Health & Senior Services
New York State Department of Health
North Carolina Department of Health and Human Services
Ohio Hospital Association
Oklahoma Health Care Information Center for Health Statistics
Oregon Association of Hospitals and Health Systems
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 & Family Services

About the KID

The HCUP Kids' Inpatient Database (KID) is a nationwide database of hospital inpatient stays. The KID is the only dataset on hospital use, outcomes, and charges designed to study children's use of hospital services in the United States. The KID is a sample of discharges from all community, non-rehabilitation hospitals in States participating in HCUP. The target universe includes pediatric discharges from community, non-rehabilitation hospitals in the United States. Pediatric discharges are defined as all discharges where the patient was age 20 or less at admission. For this analysis only discharges for children 17 years and younger were included. The KID's large sample size enables analyses of rare conditions, such as congenital anomalies and uncommon treatments, such as organ transplantation. It can be used to study a wide range of topics including the economic burden of pediatric conditions, access to services, quality of care and patient safety, and the impact of health policy changes. The KID is produced every three years; prior databases are available for 1997, 2000, and 2003.

About HCUPnet

HCUPnet is an online query system that offers instant access to the largest set of all-payer health care databases that are publicly available. HCUPnet has an easy step-by-step query system, allowing for tables and graphs to be generated on national and regional statistics, as well as trends for community hospitals in the U.S. HCUPnet generates statistics using data from HCUP's Nationwide Inpatient Sample (NIS), the Kids' Inpatient Database (KID), the State Inpatient Databases (SID) and the State Emergency Department Databases (SEDD).

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 2005*, located at <http://www.hcup-us.ahrq.gov/reports.jsp>.

For a detailed description of HCUP, more information on the design of the KID, 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 Kids' Inpatient Database, 2006. Online. June 2008. U.S. Agency for Healthcare Research and Quality. <http://www.hcup-us.ahrq.gov/db/nation/kid/kiddbdocumentation.jsp>.

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>.

Suggested Citation

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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
540 Gaither Road
Rockville, MD 20850

Table 1. Characteristics of hospital stays related to asthma compared to stays with no mention of asthma, among children, 2006*

	Pediatric hospital stays with:		
	Asthma as a principal diagnosis	Asthma as a secondary diagnosis	No mention of asthma
Number of hospital stays	137,700	197,000	2,138,600
(percent of all stays)	(5.6%)	(8.0%)	(86.5%)
Percentage of all asthma stays	41.1%	58.9%	
Mean length of stay, days	2.2	4.0	4.6
Mean charge per stay, dollars	\$ 9,100	\$ 17,700	\$ 22,600
Percent admitted from the emergency department	64.6%	52.3%	44.1%
Percent died in hospital	0.03%	0.16%	0.56%
<i>Hospitalization Rate per 1,000 Children in the Population</i>			
All Children	1.9	2.7	29.0
<i>Age</i>			
<1 year	2.8	5.1	149.0
1-4 years	3.0	3.2	21.6
5-9 years	2.3	2.3	16.9
10-14 years	1.4	2.8	24.7
15-17 years	0.3	1.8	24.2
<i>Gender</i>			
Boys	2.3	2.9	27.9
Girls	1.4	2.4	29.6

*Children were defined as patients younger than 18 years of age. Newborns were excluded.

Source: AHRQ, Center for Delivery, Organization, and Markets, Healthcare Cost and Utilization Project, Kids' Inpatient Database (KID), 2006.

Table 2. Most common principal diagnoses for hospital stays with a secondary diagnosis of asthma, among children, 2006*

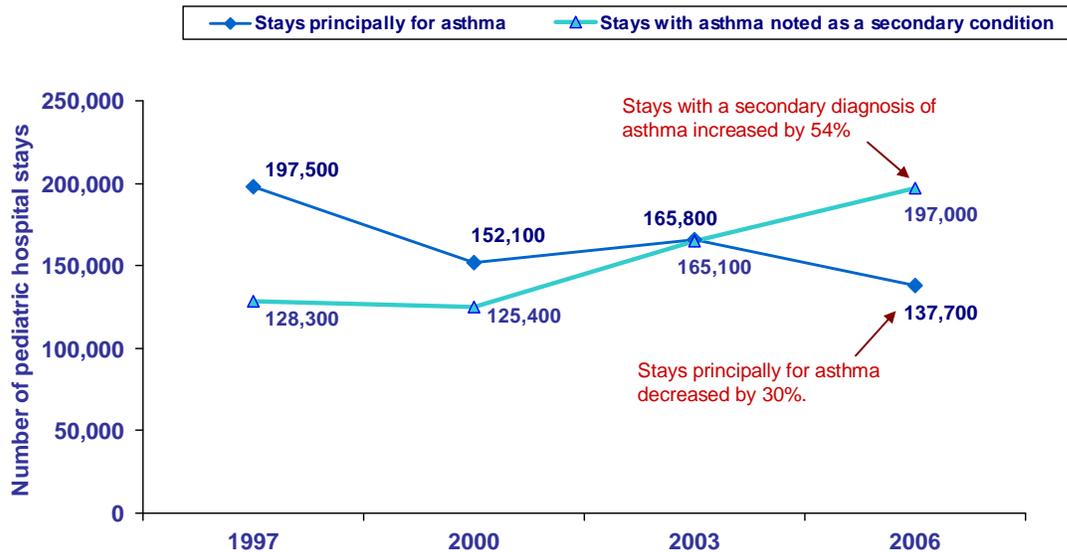
Rank	Principal Diagnosis	Number of stays with asthma as a secondary diagnosis	Percentage of pediatric stays with this principal diagnosis among:	
			Stays with asthma as a secondary diagnosis	Stays with no mention of asthma
1	Pneumonia	53,200	27.0%	5.1%
2	Acute bronchitis	17,200	8.8%	5.7%
3	Mood disorders	10,700	5.4%	3.5%
4	Appendicitis	5,400	2.7%	3.6%
5	Fluid and electrolyte disorders	4,700	2.4%	4.0%

*Children were defined as patients younger than 18 years of age. Newborns were excluded.

Source: AHRQ, Center for Delivery, Organization, and Markets, Healthcare Cost and Utilization Project, Kids' Inpatient Database (KID), 2006.



Figure 1. Number of pediatric hospital stays principally for asthma decreased while the number of stays with a secondary diagnosis of asthma increased, 1997-2006*

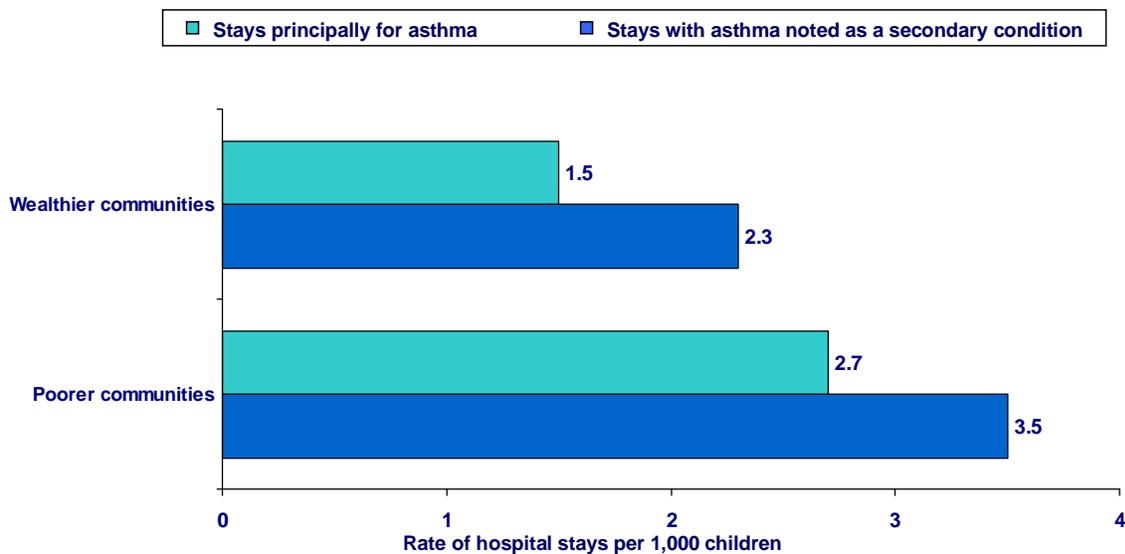


* Children were defined as patients younger than 18 years of age. Newborns were excluded.

Source: AHRQ, Center for Delivery, Organization, and Markets, Healthcare Cost and Utilization Project, Kids' Inpatient Database, 1997, 2000, 2003, & 2006.



Figure 2. Rate of pediatric hospital stays principally for asthma was 76 percent greater in poorer communities compared to wealthier communities, 2006 *



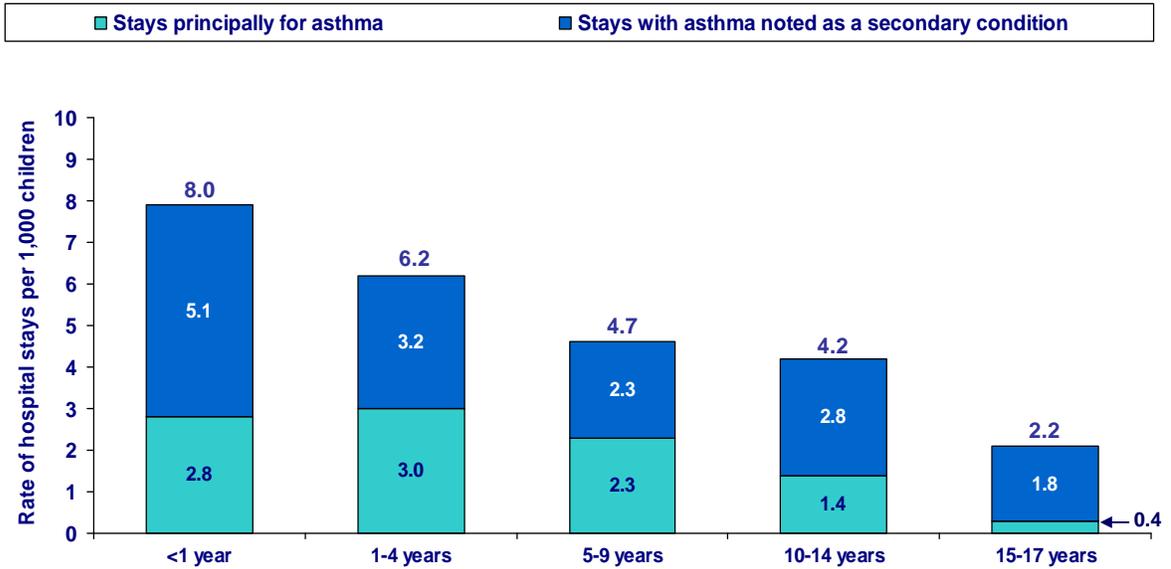
Children were defined as patients younger than 18 years of age. Newborns were excluded.

Note: The denominator for the rates was derived from 2006 Claritas Population Data. "Poorer communities" included ZIP Codes with median income level less than \$37,000; "wealthier communities" included ZIP Codes with median income level greater than or equal to \$37,000.

Source: AHRQ, Center for Delivery, Organization, and Markets, Healthcare Cost and Utilization Project, Kids' Inpatient Database, 2006.



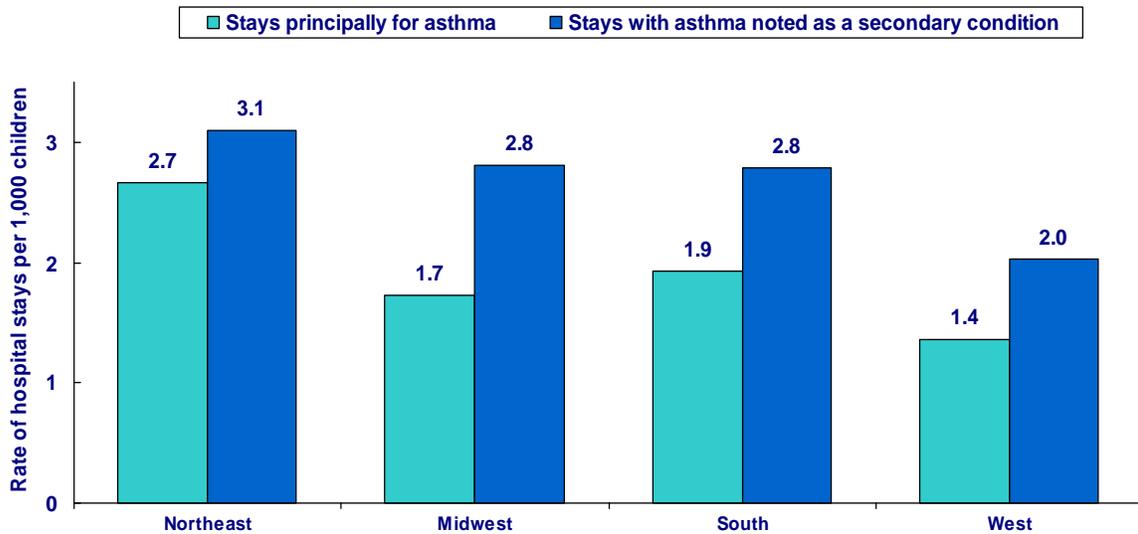
Figure 3. Rate of hospitalization for asthma-related stays was highest among children less than one year of age, 2006*



* Children were defined as patients younger than 18 years of age. Newborns were excluded.
 Source: AHRQ, Center for Delivery, Organization, and Markets, Healthcare Cost and Utilization Project, Kids' Inpatient Database, 2006.



Figure 4. Rate of pediatric asthma-related hospital stays was highest in the Northeast, 2006*



* Children were defined as patients younger than 18 years of age. Newborns were excluded.
 Source: AHRQ, Center for Delivery, Organization, and Markets, Healthcare Cost and Utilization Project, Kids' Inpatient Database, 2006.