HEALTHCARE COST AND UTILIZATION PROJECT

Agency for Healthcare Research and Quality

STATISTICAL BRIEF #134

May 2012

Emergency Department Visits and Hospitalizations Associated with Animal Injuries, 2009

Annelise Adams, M.S.P.H., Janet P. Sutton, Ph.D., and Anne Elixhauser, Ph.D.

Highlights

- Animal-related injuries accounted for nearly 1.3 million treat-and-release ED visits, (418/100,000 population) and 60,800 hospital stays (20/ 100,000 population) in 2009.
- Bites and stings from non-venomous arthropods (such as ticks and mosquitoes), accounted for one-third of all animal-related treat-and-release ED visits and one-fifth of all animal-related inpatient discharges.
- The rate of animal-related treat-and-release ED visits in rural areas was 1.7 times higher than in urban areas and the rate of inpatient discharges was 1.6 times higher for rural than for urban areas.
- The rate of treat-and-release ED visits for injuries caused by animals was 37 percent higher for persons residing in the lowest income communities, compared to those in higher income communities and the rate of hospital stays was 27 percent higher among those in the lowest income communities.
- Large regional variation was observed in the rates of animal-related ED visits and hospitalizations. Rates of treat-and-release ED visits ranged from a low of 315/100,000 in the West to a high of 470/100,000 in the South. Hospitalization rates ranged from a low of 15/100,000 in the Midwest to a high of 24/100,000 in the South.

Introduction

With increased human-animal interaction through recreational, occupational, and accidental exposure, the incidence of animal-related injuries has also increased.[1] While the majority of animal-related events result in only minor injury, they continue to pose a significant medical, public health, and financial burden on the U.S. population. An estimated 200 to 500 people die annually in the United States due to animal-related injuries, such as falls from horses, bites from venomous and non-venomous snakes and arthropods, dog attacks, and other animal encounters.[2,3] In 2008, an estimated 316,200 emergency department (ED) visits and 9,500 hospital discharges were attributed to dog bites alone.[4]

According to previous studies, direct costs associated with animal-related injuries total more than 2 billion dollars in the U.S. each year.[5] These incidents also result in additional economic consequences such as time lost from work or school, decreased productivity, and costs resulting from short or long-term disability.[6]

This Statistical Brief presents data from the Healthcare Cost and Utilization Project (HCUP) on treat and release emergency

[1] Erkal S., Gerberick S.G., Ryan A.D., Renier C.M., Alexander B.H. Animal-related Injuries: a Population-Based Study of a Five-State Region in the Up/ Midwest: Regional Rural Injury Study II. *Journal of Safety Research.* 2008. 39: 351-363.

[2] Langley R.L. Animal-related Fatalities in the United States—An Update. *Wilderness and Environmental Medicine.* 2005. 16: 67-74.

[3] CDC. Nonfatal Motor-Vehicle Animal Crash—Related Injuries—United States, 2001-2002. *Morbidity and Mortality Weekly.* 2004. 53(30):675-678.

[4] Holmquist L., Elixhauser A. Emergency Department Visits and Inpatient Discharges Involving Dog Bites, 2008. U.S Agency for Healthcare Research and Quality, Rockville, MD. www.hcup-us.ahrq.gov/reports/statbriefs/sb101.pdf

[5] Langley RL. Animal Bites and Stings Reported by United States Poison Control Centers, 2001-2005. *Wilderness and Environmental Medicine*. 2008. 19: 7-14.

[6] Goldstein J.C. Bite Wounds and Infection. *Clinical Infectious Diseases*. 1992. 14(3): 633-638.

department (ED) visits and hospitalizations (which may have begun in the ED) in 2009, resulting from animal-related bites, stings, and other injuries. All differences between estimates noted in the text are statistically significant at the 0.05 level or better.

Findings

General findings
In 2009, animal-related injuries accounted for nearly 1.3 million treat-and-release emergency department visits (418.2/100,000 population), and approximately 60,800 hospital stays (19.9/100,000 population), as shown in table 1. On average, people hospitalized with an animal-related injury were 44.0 years old, while those who were treated and released from the ED averaged 30.8 years (data not shown).

There were no significant differences between males and females in ED visits or hospitalizations for animal-related injuries. Younger people, ages 0 to 17 years, were more likely to be treated and released from the ED while rates of hospitalization ranged from 13.4 stays/100,000 populations for children to 29.0 stays/100,000 population for seniors age 65 and older.

People from lower income communities and from rural areas had significantly higher rates of animal-related ED visits and hospitalization. The rate of treat-and-release ED visits for injuries caused by animals was 37 percent higher for persons residing in the lowest income communities (512.5 visits per 100,000), compared to those in higher income communities (372.8 visits). Similarly, the rate of hospital stays was 27 percent higher among those in the lowest income communities (22.7 stays per 100,000) compared to higher income communities (17.9 stays).

The rate of animal-related treat-and-release ED visits in rural areas (640.2 visits per 100,000 population) was 1.7 times higher than in urban areas (370.5 visits). The rate of inpatient discharges was 1.6 times higher for rural areas (28.2 stays per 100,000 population) than for urban areas (17.6 stays).

Treat-and-release ED visit rates ranged from 469.6/100,000 population in the South to a low of 315.2/ 100,000 population in the West. Hospitalizations varied regionally, with a range of 15.4 stays/100,000 population in the Midwest to 23.6 stays/100,000 population in the South.

Table 1. Characteristics of patients seen in the emergency department (ED) or admitted to the hospital with an animal-related injury*, 2009

	Treat-and-release ED visits	Hospitalizations
Admissions (number)	1,284,000	60,800
Hospital stays that began in the ED (percentage)	–	13.4
	Rate/100,000	**Rate/100,000**
All visits or discharges	418.2	19.9
Sex**		
Males	412.6	19.4
Females	423.7	20.2
Age†		
0 to 17 years	590.2	13.4
18 to 44 years	411.0	15.7
45 to 64 years	337.2	27.0
65 years and older	277.4	29.0
Median household income of patient's ZIP Code		
Lowest income quartile	512.5	22.7
All other income quartiles	372.8	17.9
Patient residence		
Urban	370.5	17.6
Rural	640.2	28.2
Hospital region‡		
Northeast	468.8	20.3
Midwest	399.6	15.4
South	469.6	23.6
West	315.2	17.6

Sources: AHRQ, Center for Delivery, Organization, and Markets, Healthcare Cost and Utilization Project, Nationwide Emergency Department Sample (NEDS), 2009 and Nationwide Inpatient Sample (NIS), 2009

* Based on all-listed external cause of injury codes (E codes).

** Gender differences in treat-and-release and hospitalization rates were not statistically significant ($p < .05$).

† Age differences in hospitalization rates were not statistically significant ($p < .05$) for the following comparisons: ages 0–17 v. 18–44; ages 45–64 v. 65+.

‡ Regional differences in ED visit rates were not statistically significant ($p < .05$) for the following comparisons: Northeast v. South. Regional differences in hospitalization rates were not statistically significant ($p < .05$) for the following comparisons: Northeast v. South; Northwest v. West; Midwest v. West.

Specific types of animal-related injuries
As shown in tables 2 and 3, bites and stings from non-venomous arthropods (such as ticks and mosquitoes) contributed to the greatest number of ED visits and hospital stays. Non-venomous arthropods were the cause of 33.9 percent of animal-related treat-and-release ED visits and 20.9 percent of hospitalizations.

Dog bites were responsible for 24.8 percent of animal-related treat-and-release ED visits and 16.6 percent of animal-related hospitalizations. Injuries from venomous arthropods (such as bees, wasps, hornets, scorpions, and poisonous spiders) resulted in 18.6 percent of treat-and-release ED visits, and 13.5 percent of hospitalizations

Injuries resulting from animals being ridden were a large contributor to hospitalizations (17.4 percent), but a smaller proportion of all animal-related treat-and-release ED visits (5.3 percent).

The aggregate costs of hospitalization for animal-related injury totaled over $425 million with the average cost per stay of about $7,000 (table 3). Costs associated inpatient hospitalizations varied markedly by type of animal. Riding accidents were among the most costly injuries leading to hospitalizations, accounting for over 26 percent of aggregate inpatient costs associated with animal-related injury. While accidents resulting from venomous reptiles accounted for the highest average cost for inpatient stays ($15,300), the average length of stay was among the lowest of all animal-related injuries (2.1 days).

Table 2. Treat-and-release emergency department (ED) visits for animal-related injuries, by type of injury, 2009

Type of injury or accident	Number of ED visits	Percentage of total animal-related ED visits	Rate/100,000
Any animal-related injury*	1,284,000	100.0	418.2
Non-venomous arthropods	434,700	33.9	141.6
Dog bites	318,200	24.8	103.6
Venomous arthropods	238,700	18.6	77.8
Other animal bites	94,100	7.3	30.6
All other animal-related injuries	75,200	5.9	24.5
Animal being ridden	68,100	5.3	22.2
Venomous sea animals/plants	39,400	3.1	12.8
Venomous reptiles	8,400	0.7	2.8
Non-venomous reptiles	3,400	0.3	1.1
Rat bites	3,000	0.2	1.0
Animal-related accident involving vehicle	1,300	0.1	0.4
Animal being drawn	1,300	0.1	0.4

Source: AHRQ, Center for Delivery, Organization, and Markets, Healthcare Cost and Utilization Project, Nationwide Emergency Department Sample, 2009
*Represents patients discharged for any animal-related injury, based on all-listed External cause of injury codes.
Because more than one type of injury may be recorded, the sum of specific types of injuries may exceed the number of any animal-related injuries.

Table 3. Inpatient stays for animal-related injuries, by type of injury, 2009

Type of injury or accident	Number of inpatient stays	Percentage of total animal-related inpatient stays	Rate/ 100,000	Mean length of stay	Mean costs, in dollars	Aggregate costs, in thousands, dollars	Percentage of aggregate hospital costs
Any animal-related injury*	60,800	100.0	19.9	3.4	7,000	425,487	100.0
Non-venomous arthropods	12,700	20.9	4.1	3.6	5,200	65,855	15.5
Animal being ridden	10,600	17.4	3.5	3.6	10,600	111,690	26.2
Dog bites	10,100	16.6	3.3	3.3	5,700	57,172	13.4
Other animal bites	9,700	16.0	3.2	3.1	4,600	43,907	10.3
Venomous arthropods	8,200	13.5	2.7	3.4	5,200	42,979	10.1
All other animal-related injuries	5,500	9.0	1.8	4.1	9,500	51,918	12.2
Venomous reptiles	3,000	4.9	0.1	2.1	15,300	45,800	10.8
Venomous sea animals/plants	760	1.3	0.3	3.1	5,000	3,808	0.9
Animal-related accident involving vehicle	150	0.2	0.1	4.3	11,400	1,713	0.4
Animal being drawn	150	0.2	0.1	4.5	13,100	1,900	0.4
Non-venomous reptiles	70	0.1	0.0	2.4	3,900	263	0.1
Rat bites	60	0.1	0.0	4.2	8,500	530	0.1

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

*Represents patients discharged for any animal-related injury, based on all-listed External cause of injury codes. Because more than one type of injury may be recorded, the sum of specific types of injuries may exceed the number of any animal-related injuries.

Diagnoses associated with animal-related injuries

Tables 4 and 5 provide information on diagnoses associated with animal-related injuries. Most treat-and-release ED visits involved superficial injuries and contusions (33.0 percent), open wounds of extremities (19.6 percent), and poisoning (16.9 percent). Inpatient stays were predominantly for skin and subcutaneous tissue infections (36.9 percent), poisoning (9.0 percent), and open wounds of extremities (6.7 percent).

Table 4. Top 10 first-listed diagnoses for treat-and-release emergency department (ED) visits, by volume, animal-related injuries, U.S., 2009

Rank	First-listed diagnosis	ED visits (number)	Percentage of ED visits
1	Superficial injury/contusion	424,000	33.0
2	Open wounds of extremities	252,100	19.6
3	Poisoning by non-medicinal substance	217,100	16.9
4	Open wound of head and trunk	101,900	7.9
5	Skin and subcutaneous tissue infection	82,900	6.5
6	Allergic reactions	40,600	3.2
7	Fracture of upper limb	18,100	1.4
8	Other injuries and conditions due to external causes	15,900	1.2
9	Sprains and strains	15,700	1.2
10	Other skin disorders	8,600	0.7

Sources: AHRQ, Center for Delivery, Organization, and Markets, Healthcare Cost and Utilization Project, Nationwide Emergency Department Sample, 2009

Table 5. Top 10 principal diagnoses for inpatient stays, by volume, animal-related injuries, U.S., 2009

Rank	Principal diagnosis	Stays (number)	Percentage of stays
1	Skin and subcutaneous tissue infection	22,400	36.9
2	Poisoning by non-medicinal substance	5,500	9.0
3	Open wounds of extremities	4,100	6.7
4	Other fractures	3,400	5.5
5	Crushing injury or internal injury	2,400	3.9
6	Fracture of lower limb	2,100	3.5
7	Fracture of upper limb	2,000	3.3
8	Superficial injury/contusion	1,800	3.0
9	Intracranial injury	1,700	2.9
10	Open wound of head and trunk	1,500	2.4

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

Characteristics of patients who were injured by an animal, by type of injury
Tables 6 and 7 provide information on patient characteristics for specific types of animal-related injuries.

Differences by sex. Although there were no sex differences in overall animal-related treat-and-release ED visits and inpatient hospitalizations, males and females differed significantly in the types of injuries experienced. Females had a 76 percent higher treat-and-release ED visit rate for riding accidents, in addition to having higher ED rates due to "other animal bites" and "all other animal-related injuries" compared to males. Compared to males, females had a 38 percent higher hospitalization rate for injuries due to an animal being ridden and their hospitalization rate for injuries due to "other animal bites," (other than rats and dogs) was more than twice as high.

Males had significantly higher treat-and-release ED visit rates for venomous and non-venomous reptiles, venomous arthropods, other venomous animals and plants, and dog bites. Hospitalizations due to venomous reptiles and venomous and non-venomous arthropods were significantly higher in males than females.

Differences by age group. Children ages 0–17 had the highest rates of treat-and-release ED visits for venomous arthropods, other venomous animals and plants, dog bites, non-venomous reptiles, and non-venomous arthropods. Adults 18–44 had the highest rate of treat-and-release ED visits due to animals being ridden and for injuries due to venomous reptiles. Seniors experienced the highest ED visit rates for other animal bites (not dog or rat) and for all other animal-related injuries.

Riding accidents were a leading cause of hospitalization among adults ages 45 to 64 (6.3 hospitalizations/100,000 population), followed by venomous arthropods. Other animal bites (not dog or rat) were responsible for the highest rate of hospitalization among seniors, accounting for 8.4 stays/100,000 population. Seniors also had the highest rates of hospitalization for dog bites and non-venomous arthropods.

Differences by community income level. People residing in the lowest income communities had higher animal-related ED and hospitalization rates than those residing in higher-income communities. For persons residing in the lowest income communities, injuries from non-venomous arthropods accounted for 199/100,000 treat-and-release ED visits, compared to 118/100,000 visits for higher income groups. Rates were higher in low income communities for all causes examined.

Among persons from the lowest income communities, hospitalization rates were approximately twice as high for injuries due to venomous arthropods and venomous reptiles and 50 percent higher for non-venomous arthropods. Only for "other animal bites" (not dog or rat) did rates in higher income communities exceed those in lower income communities.

Differences by rural-urban location. Rural residents were more likely to be treated and released from the ED for all types of injuries examined here. The highest rates of ED visits were for injuries due to non-venomous arthropods, venomous arthropods, and dog bites. Similarly, where there were differences in hospitalization rates between rural and urban residents, rural residents had higher rates. The highest rates of hospitalization for rural residents were for animals being ridden, non-venomous arthropods, and venomous arthropods.

Differences by region. The South had the highest rate of treat-and-release ED visits due to venomous arthropods, other venomous animals and plants, and venomous reptiles. The Northeast had the highest rates of ED visits due to non-venomous arthropods and dog bites. The West had the highest rate of ED visits for injuries due to animals being ridden. Similar patterns were seen for hospital stays, except that there were no regional differences for venomous reptiles.

Table 6. Rates of animal-related treat-and-release ED visits per 100,000 population, by type of injury and patient characteristics, 2009

	Any animal -related injury	Animal being ridden	Venomous reptiles	Venomous arthropods	Venomous sea animal/plants	Dog bites	Non-venomous reptiles	Non-venomous arthropods	Other animal bites	All other animal-related injuries
Sex										
Males	–	16.0	***3.9***	***84.8***	***15.4***	***109.3***	***1.4***	–	22.2	21.5
Females	–	***28.2***	1.7	70.9	10.3	98.1	0.8	–	***38.9***	***27.4***
Age*										
0–17	***590.2***	23.1	2.3	***88.6***	***17.1***	***156.8***	***1.5***	***256.7***	19.8	22.7
18–44	411.0	***25.9***	***3.2***	83.4	15.7	97.9	1.2	128.4	29.8	24.0
45–64	337.2	23.5	3.1	69.7	8.7	82.7	0.9	86.5	36.6	24.9
65+	277.4	7.0	1.6	57.3	5.0	62.0	0.5	73.2	***41.7***	***28.4***
Median household income of patient's ZIP Code										
Lowest quartile	***512.5***	–	***3.9***	***100.5***	***14.9***	***113.8***	***1.5***	***199.0***	–	–
Other	372.8	–	2.2	67.5	11.5	97.4	0.9	117.8	–	–
Location										
Urban	370.5	16.7	2.1	63.9	10.2	99.3	0.9	128.9	28.2	19.1
Rural	***640.2***	***48.6***	***5.8***	***144.7***	***25.2***	***121.5***	***2.3***	***198.3***	***41.6***	***50.7***
Region†										
Northeast	468.8	15.4	0.1	66.2	9.2	***110.2***	0.5	***197.4***	***42.1***	25.4
Midwest	399.6	22.4	1.2	84.0	11.7	108.1	0.7	109.8	31.5	***29.3***
South	***469.6***	22.8	***5.4***	***91.4***	***18.0***	103.7	***1.9***	175.0	27.8	22.6
West	315.2	***26.2***	2.1	59.2	8.5	94.4	0.7	75.3	25.5	22.3

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

Notes: Analysis is limited to the injury types with the largest number of emergency department visits. A dashed line (–) indicates that the difference in rates for a given characteristic were not significantly different ($p < .05$) for the listed injury type.

* Age differences in treat-and-release rates were not statistically significant ($p<.05$) for the following groups:

Animals being ridden—ages 0–17 v. 45–64
Venomous reptiles—ages 18–44 v.45–64
Venomous arthropods—ages 0–17 v. 18–44
Venomous sea animals/plants—ages 0–17 v. 18–44
Non-venomous reptiles—ages 0–17 v. 18–44
All other animal-related injuries—ages 0–17 v. 18–44; ages 0–17 v. 45–64; ages 18–44 v. 45–64

† Regional differences in treat-and-release rates were not statistically significant ($p<.05$) for the following groups:

Any animal-related injuries—Northeast v. South
Animals being ridden—Midwest v. South; Midwest v. West; South v. West
Venomous arthropods—Northeast v. West; Midwest v. South
Venomous sea animals/plants—Northeast v. Midwest; Northeast v. West; Midwest v. West
Dog bites—Northeast v. Midwest; Northeast v. South; Midwest v. South; South v. West
Non-venomous reptiles—Midwest v. West; Northeast v. Midwest; Northeast v. West
Non-venomous arthropods—Northeast v. South
Other animal bites—Midwest v. South; South v. West
All other animal-related injuries—Northeast v. Midwest; Northeast v. South; Northeast v. West; South v. West

Table 7. Rates of animal-related inpatient stays per 100,000 population, by patient characteristics, 2009

	Any animal-related injury	Animal being ridden	Venomous reptiles	Venomous arthropods	Dog bites	Non-venomous arthropods	Other animal bites	All other animal – related injuries
Sex								
Males	–	2.9	***1.3***	***3.1***	–	***4.6***	2.0	–
Females	–	***4.0***	0.7	2.3	–	3.7	***4.3***	–
Age*								
0-17	13.4	1.6	–	1.5	3.4	4.1	0.7	0.9
18-44	15.7	3.1	–	2.6	2.5	3.5	1.8	1.0
45-64	27.0	***6.3***	–	***3.7***	3.7	4.7	4.7	2.4
65+	***29.0***	2.2	–	2.9	***4.6***	***4.9***	***8.4***	***4.7***
Median household income of patient's ZIP Code								
Lowest quartile	***22.7***	–	***1.5***	***4.2***	–	***5.3***	2.6	–
Other	17.9	–	0.8	2.0	–	3.5	***3.2***	–
Location								
Urban	17.6	2.8	0.8	2.3	–	3.8	–	1.4
Rural	***28.2***	***6.5***	***2.1***	***4.4***	–	***4.8***	–	***3.7***
Region†								
Northeast	20.3	2.5	–	1.6	***4.4***	***5.4***	***4.3***	–
Midwest	15.4	2.3	–	2.3	2.8	2.8	3.1	–
South	***23.6***	3.8	–	***4.0***	3.2	5.2	3.0	–
West	17.6	***4.7***	–	1.9	3.0	2.8	2.6	–

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

Notes: Analysis is limited to the injury types with the largest number of emergency department visits. A dashed line (–) indicates that the difference in rates for a given characteristic were not significantly different ($p < .05$) for the listed injury type.

* Age differences in hospitalization rates were not statistically significant ($p<.05$) for the following groups:
Any animal related injury—ages 0–17 v. 18–44; ages 45–64 v. 65+
Venomous arthropods—ages 18–44 v. 65+
Dog bites—ages 0–17 v. 45–64
Non-venomous arthropods—ages 0–17 v 18–44; ages 0–17 v. 45–64; ages 0–17 v. 65+; ages 45–64 v. 65+
All other animal-related injuries—ages 0–17 v. 18–44.

† Regional differences in hospitalization rates were not statistically significant ($p<.05$) for the following groups:
Any animal-related injury—Northeast v. South; Northeast v. West; Midwest v. West
Animals being ridden—Northeast v. Midwest; South v. West
Venomous arthropods—Northeast v. West; Midwest v. West
Dog bites—Midwest v. South; Midwest v. West; South v. West
Non-venomous arthropods—Northeast v. South; Midwest v. West
Other animal bites—Midwest v. South; Midwest v. West; South v. West

Data Source

The estimates in this Statistical Brief are based upon data from the HCUP 2009 Nationwide Inpatient Sample (NIS) and the 2009 Nationwide Emergency Department Sample (NEDS). Historical data were drawn from the 1993–2007 NIS. The statistics were generated from HCUPnet, a free, online query system that provides users with *immediate access* to largest set of publicly available, all-payer national, regional, and State-level hospital care databases from HCUP.

Supplemental source included data on regional population estimates from "Table 1: Annual Estimates of the Resident Population for the United States, Regions, States, and Puerto Rico: April 1, 2000 to July 1, 2009 (NST-EST2009-01)," Population Division, U.S. Census Bureau, Release date: December 2009 (http://www.census.gov/popest/data/historical/2000s/vintage_2009/index.html).

Definitions

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

ICD-9-CM is the International Classification of Diseases, Ninth Revision, Clinical Modification, which assigns numeric codes to diagnoses. There are about 14,000 ICD-9-CM diagnosis codes and about 4,000 ICD-9-CM procedure codes.

CCS categorizes ICD-9-CM diagnoses into a manageable number of clinically meaningful categories.[7] This "clinical grouper" makes it easier to quickly understand patterns of diagnoses and procedures.

Case definition
External cause of injury codes (E codes) indicating animal-related injuries included the following:

Animal-related injury	E code	Definition
Animal-related accident involving vehicle	E810.5	Motor vehicle accident (MVA) involving collision with train; rider of animal or occupant of animal-drawn vehicle
	E811.5	(MVA) involving re-entrant collision with another vehicle; rider of animal or occupant of animal-drawn vehicle
	E812.5	Other (MVA) involving collision with motor vehicle; rider of animal or occupant of animal-drawn vehicle
	E813.5	(MVA) involving collision with other vehicle; rider of animal or occupant of animal-drawn vehicle
	E814.5	(MVA) involving collision with pedestrian; rider of animal or occupant of animal-drawn vehicle
	E815.5	Other (MVA) involving collision on highway; rider of animal or occupant of animal-drawn vehicle
	E816.5	Motor vehicle traffic accident due to loss of control, without collision on the highway; rider of animal or occupant of animal-drawn vehicle
	E817.5	Non-collision (MVA) while boarding or alighting; rider of animal or occupant of animal-drawn vehicle
	E818.5	Other non-collision (MVA); rider of animal or occupant of animal-drawn vehicle

[7] HCUP Clinical Classifications Software (CCS). Healthcare Cost and Utilization Project (HCUP). U.S. Agency for Healthcare Research and Quality, Rockville, MD. Available at http://www.hcup-us.ahrq.gov/toolssoftware/ccs/ccs.jsp. Updated March 2012. (Accessed May 22, 2012).

	E819.5	(MVA) of unspecified nature; rider of animal or occupant of animal-drawn vehicle
	E820.5	Non-traffic accident involving motor-driven snow vehicle; rider of animal or occupant of animal-drawn vehicle
	E821.5	Non-traffic accident involving other off-road motor vehicle; rider of animal or occupant of animal-drawn vehicle
	E822.5	Other motor vehicle non-traffic accident involving collision with moving object; rider of animal or occupant of animal-drawn vehicle
	E823.5	Other motor vehicle non-traffic accident involving collision with stationary object; rider of animal or occupant of animal-drawn vehicle
	E824.5	Other motor vehicle non-traffic accident while boarding or alighting; rider of animal or occupant of animal-drawn vehicle
	E825.5	Other motor vehicle non-traffic accident of other an unspecified nature; rider of animal or occupant of animal-drawn vehicle
Animal being drawn	E826.3	Pedal cycle accident injuring occupant of animal-drawn vehicle
	E827.0	Animal-drawn vehicle accident injuring pedestrian
	E827.2	Animal-drawn vehicle accident injuring rider of animal
	E827.3	Animal-drawn vehicle accident injuring occupant of animal drawn vehicle
	E827.4	Animal-drawn vehicle accident injuring occupant of streetcar
	E827.8	Animal-drawn vehicle accident injuring other specified person
	E827.9	Animal-drawn vehicle accident injuring unspecified person
Animal being ridden	E826.2	Pedal cycle accident injuring rider of animal
	E828.2	Accident involving animal being ridden injuring rider of animal
	E828.4	Accident involving animal being ridden injuring occupant of streetcar
	E828.8	Accident involving animal being ridden injuring other specified person
	E828.9	Accident involving animal being ridden injuring unspecified person
Venomous reptiles	E905.0	Venomous snakes and lizards causing poisoning and toxic reactions
Venomous arthropods	E905.1	Venomous spiders causing poisoning and toxic reactions
	E905.2	Scorpion sting causing poisoning and toxic reactions
	E905.3	Sting of hornets, wasps, and bees causing poisoning by other specified animals and plants
	E905.4	Centipede and venomous millipede bite causing poisoning and toxic reactions
	E905.5	Other venomous arthropods causing poisoning and toxic reactions
Venomous sea animals/plants	E905.6	Venomous marine animals and plants causing poisoning and toxic reactions
	E905.7	Poisoning and toxic reactions caused by other plants
	E905.8	Poisoning and toxic reactions caused by other specified animals and plants
	E905.9	Poisoning and toxic reactions caused by unspecified animals and plants
Dog bites	E906.0	Dog bite
Rat bites	E906.1	Rat bite
Non-venomous reptiles	E906.2	Bite of nonvenomous snakes and lizards
Non-venomous arthropods	E906.4	Bite of nonvenomous arthropod
Other animal bites	E906.3	Bite of other animal except arthropod (cat, eel, rodent except rat, shark)
	E906.5	Bite by unspecified animal
All other animal-related injuries	E906.8	Other specified injury caused by animal
	E960.9	Unspecified injury caused by animal

For this report, principal or first-listed diagnoses were defined as CCS diagnosis categories:
197: Skin and subcutaneous tissue infection
200: Other skin disorders
229: Fracture of upper limb

230: Fracture of lower limb
231: Other fractures
232: Sprains and strains
233: Intracranial injury
234: Crushing injury or internal injury
235: Open wound of head and trunk
236: Open wound of extremity
239: Superficial injury or contusion
243: Poisoning by non-medicinal substance
244: Other injuries and conditions due to external causes
253: Allergic reactions

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 obstetrics and gynecology, otolaryngology, orthopedic, cancer, pediatric, public, and academic medical hospitals. Excluded are long-term care, rehabilitation, psychiatric, and alcoholism and chemical dependency hospitals. Please note, a discharge of this nature will be included in the NIS if it occurred in a community hospital.

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

Costs and charges
Total hospital charges were converted to costs using HCUP Cost-to-Charge Ratios based on hospital accounting reports from the Centers for Medicare & Medicaid Services (CMS).[8] *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.

Mean cost per day is calculated as the mean cost per stay divided by the mean length of stay.

Hospital location
The classification of whether a hospital is in a metropolitan area ("urban") or non-metropolitan area ("rural"), is defined from the American Hospital Association (AHA) Annual Survey, using the 1993 U.S. Office of Management and Budget definition.

Location of patients' residence
Place of residence is based on the urban-rural classification scheme for U.S. counties developed by the National Center for Health Statistics (NCHS):

- Large Central Metropolitan: Central counties of metropolitan areas with 1 million or more residents
- Large Fringe Metropolitan: Fringe counties of counties of metropolitan areas with 1 million or more residents
- Medium Metropolitan: Counties in metropolitan areas of 250,000-999,999 residents
- Small Metropolitan: Counties in metropolitan areas of 50,000-249,999 residents
- Micropolitan: Nonmetropolitan counties, i.e., a nonmetropolitan county with an area of 10,000 or more residents
- Non-core: Nonmetropolitan and nonmicropolitan counties.

[8] Ibid.

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 Claritas. The income quartile 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:

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
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
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
Ohio Hospital Association
Oklahoma State Department of Health
Oregon Association of Hospitals and Health Systems
Oregon Health Policy and Research
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 discharges. The NIS is nationally representative of all community hospitals (i.e., short-term, non-Federal, nonrehabilitation hospitals). The NIS is a sample of hospitals and includes all patients from each hospital, regardless of payer. It is drawn from a sampling frame that contains hospitals comprising about 95 percent of all discharges in the United States. The vast size of the NIS allows the study of topics at both the national and regional levels for specific subgroups of patients. In addition, NIS data are standardized across years to facilitate ease of use.

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 decisionmaking regarding this critical source of care. The NEDS is produced annually beginning in 2006.

About HCUPnet

HCUPnet is an online query system that offers instant access to the largest set of all-payer health care databases 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 United States. HCUPnet generates statistics using data from HCUP's Nationwide Inpatient Sample (NIS), the Kids' Inpatient Database (KID), the Nationwide Emergency Department Sample (NEDS), the State Inpatient Databases (SID), and the State Emergency Department Databases (SEDD).

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

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

Introduction to the HCUP Nationwide Inpatient Sample, 2009. Online. May 2011. U.S. Agency for Healthcare Research and Quality. Available at http://hcup-us.ahrq.gov/db/nation/nis/NIS_2008_INTRODUCTION.pdf (Accessed May 22, 2012).

Introduction to the HCUP Nationwide Emergency Department Sample, 2008. Online. October 2010. U.S. Agency for Healthcare Research and Quality. Available at http://hcup-us.ahrq.gov/db/nation/neds/NEDS2008Introductionv3.pdf (Accessed May 22, 2012).

Suggested Citation

Adams, A. (SSS), Sutton, J. (SSS), Elixhauser, A (AHRQ). *Emergency Department Visits and Hospitalizations Associated with Animal Injuries, 2009*. HCUP Statistical Brief #134. May 2012. Agency for Healthcare Research and Quality, Rockville, MD. http://www.hcup-us.ahrq.gov/reports/statbriefs/sb134.pdf

Acknowledgments

The authors would like to acknowledge the contribution of Valeriy Bakaushin and Devi Katikineni of Social and Scientific Systems, Inc. for SAS programming assistance.

* * *

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