

## STATISTICAL BRIEF #114

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### Sports Related Concussions, 2008

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#### Introduction

Sports related concussions have attracted increasing public attention in recent years. In January 2011, Congress reintroduced legislation to set minimum safety standards for concussion management in public schools.<sup>1</sup> As of March 2011, a dozen states<sup>2</sup> have laws in place that promote the use of established protocols that guide the management of student athletes who suffer concussions. More states<sup>3</sup> are following suit with similar legislation pending. Without appropriate management, sports related concussions can have adverse effects on a student's school performance and social functioning, and can cause long-term symptoms and complications.

This Statistical Brief presents data from the Healthcare Cost and Utilization Project (HCUP) on emergency department (ED) visits and inpatient admissions for sports related concussions in 2008. Patient demographic characteristics (age, gender, and region), hospital characteristics (teaching and trauma center status), and clinical characteristics (loss of consciousness) are compared between sports related and non-sports related concussions. Top concurrent conditions are also compared between these two types of concussions. All differences between estimates noted in the text are statistically significant at the 0.05 level or better.

#### Findings

In 2008, there were approximately 44,000 ED visits for sports related concussions; of all ED visits for concussion, 7.4 percent were related to sports. Table 1 compares the distribution of ED visits for sports related concussions to non-sports related concussions by patient demographic and clinical characteristics, and hospital characteristics.

#### Highlights

- In 2008, about 44,000 ED visits were related to concussions that occurred during sports activities.
- Fifty-eight percent of sports related concussion ED visits was for youth 14 to 18 years of age, 17 percent for 11- to 13-year olds, and another 8 percent by 19- to 23-year olds.
- Overall, half of sports related concussions were associated with no loss of consciousness, one-fifth of cases had brief loss of consciousness, 12 percent had moderate or prolonged loss of consciousness, and the remainder was unspecified.
- The vast majority (95 percent) of sports related concussion ED cases were discharged home compared to 80 percent of non-sports related concussions.
- Twenty-five percent of hospitalized patients had suffered moderate or prolonged loss of consciousness, compared to 11 percent of patients who were treated and released from the ED.
- Concurrent conditions tended to be more serious when concussion was listed as a secondary condition, and included open wounds of the head, neck and trunk, and skull and face fractures.

<sup>1</sup> H.R. 469—The Protecting Student Athletes from Concussions Act of 2011.

<sup>2</sup> States with current legislation include Connecticut, Idaho, Massachusetts, New Jersey, New Mexico, Oklahoma, Oregon, Rhode Island, South Dakota, Texas, Virginia, and Washington.

<sup>3</sup> States with pending legislation include Alaska, Arizona, California, Colorado, District of Columbia, Florida, Hawaii, Illinois, Indiana, Iowa, Kansas, Maine, Maryland, Missouri, Nebraska, New York, North Dakota, Ohio, Pennsylvania, Tennessee, Utah, Vermont, and Wyoming.

**Table 1: Characteristics of emergency department (ED) visits related to concussion, 2008**

	ED visits for concussion *	
	Sports related	Non-sports related
<b>Total number of visits</b>	<b>43,802</b>	<b>549,012</b>
Percentage of all ED visits	0.04	0.44
<b>Patient characteristics</b>		
<i>Gender (percentage)</i>		
Male	77.8	58.3
Female	22.2	41.7
<i>Region, rate per 10,000 population</i>		
Northeast	2.1	16.8
Midwest	1.7	21.4
South	1.0	17.4
West	1.2	15.8
<b>Clinical characteristics</b>		
<i>Loss of consciousness (percentage)</i>		
No loss	51.6	39.9
Brief loss	21.1	19.2
Moderate or prolonged loss	11.6	25.0
Unspecified	15.6	15.9
<b>Hospital characteristics</b>		
<i>Teaching status (percentage)</i>		
Yes	38.8	39.9
No	61.2	60.1
<i>Trauma center status (percentage)</i>		
Yes	39.2	44.1
No	60.8	55.9
* Based on all-listed diagnoses. Source: AHRQ, Center for Delivery, Organization, and Markets, Healthcare Cost and Utilization Project, Nationwide Emergency Department Sample, 2008		

In 2008, males accounted for more than three-quarters of ED visits for concussion related to sports. This compares to 58.3 percent of males with non-sports related concussions.

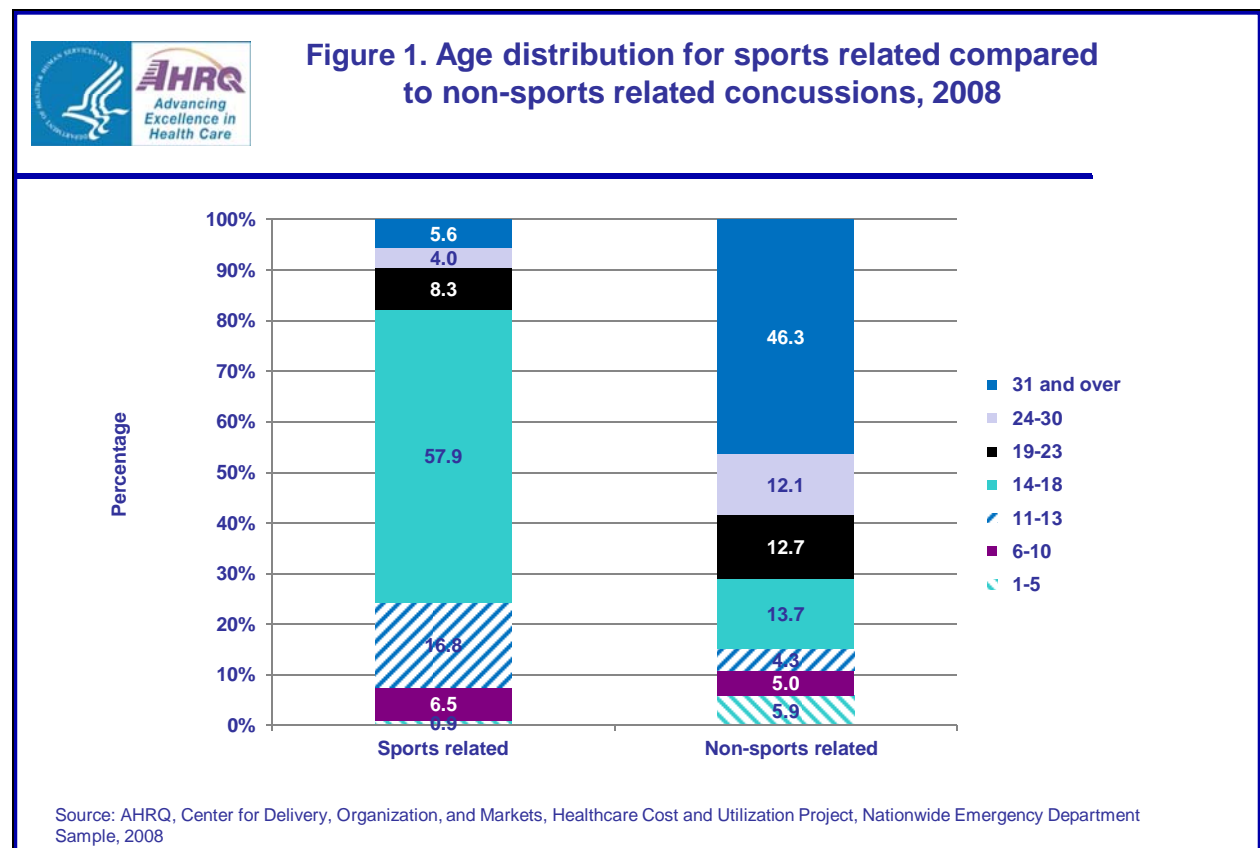
The rate of ED visits for sports related concussions was higher in the Northeast and Midwest regions at 2.1 and 1.7 per 10,000 population, compared to the South and West (1.0 and 1.2 per 10,000). The rate of ED visits for non-sports related concussions was between 7 and 16 times higher than sports related concussions and was the highest in the Midwest region of the U.S.

More than half of ED patients diagnosed with a sports related concussion experienced no loss of consciousness (51.6 percent) and another one-fifth experienced a brief loss of consciousness (21.1 percent). In comparison, ED patients with a non-sports related concussion were more likely to report loss of consciousness—one-quarter of them experienced moderate or prolonged loss of consciousness, more than twice the proportion of ED patients diagnosed with a sports related concussion (11.6 percent).

Emergency departments of teaching hospitals treated a little more than one-third of visits for concussion, regardless of whether the concussion was sports related or not. Thirty-nine percent of ED visits for sports related concussions occurred in an ED with a designated trauma center, compared to 44.1 percent of ED visits for non-sports related concussions.

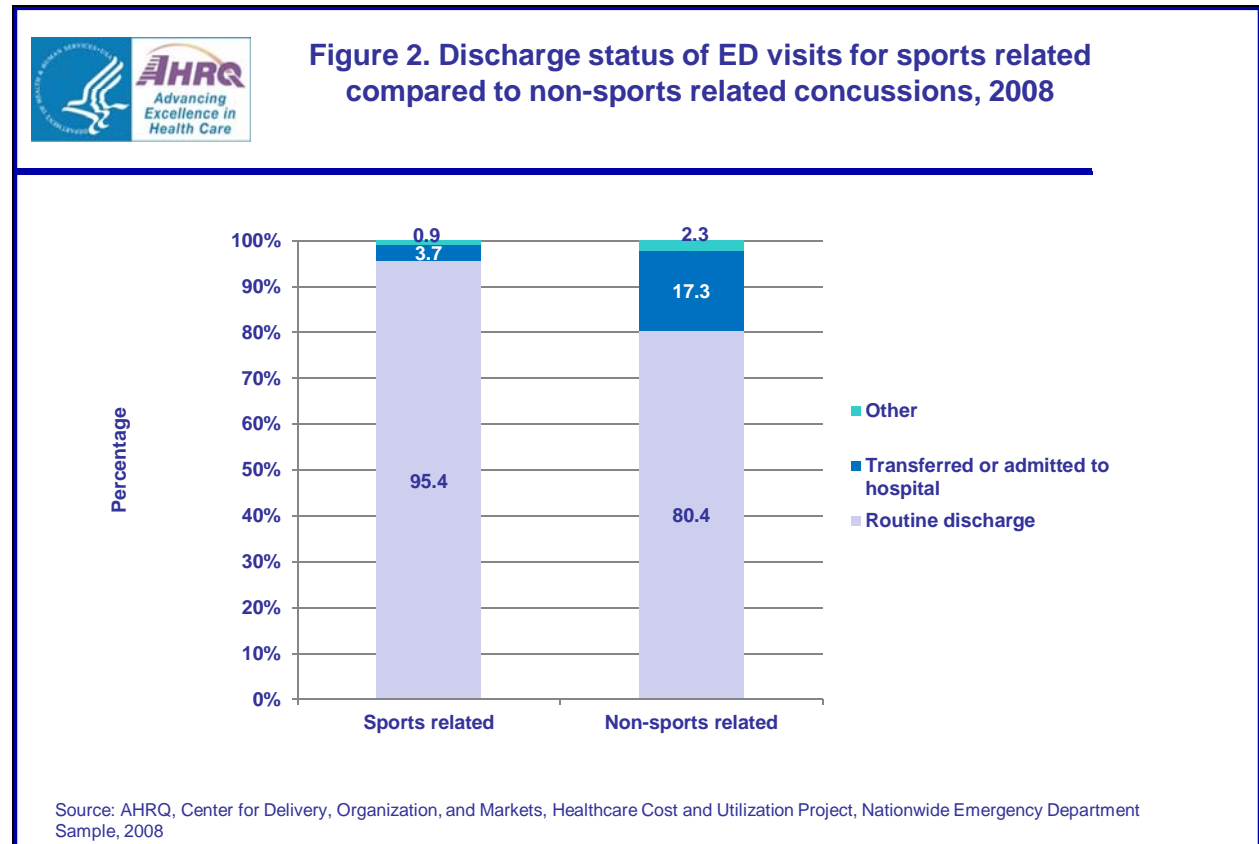
*Sports related concussions by patient age*

The ED visits for sports related concussion are highly concentrated in school age children. Figure 1 shows the age distribution of sports related and non-sports related concussions in 2008. Of all ED visits for sports related concussion, more than half (57.9 percent) were for high school age children (14–18 years of age). Another 16.8 percent were for middle school age children (11–13 years of age). Less than one-tenth of ED patients diagnosed with sports related concussion were 24 and older. In contrast, the majority of non-sports related concussion ED visits (58.4 percent) occurred in patients 24 and older.



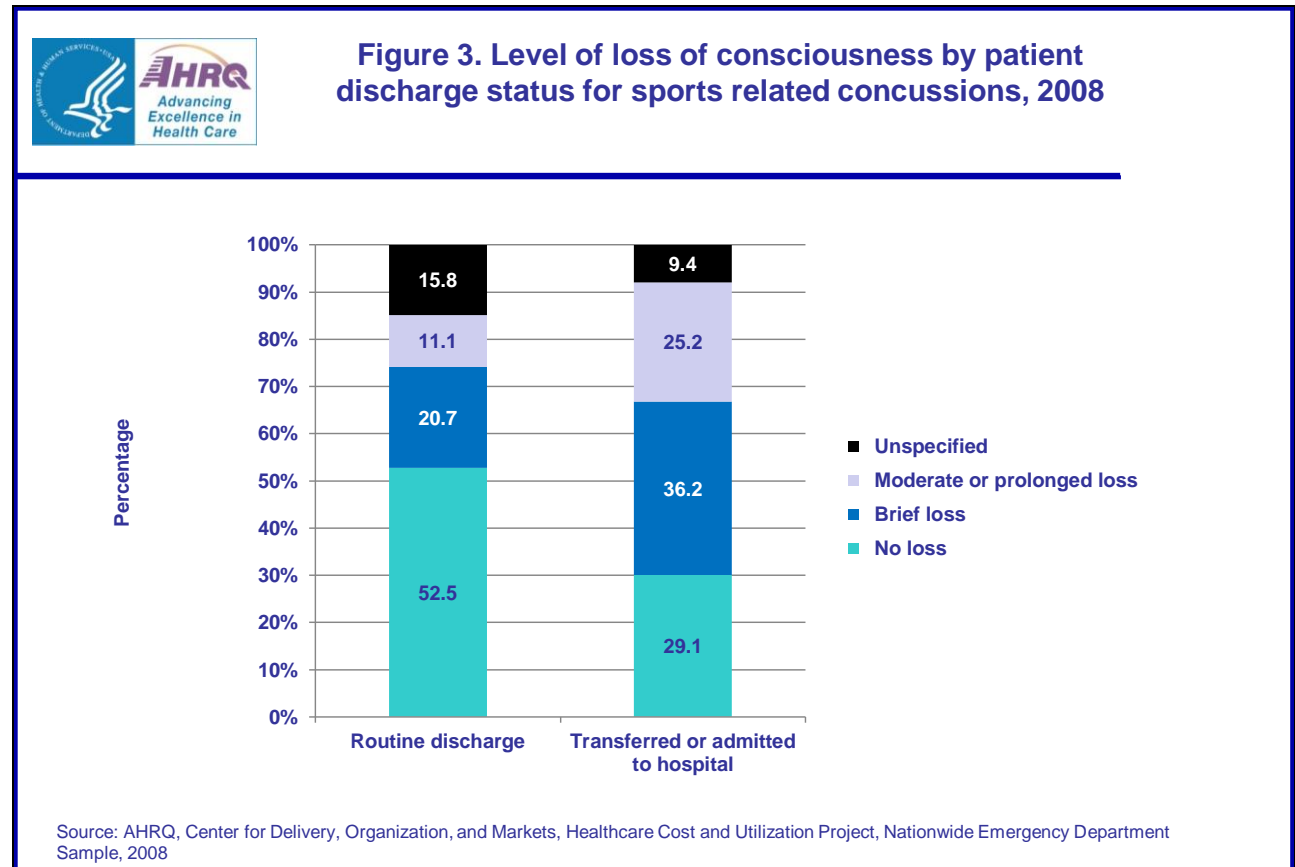
*Patient discharge status for sports related concussions*

Figure 2 shows that the vast majority (95.4 percent) of ED visits in patients with a sports related concussion were discharged home. Only 3.7 percent of patients were admitted to the same hospital or transferred to another hospital for further treatment. For ED visits following non-sports related concussions, 17.3 percent were admitted or transferred to another hospital.



*Level of consciousness by patient discharge status for sports related concussion*

A higher proportion of patients who were hospitalized after an ED visit for sports related concussion experienced loss of consciousness than those who were discharged home (figure 3). Thirty-six percent of hospitalized patients experienced brief loss of consciousness, compared to 20.7 percent of those sent home. The proportion of hospitalized patients who had suffered moderate or prolonged loss of consciousness (25.2 percent) was more than double that of patients routinely discharged (11.1 percent).



*Top conditions associated with sports related concussion*

Table 2 provides the top 10 conditions associated with concussion. For ED visits with concussion listed as the principal diagnosis, the associated conditions were less serious than when concussion was listed as a secondary diagnosis. For sports related concussion cases, open wounds of head, neck and trunk, skull and face fractures, and fracture of upper limb were all more frequent when concussion was listed as a secondary condition. Less serious conditions such as a superficial injury or contusion, sprains and strains, and headache were associated with sport related concussion listed as a principal diagnosis.

**Table 2: Conditions associated with sports related concussions, 2008**

Concussion listed as the principal diagnosis			Concussion listed as a secondary diagnosis	
Rank	Associated secondary conditions		Associated principal conditions	
	CCS condition	Percentage of all associated conditions	CCS condition	Percentage of all associated conditions
1	Superficial injury; contusion	18.9	Superficial injury; contusion	25.7
2	Sprains and strains	13.1	Open wounds of head; neck; and trunk	19.5
3	Headache; including migraine	9.4	Other injuries and conditions due to external causes	18.9
4	Open wounds of head; neck; and trunk	5.6	Sprains and strains	11.5
5	Nausea and vomiting	4.5	Skull and face fractures	7.5
6	Other injuries and conditions due to external causes	4.5	Headache; including migraine	3.9
7	Asthma	4.5	Fracture of upper limb	1.4
8	Spondylosis; intervertebral disc disorders; other back problems	4.4	Spondylosis; intervertebral disc disorders; other back problems	1.4
9	Conditions associated with dizziness or vertigo	2.4	Syncope	1.2
10	Skull and face fractures	1.8	Delirium, dementia, and amnestic and other cognitive disorders	1.1

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

## Data Source

The estimates in this Statistical Brief are based upon data from the HCUP 2008 Nationwide Emergency Department Sample (NEDS). Supplemental sources included data from the U.S. Census Bureau, Population Division, Annual Estimates of the Population for the United States, Regions, and Divisions.

## 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. All-listed diagnoses include the principal diagnosis plus these additional secondary conditions.

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.<sup>4</sup> This "clinical grouper" makes it easier to quickly understand patterns of diagnoses and procedures.

#### *Case definition*

The ICD-9-CM codes defining concussion include diagnosis codes with '850' in the first three digits. Sports related concussion is defined as concussion that has E code 'E9170' or 'E9175', or 'E886'.

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

#### *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

#### *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.

## **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.

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<sup>4</sup> 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/toolsoftware/ccs/ccs.jsp](http://www.hcup-us.ahrq.gov/toolsoftware/ccs/ccs.jsp)

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  
**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 NEDS

The HCUP Nationwide Emergency Department Database (NEDS) is a unique and powerful database that yields national estimates of emergency department (ED) visits. The NEDS was constructed using records from both the HCUP State Emergency Department Databases (SEDD) and the State Inpatient Databases (SID). The SEDD capture information on ED visits that do not result in an admission (i.e., treat-and-release visits and transfers to another hospital); the SID contain information on patients initially seen in the emergency room and then admitted to the same hospital. The NEDS was created to enable analyses of ED utilization patterns and support public health professionals, administrators, policymakers, and



clinicians in their decision-making regarding this critical source of care. The NEDS is produced annually beginning in 2006.

### For More Information

For more information about HCUP, visit [www.hcup-us.ahrq.gov](http://www.hcup-us.ahrq.gov).

For additional HCUP statistics, visit HCUPnet, our interactive query system, at [www.hcup.ahrq.gov](http://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 NEDS, and methods to calculate estimates, please refer to the following publications:

*Introduction to the HCUP Nationwide Emergency Department Sample, 2008*. Online. October 2010. U.S. Agency for Healthcare Research and Quality. <http://hcup-us.ahrq.gov/db/nation/neds/NEDS2008Introductionv3.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](mailto:hcup@ahrq.gov) or send a letter to the address below:

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