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Infectious Enteritis and Foodborne Illness in the United States, 2010

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Introduction

Foodborne illnesses are a common cause of morbidity and sometimes death in the United States, affecting 1 in 6 Americans and causing approximately 128,000 hospitalizations and 3,000 deaths each year.[1] The Centers for Disease Control and Prevention (CDC) categorizes foodborne illnesses into two groups: 1) illnesses caused by one of the 31 currently known major pathogens, i.e., bacteria, viruses, parasites, and chemicals, and 2) episodes of acute gastroenteritis caused by unknown agents or substances with unproven ability to cause illnesses.

While the known pathogens cause an estimated 9.4 million foodborne illness episodes each year,[2] it is estimated that the majority of cases—38.4 million—are caused by the unspecified agents.[3] The top pathogens include Norovirus, *Salmonella*, *Clostridium perfringens*, *Campylobacter*, and *Staphylococcus aureus.* Many episodes of foodborne illness are marked by acute gastroenteritis; however, not all cases of acute gastroenteritis are caused by organisms found in food, so gastrointestinal symptoms do not necessarily mean a person has a foodborne illness.[4]

Common symptoms of acute gastroenteritis are diarrhea and vomiting. In addition, more serious complications such as colitis, bloodstream infection, meningitis, joint infection, kidney failure, and other problems can develop.[5,6] In the United States, some groups of the population are at a higher risk for developing

Highlights

- In 2010, as many as 3.7 million treat-and-release emergency department (ED) visits and nearly 1.3 million inpatient hospital stays had diagnoses of enteritis or gastrointestinal symptoms that suggested possible foodborne illness.
- There were 313,900 ED visits and 228,800 inpatient stays specifically related to infectious enteritis.
- Focusing on infectious enteritis, treat-and-release ED visits tended to be for younger patients, with 81 percent under the age of 45, while inpatient stays tended to be for older patients, with 60 percent aged 45 years or older.
- The rate of ED visits for infectious enteritis was more than 75 percent higher in rural areas than in urban areas (160 and 90 ED visits per 100,000, respectively).
- The rate of ED visits for infectious enteritis was 160 percent higher in the lowest income communities (139 ED visits per 100,000) than in the highest income communities (53 ED visits per 100,000).
- In 2010, the rates of ED visits for infectious enteritis were highest in the cold weather months, averaging 31,200 per month from January through March versus 18,900 from April through October.
- More than 96 percent of the infectious enteritis treat-and-release ED visits were due to unspecified or unknown enteritis, food poisoning, or intestinal infections.

[1] Centers for Disease Control and Prevention. April 11, 2011 CDC Estimates of Foodborne Illness in the United States. CDC 2011 Estimates: Findings. Available at http://www.cdc.gov/foodborneburden/2011-foodborne-estimates.html. (Accessed February 8, 2013).
[2] Scallan E, Hoekstra R M, Angulo FJ, Tauxe RV, et al. Foodborne illness acquired in the United States—Major pathogens. Emerging Infectious Diseases. 2011;17(1):7–15.
[3] Scallan E., Griffin PM, Angulo FJ, Tauxe RV, et al. Foodborne illness acquired in the United States—Unspecified agents. Emerging Infectious Diseases. 2011;17(1):16–22.
[4] Flint JA, Van Duynhoven YT, Angulo FJ, DeLong SM, et al. Estimating the burden of acute gastroenteritis, foodborne disease, and pathogens commonly transmitted by food: An international review. Clinical Infectious Diseases. 2005;41:698–704.
[5] King CK, Glass R, Bresee JS, and Duggan C. Managing acute gastroenteritis among children: Oral rehydration, maintenance, and nutritional therapy. Morbidity and Mortality Weekly Report (MMWR). 2003;52(RR16):1–16.
[6] Centers for Disease Control and Prevention, Morbidity and Mortality Weekly Report (MMWR). June 10, 2011 Vital Signs: Incidence and Trends of Infection with Pathogens Transmitted Commonly Through Food—Foodborne Disease Active Surveillance Network, 10 U.S. Sites, 1996—2010. 2011; 60(22): 749–755. Available at http://www.cdc.gov/mmwr/preview/mmwrhtml/mm6022a5.htm?s_cid=mm6022a5_w. (Accessed February 8, 2013).

complications of gastroenteritis and foodborne illness, including the elderly, pregnant women, newborns, people undergoing treatments for cancer and autoimmune conditions, and those with Human Immunodeficiency Virus (HIV).[7]

This Statistical Brief presents data from the Healthcare Cost and Utilization Project (HCUP) on hospital inpatient stays and treat-and-release emergency department (ED) visits for infectious enteritis and foodborne noninfectious gastroenteritis and diarrhea.[8] Case definitions were based on previously published research on foodborne illnesses in 2009 (see table under "Definitions" for specific ICD-9-CM codes used in this analysis). Inpatient hospital stays and treat-and-release emergency department (ED) visits with all-listed diagnoses for infectious enteritis and nonspecific gastroenteritis diagnoses are included.

The total number of inpatient stays and ED visits are reported for infectious enteritis and foodborne illness, as well as for the less specific diagnoses. In addition, details are provided focusing on specific types of foodborne illness-related inpatient stays and ED visits. Characteristics and population rates are highlighted, trends in population rates of inpatient stays are shown from 1993 to 2010, and the number of inpatient stays and ED visits are shown by month for 2010. All differences between estimates noted in the text are statistically significant at the 0.05 level or better.

Findings

In 2010, nearly 3.7 million treat-and-release ED visits and 1.3 million hospital stays involved diagnoses of enteritis or gastrointestinal symptoms that suggested possible foodborne illness (table 1). Of the 3.7 million treat-and-release ED visits, 9 percent, or 313,900 visits, had a diagnosis of infectious enteritis, while 39 percent (1,426,100 visits) had noninfectious gastroenteritis, and 53 percent (1,930,900 visits) had diarrhea or other gastrointestinal symptoms. Of the nearly 1.3 million hospital stays, 18 percent, or

Table 1. Treat-and-release emergency department visits and inpatient hospital stays with diagnoses of enteritis or symptoms suggesting possible foodborne illness, 2010

All-listed diagnoses	Treat-and-release emergency department visits			Inpatient hospital stays		
	Number	Percentage	Rate per 100,000	Number	Percentage	Rate per 100,000
Total	**3,670,900**		**1,188**	**1,265,300**		**409**
Infectious enteritis	313,900	9%	102	228,800	18%	74
Principal, or first-listed, diagnosis	255,200	7%	83	128,200	10%	41
Secondary diagnosis only	58,800	2%	19	100,600	8%	33
Noninfectious gastroenteritis, not elsewhere classified	1,426,100	39%	461	397,600	31%	129
Principal, or first-listed, diagnosis	1,139,100	31%	369	149,400	12%	48
Secondary diagnosis only	287,100	8%	93	248,200	20%	80
Diarrhea and other gastrointestinal symptoms	1,930,900	53%	625	638,900	50%	207
Principal, or first-listed, diagnosis	440,800	12%	143	27,000	2%	9
Secondary diagnosis only	1,490,100	41%	482	611,900	48%	198

Source: AHRQ, Center for Delivery, Organization, and Markets, Healthcare Cost and Utilization Project, Nationwide Emergency Department Sample and Nationwide Inpatient Sample, 2010
Percentages may not sum to 100 because of rounding.

[7] Lund, B. M., O'Brien, S. J. "The Occurrence and Prevention of Foodborne Disease in Vulnerable People." Foodborne Pathogens and Disease. 2011; 8(9): 961-973.
[8] Please see definitions section for the ICD-9-CM diagnosis codes used to define each category.

228,800 inpatient stays, had diagnoses of infectious enteritis, 31 percent (397,600) had a diagnosis of noninfectious gastroenteritis, and 50 percent (638,900) had only a diagnosis of diarrhea or other gastrointestinal symptoms.

A majority of the treat-and-release ED visits for infectious enteritis were principal diagnoses, but inpatient stays for infectious enteritis were more evenly split between principal and secondary diagnoses. In total, there were 102 ED visits and 74 inpatient stays per 100,000 people for infectious enteritis in the United States in 2010.

Characteristics of ED visits and hospital stays related to infectious enteritis
Remaining analyses focus on the 313,900 treat-and-release ED visits and 228,800 inpatient hospital stays related to infectious enteritis diagnoses in 2010. As shown in table 2, treat-and-release ED visits for infectious enteritis tended to be for younger patients (42 percent were under 18 years old), while inpatient stays tended to be for older patients (33 percent of stays were for patients aged 65 and older and 27 percent were for 45 to 64 year olds).

In both settings, females were seen more frequently than males, constituting 56 percent of ED visits and 58 percent of inpatient stays. Private insurance was the most common expected payer for treat-and-release ED visits (38 percent), closely followed by Medicaid (34 percent). On the other hand, for inpatient stays, Medicare was the most common payer (38 percent), followed by private insurance (33 percent).

Less than 1 percent of patients hospitalized for infectious enteritis died in the hospital. The mean length of hospitalization was 4.1 days and the mean cost was $7,800. The aggregate cost of infectious enteritis-related inpatient stays was about $1.8 billion in 2010.

Table 2. Characteristics of treat-and-release ED visits and inpatient hospital stays related to infectious enteritis, based on all-listed diagnoses, 2009

	Treat-and-release ED visits	**Inpatient hospital stays**
	0.2 percent of all treat-and-release ED visits	0.6 percent of all hospital stays
Mean visits/stays per day	860	627
Age (percentage)		
<18 years	42%	17%
18 to 44 years	39%	23%
45 to 64 years	13%	27%
65 years and older	6%	33%
Sex (number, percentage)		
Female	56%	58%
Male	44%	42%
Expected payer (number, percentage)		
Medicare	8%	38%
Medicaid	34%	20%
Privately insured	38%	33%
Uninsured	16%	7%
Died during hospital stay	-	0.8%
Mean length of stay (days)	-	4.1
Mean cost	-	$7,800
Aggregate cost	-	$1,775,131,300

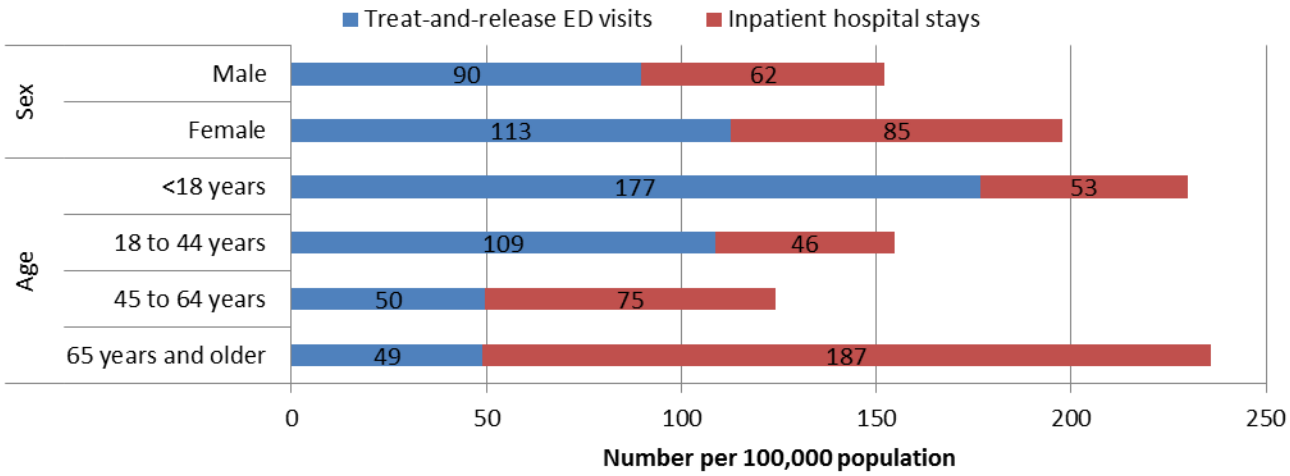
Source: AHRQ, Center for Delivery, Organization, and Markets, Healthcare Cost and Utilization Project, Nationwide Inpatient Sample and Nationwide Emergency Department Sample, 2010

Figure 1 shows that females had higher rates of ED visits and hospital stays for infectious enteritis than did males (113 ED visits and 85 hospital stays per 100,000 females versus 90 ED visits and 62 hospital stays per 100,000 males).

The rate of ED visits among those younger than 18 years was the highest of any age group, at 177 per 100,000 people. This rate was more than 50 percent higher than the next highest age group, 18 to 44 year olds, who had 109 visits per 100,000 people. Patients aged 45 to 64 years and 65 years and older had lower rates of ED visits, with 50 and 49 per 100,000, respectively.

For inpatient stays, the elderly had the highest admission rate, with 187 inpatient stays per 100,000 people. That rate was about 2.5 times the rate of 45 to 64 year olds, 4.1 times that of 18 to 44 year olds, and 3.5 times that of those under 18 years old.

Figure 1. Rate of ED visits and hospital stays* related to infectious enteritis by sex and age per 100,000 population, 2010



Source: AHRQ, Center for Delivery, Organization, and Markets, Healthcare Cost and Utilization Project, Nationwide Inpatient Sample and Nationwide Emergency Department Sample, 2010

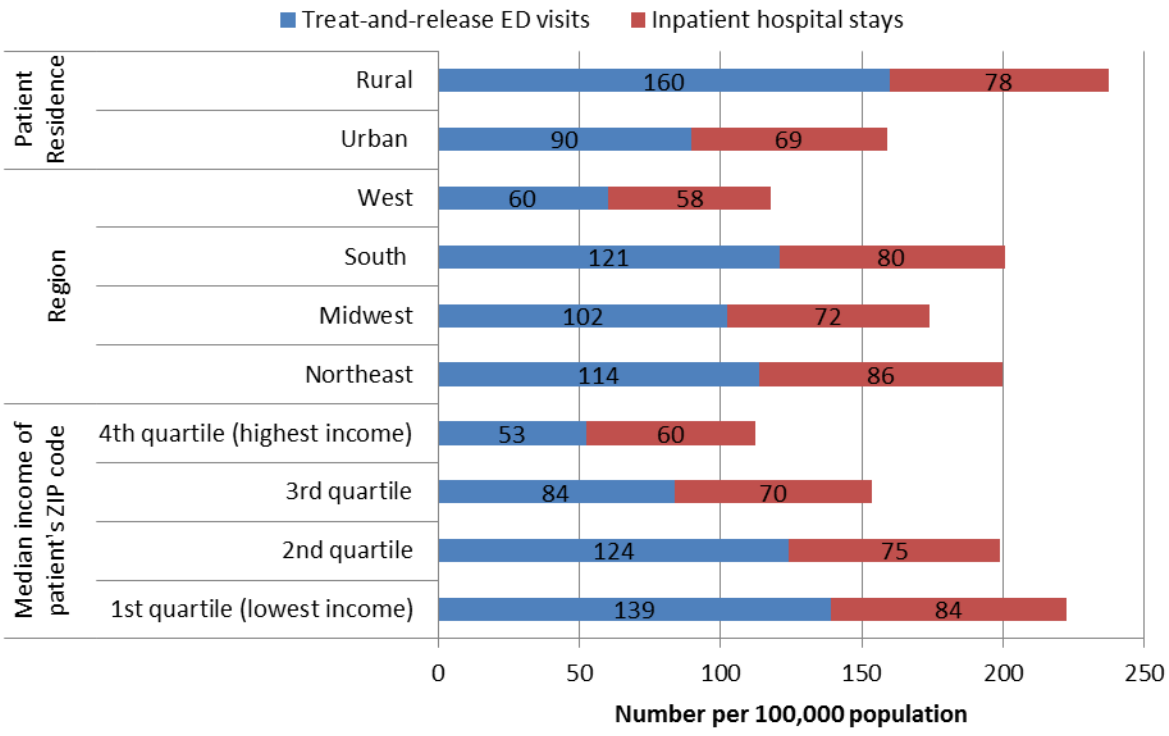
* Based on all-listed diagnoses.

As shown in figure 2, rural areas had higher rates of both ED visits and inpatient stays than did urban areas. The difference was especially pronounced for ED visits, where the rural rate was 160 infectious enteritis visits per 100,000 compared with 90 visits per 100,000 urban residents. In addition, rural residents were more likely to be hospitalized than were urban residents. The relative rate of ED visits per inpatient stay was only 1.3 to 1 in urban areas (90 ED visits for every 69 hospital stays) compared to more than 2 to 1 in rural areas (160 ED visits for every 78 hospital stays).

Compared to all other regions, the rates of both ED visits and inpatient stays were the lowest in the West, at 60 visits and 58 inpatient stays per 100,000 people, respectively.

Rates of ED visits and inpatient stays decreased as community level income increased. Residents in communities that fell into the lower income quartiles had higher ED visit rates, 124–139 ED visits per 100,000 versus 53–84 ED visits per 100,000 in the higher income quartiles. There were smaller differences in the rates of inpatient stays by community level income, although, again, the lowest income quartile had the highest admission rate (84 stays per 100,000) and the highest income quartile had the lowest admission rate (60 inpatient stays per 100,000).

Figure 2. Rate of ED visits and hospital stays related to infectious enteritis by residence, region, and income per 100,000 population, 2010

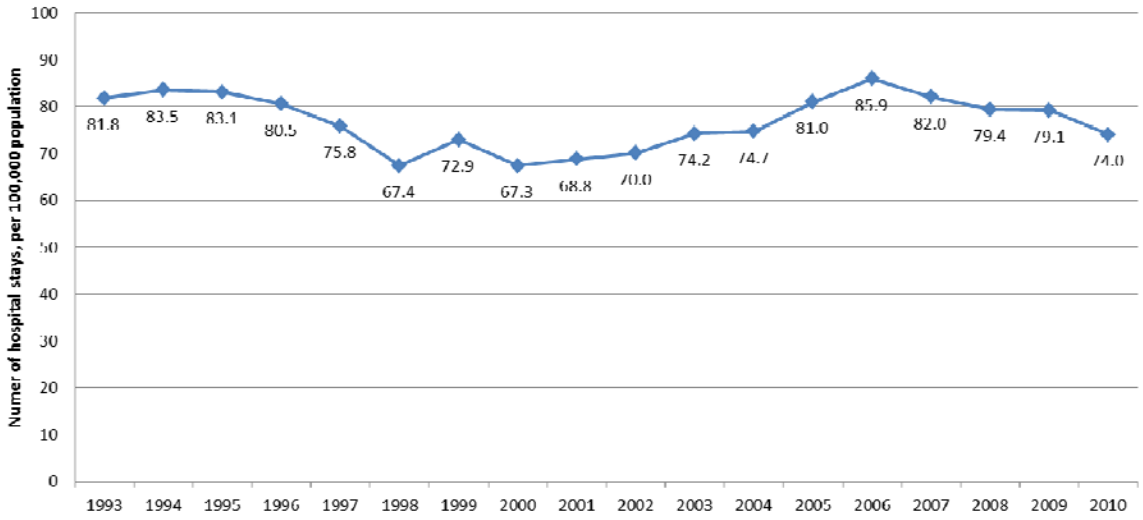


Source: AHRQ, Center for Delivery, Organization, and Markets, Healthcare Cost and Utilization Project, Nationwide Inpatient Sample and Nationwide Emergency Department Sample, 2010

Trend in inpatient stays for infectious enteritis

Overall, the rates of infectious enteritis-related hospitalizations decreased throughout most of the 1990s, began to increase in the early 2000s, but began to decline again in 2007 (figure 3). During this 18-year period, the lowest rate of approximately 67 inpatient stays per 100,000 was observed in 2000 and the highest rate of 86 inpatient stays per 100,000 was observed in 2006. The rate of 74 hospitalizations per 100,000 in 2010 was about 10 percent lower than in 1993 (82 stays per 100,000) and 14 percent lower than in 2006 (86 stays per 100,000).

Figure 3. Trend in hospitalizations* related to infectious enteritis diagnoses per 100,000 population, 1993-2010

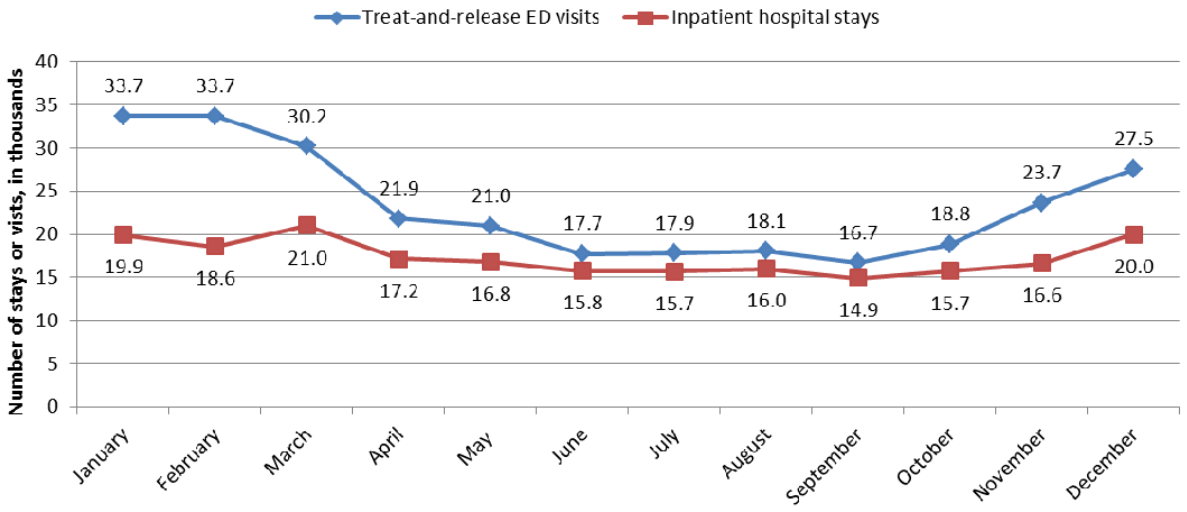


Source: AHRQ, Center for Delivery, Organization, and Markets, Healthcare Cost and Utilization Project, Nationwide Inpatient Sample, 1993-2010.
*Based on all listed diagnoses.

Trends in ED visits and inpatient stays for infectious enteritis by month

Figure 4 illustrates the number of ED visits and hospital stays by month for 2010. The number of inpatient stays and ED visits were highest in the winter months (January through March, and December), with 18,000 or more hospital stays and 27,000 or more ED visits per month. Hospital stays were lowest—16,000 monthly admissions or fewer—from June through October. Treat-and-release ED visits were also at their lowest during these months, at 18,800 monthly visits or lower.

Figure 4. Number of ED visits and hospital stays* related to infectious enteritis per month, in thousands, during 2010



Source: AHRQ, Center for Delivery, Organization, and Markets, Healthcare Cost and Utilization Project, Nationwide Emergency Department Sample and Nationwide Inpatient Sample, 2010

* Based on all-listed diagnoses.

Diagnosis codes for infectious enteritis in ED visits

Among treat-and-release ED visits, "viral enteritis not otherwise specified" topped the list as the most common diagnosis code for infectious enteritis, recorded in 233,200 visits (table 3). More than 96 percent of the infectious enteritis ED visits were coded as unspecified or unknown enteritis, food poisoning, or intestinal infections. Hepatitis A was the most common specific agent, with 3,100 ED visits; *Salmonella* ranked seventh overall, with 1,200 ED visits; rotavirus ranked ninth, with 1,100 ED visits.

ED visits for *Salmonella* and rotavirus were more common among children than adults. Children under one year had 5.8 *Salmonella* and 6.2 rotavirus visits per 100,000 people. Children 1 to 17 years had 0.5 *Salmonella* and 1.2 rotavirus visits per 100,000 compared with no more than 0.3 visits per 100,000 for any age group aged 18 or older. Hepatitis A was more common in adults than in children, with adult rates ranging from 0.9 to 2.0 per 100,000, while children had rates between 0.1–0.2 per 100,000.

Table 3. All-listed causes of infectious enteritis in treat-and-release emergency department visits, 2010

Diagnosis (ICD-9-CM code)	Overall ranking	Rate of ED visits per 100,000, by age					Total number of ED visits
		<1	1–17	18–44	45–64	65+	
All infectious enteritis cases							**313,900**
Viral enteritis not otherwise specified (008.8)	1	424.6	137.6	74.3	28.4	31.1	233,200
Ill-defined intestinal infections (009.0–009.3)	2	33.9	12.0	16.6	10.0	8.7	40,100
Unspecified bacterial food poisoning (005.9)	3	1.1	5.1	11.5	6.1	5.3	23,700
Unspecified bacterial intestinal infection (008.5)	4	1.7	0.9	2.5	1.4	1.3	5,200
Hepatitis A (070.0–070.1)	5	0.2	0.1	0.9	2.0	0.9	3,100
Protozoal intestinal diseases (006.0–007.9)	6	0.3	0.6	0.6	0.3	0.4	1,600
Salmonella (003.0–003.9)	7	5.8	0.5	0.3	0.2	0.2	1,200
Other specific foodborne infections (023.0–023.9; 027.0; 124; 130.0–130.9)	8	0.0	0.1	0.6	0.4	0.2	1,200
Rotavirus enteritis (008.61)	9	6.2	1.2	0.0	0.0	0.0	1,100
Other specified viral enteritis (008.6; 008.62–008.69)	10	2.9	0.5	0.2	0.2	0.2	1,000
Campylobacter intestinal infection (008.43)	11	0.4	0.2	0.2	0.2	0.2	600
Other specified bacterial food poisoning (005.0–005.89)	12	0.0	0.0	0.2	0.2	0.1	500
E. coli enteritis (008.00–008.09)	13	0.3	0.2	0.1	0.1	0.2	400
Shigella (004.0–004.9)	14	0.5	0.3	0.1	0.0	0.0	400
Other specified bacterial intestinal infections (008.1–008.42; 008.44; 008.46–008.49)	15	0.3	0.1	0.1	0.1	0.1	400
Cholera, typhoid, and paratyphoid (001.0–002.9)	16	0.1	0.1	0.1	0.1	0.1	300

Note: Age-specific ED visits may not total to all stays due to missing age.

Source: AHRQ, Center for Delivery, Organization, and Markets, Healthcare Cost and Utilization Project, Nationwide Emergency Department Sample, 2010

Diagnosis codes for infectious enteritis in hospital stays

Among hospital stays, the most common diagnosis code indicating infectious enteritis was "viral enteritis not otherwise specified," which was listed in 126,900 inpatient stays (table 4), more than half of all infectious enteritis inpatient stays. As with ED visits, known agents of foodborne illness were diagnosed in fewer inpatient stays than unspecified agents, and *Salmonella* and hepatitis A were the most common known agents specified in hospital stays. Compared with ED visits, the known agents make up a larger proportion of the cases for inpatient stays. *Salmonella* and hepatitis A combined account for more than 8 percent of the inpatient stays. Other infections with known agents were far less common.

Rates of inpatient stays per age group were similar to the patterns for ED visits, with rotavirus more common in children and hepatitis A more common in adults. *Salmonella* most frequently affected children under 1 year, with 29.8 inpatient stays per 100,000, but was next most common in those 65 and older, who had 7.3 inpatient stays per 100,000.

Table 4. All-listed causes of infectious enteritis in hospitals, 2010

Diagnosis (ICD-9-CM code)	Overall ranking	Rate of inpatient stays per 100,000, by age					Total number of inpatient stays
		<1	1–17	18–44	45–64	65+	
All infectious enteritis							228,800
Viral enteritis not otherwise specified (008.8)	1	168.8	25.9	24.1	37.2	109.3	126,900
Ill-defined intestinal infections (009.0–009.3)	2	12.1	3.3	10.0	17.2	38.2	43,600
Salmonella (003.0–003.9)	3	29.8	3.0	1.7	3.2	7.3	10,700
Hepatitis A (070.0–070.1)	4	0.3	0.3	1.9	4.9	5.6	8,600
Unspecified bacterial food poisoning (005.9)	5	0.1	0.4	1.8	2.6	6.9	7,200
Other specific foodborne infections (023.0–023.9; 027.0; 124; 130.0–130.9)	6	1.9	0.1	1.9	2.1	1.6	4,700
Campylobacter intestinal infection (008.43)	7	3.5	0.8	1.0	1.5	3.4	4,400
Other specified viral enteritis (008.6; 008.62–008.69)	8	4.9	0.8	0.8	1.5	3.8	4,400
Protozoal intestinal diseases (006.0–007.9)	9	0.8	0.8	1.4	1.5	2.2	4,300
Rotavirus enteritis (008.61)	10	22.9	4.4	0.1	0.1	0.4	4,300
Other specified bacterial intestinal infections (008.1–008.42; 008.44; 008.46–008.49)	11	1.5	0.2	0.3	1.1	4.2	3,100
Unspecified bacterial intestinal infection (008.5)	12	1.7	0.4	0.6	0.6	1.9	2,300
Shigella (004.0–004.9)	13	1.1	1.0	0.4	0.3	0.7	1,600
E. coli enteritis (008.00–008.09)	14	0.5	0.7	0.3	0.4	1.0	1,600
Other specified bacterial food poisoning (005.0–005.89)	15	0.4	0.1	0.1	0.3	0.3	500
Cholera, typhoid, and paratyphoid (001.0–002.9)	16	0.4	0.2	0.1	0.1	0.1	500

Note: Age-specific ED visits may not total to all stays due to missing age.

Source: AHRQ, Center for Delivery, Organization, and Markets, Healthcare Cost and Utilization Project, Nationwide Inpatient Sample, 2010

Data Source

The estimates in this Statistical Brief are based upon data from the Healthcare Cost and Utilization Project (HCUP) 2010 Nationwide Inpatient Sample (NIS) and Nationwide Emergency Department Sample (NEDS). Historical data were drawn from the 1993-2009 NIS. Supplemental sources included data on regional population estimates from "Table 1. Intercensal Estimates of the Resident Population for the United States, Regions, States, and Puerto Rico: April 1, 2000 to July 1, 2010 (ST-EST00INT-01)", Population Division, U.S. Census Bureau, Release Date: September 2011. http://www.census.gov/popest/data/intercensal/state/state2010.html); and from "State Population Estimates: Annual Time Series, July 1, 1990 to July 1, 1999 (ST-99-3)," Population Division, U.S. Census Bureau, Release date: December 29, 1999 (http://www.census.gov/popest/data/state/totals/1990s/tables/ST-99-03.txt). Population estimates by age were from "Intercensal Estimates of the Resident Population by Single Year of Age, Sex, Race, and Hispanic Origin for the United States: April 1, 2000 to July 1, 2010" (US-EST00INT-ALLDATA.csv), Population Division, U.S. Census Bureau, Release Date: September 2011. (http://www.census.gov/popest/data/intercensal/national/nat2010.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.

CCS categorizes ICD-9-CM diagnoses into a manageable number of clinically meaningful categories.[9] This "clinical grouper" makes it easier to quickly understand patterns of diagnoses. CCS categories identified as "Other" are typically not reported; these categories include miscellaneous, otherwise unclassifiable diagnoses that may be difficult to interpret as a group.

Case definition
The ICD-9-CM codes defining infectious enteritis and foodborne illness include diagnosis codes in the following range: 001.0–009.3 (excluding 008.45), 023.0–023.9, 027.0, 070.0, 070.1, 124, 130.0–130.9, 558.9, and 787.9–787.99. Inpatient stays and ED visits with a diagnosis code of 008.45, *Clostridium difficile,* were excluded because this infection is not transmitted via food.

The definition of foodborne illness was drawn from two sources: a 2004 study on trends in food safety and a 2011 study by the Centers for Disease Control and Prevention. The 2004 study by McCabe-Seller and Beattie included a table of ICD-9-CM codes for illness caused by foodborne pathogens, and the 2011 study by Scallan et al.[10,11] contained two tables detailing data sources, including information on the types of pathogens estimated in each and ICD-9-CM codes, if specified. Both studies used laboratory-confirmed diagnoses from surveillance networks. The classification scheme, corresponding ICD-9-CM codes, and sources naming the illnesses are shown below.

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[9] 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 February 8, 2013).
[10] Scallan E, Hoekstra R M, Angulo FJ, Tauxe RV, et al. Foodborne illness acquired in the United States—Major pathogens. Emerging Infectious Diseases. 2011;17(1):7–15.
[11] Scallan E., Griffin PM, Angulo FJ, Tauxe RV, et al. Foodborne illness acquired in the United States—Unspecified agents. Emerging Infectious Diseases. 2011;17(1):16–22.

	ICD-9-CM code	McCabe-Seller and Beattie[12]	Scallan et al.[13,14]
Infectious enteritis			
Cholera, typhoid, and paratyphoid	001.0–002.9	x	x
Salmonella	003.0–003.9	x	x
Shigella	004.0–004.9	x	x
Other specified bacterial food poisoning	005.0–005.89	x	x
Unspecified bacterial food poisoning	005.9	x	x
Protozoal intestinal diseases	006.0–007.9	x	x
E. coli enteritis	008.00–008.09	x	x
Campylobacter intestinal infection	008.43	x	x
Other specified bacterial intestinal infections	008.1–008.42; 008.44; 008.46–008.49	x	x
Unspecified bacterial intestinal infection	008.5	x	x
Rotavirus enteritis	008.61	x	x
Other specified viral enteritis	008.6; 008.62–008.69	x	x
Viral enteritis not otherwise specified	008.8	x	x
Ill-defined intestinal infections	009.0–009.3	x	x
Hepatitis A	070.0–070.1	x	x
Other specific foodborne infections	023.0–023.9; 027.0; 124; 130.0–130.9	x	x
Noninfectious gastroenteritis, not elsewhere classified	**558.9**	**x**	**x**
Diarrhea and other gastrointestinal symptoms	**787.9–787.99**		**x**

If a hospital stay or ED visit did not have an infectious enteritis diagnosis, it was included in initial analysis if it contained a diagnosis of 558.9 (noninfectious gastroenteritis, not elsewhere classified) or 787.9–787.99 (diarrhea and other gastrointestinal symptoms). Inpatient hospital stays and ED visits with diagnoses for both noninfectious gastroenteritis and diarrhea symptoms diagnoses were classified as noninfectious gastroenteritis.

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. 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 will be included in the NIS.

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.

[12] McCabe-Seller BJ, Beattie SE. Food safety: Emerging trends in foodborne illness surveillance and prevention. Journal of the American Dietetic Association. 2004;104(11):1708–1717. Available at http://ddr.nal.usda.gov/dspace/bitstream/10113/41107/1/IND43656534.pdf. (Accessed February 8, 2013).

[13] Scallan E, Hoekstra R M, Angulo FJ, Tauxe RV, et al. Foodborne illness acquired in the United States—Major pathogens. Emerging Infectious Diseases. 2011;17(1):7–15.

[14] Scallan E., Griffin PM, Angulo FJ, Tauxe RV, et al. Foodborne illness acquired in the United States—Unspecified agents. Emerging Infectious Diseases. 2011;17(1):16–22.

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).[15] *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.

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). For this Statistical Brief, we collapsed the NCHS categories into either urban or rural according to the following:

Urban:

- Large Central Metropolitan: includes metropolitan areas with 1 million or more residents
- Large Fringe Metropolitan: includes counties of metropolitan areas with 1 million or more residents
- Medium and Small Metropolitan: includes areas with 50,000 to 999,999 residents.

Rural:

- Micropolitan and Noncore: includes nonmetropolitan counties (i.e., counties with no town greater than 50,000 residents).

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.

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

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

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

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

- Northeast: Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, and Pennsylvania

[15] HCUP Cost-to-Charge Ratio Files (CCR). Healthcare Cost and Utilization Project (HCUP). 2001–2009. U.S. Agency for Healthcare Research and Quality, Rockville, MD. Available at http://www.hcup-us.ahrq.gov/db/state/costtocharge.jsp. Updated August 2011. (Accessed January 9, 2013).

- 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 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
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 Budget & Control Board
South Dakota Association of Healthcare Organizations
Tennessee Hospital Association
Texas Department of State Health Services
Utah Department of Health
Vermont Association of Hospitals and Health Systems
Virginia Health Information
Washington State Department of Health
West Virginia Health Care Authority
Wisconsin Department of Health Services
Wyoming Hospital Association

About the NIS

The HCUP Nationwide Inpatient Sample (NIS) is a nationwide database of hospital inpatient stays. The NIS is nationally representative of all community hospitals (i.e., short-term, non-Federal, 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 more than 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.

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 U.S., download *HCUP Facts and Figures: Statistics on Hospital-Based Care in the United States in 2009*, 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_2009_INTRODUCTION.pdf. (Accessed February 8, 2013).

Introduction to the HCUP Nationwide Emergency Department Sample, 2009. Online. September 2011. U.S. Agency for Healthcare Research and Quality. Available at http://hcup-us.ahrq.gov/db/nation/neds/NEDS2009Introductionv3.pdf. (Accessed February 8, 2013).

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. Available at http://www.hcup-us.ahrq.gov/reports/CalculatingNISVariances200106092005.pdf. (Accessed February 8, 2013).

Houchens RL, Elixhauser A. *Using the HCUP Nationwide Inpatient Sample to Estimate Trends. (Updated for 1988–2004).* HCUP Methods Series Report #2006–05. Online. August 18, 2006. U.S. Agency for Healthcare Research and Quality. Available at http://www.hcup-us.ahrq.gov/reports/methods/2006_05_NISTrendsReport_1988-2004.pdf. (Accessed February 8, 2013).

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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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