Impact of Hurricanes on Injury-Related Emergency Department Visits, 2005–2016

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Highlights

- Changes in the population rate of injury-related emergency department (ED) visits following a hurricane varied by county proximity to the hurricane, people's age, and time from the hurricane event.
- The rate of injury-related ED visits resulting in hospital admission increased the most during the week of the hurricane for people of all ages living in the direct path: 22.6 percent increase for children aged 0–17 years, 13.2 percent increase for adults aged 18–64 years, and 53.2 percent increase for adults aged 65 years and older.
- Regardless of county proximity to the hurricane, the rates of injury-related treat-and-release ED visits and ED visits resulting in admission increased for adults aged 65 years and older during the week of the hurricane. However, the impact lessened the further away that older adults resided from the hurricane's path.
- Children were most affected if they lived in the direct path of the hurricane during the week of the hurricane and the first 2 weeks following the hurricane. The rate of injury-related ED visits resulting in admission among children aged 0–17 years increased 22.6, 15.6, and 26.3 percent, respectively, over these 3 weeks.

Introduction

Severe hurricanes strike portions of the United States nearly every year, affecting tens of thousands of people. In order to better identify health-related emergency response needs following a hurricane, the Agency for Healthcare Research and Quality (AHRQ) conducted a series of analyses on postdisaster hospital utilization, including a recent study that described significant increases in emergency department (ED) utilization following a hurricane.[1] Emergency response needs varied by clinical condition and patient age group.

As an extension of that study and information provided on the HCUP Fast Stats Hurricane Impact on Hospital Use topic,[2] this Healthcare Cost and Utilization Project (HCUP) Statistical Brief presents a more detailed analysis focused on ED visits for injuries following a hurricane. Statistics are presented from the 2005–2016 State Inpatient Databases (SID) and State Emergency Department Databases (SEDD) from 11 States affected by seven hurricanes (listed in the Data Source section at the end of this Statistical Brief).

Counties designated by the Federal Emergency Management Agency[3] as disaster areas because of the hurricane were classified based on their proximity to the hurricane:

- Direct path: those disaster-designated counties through which the hurricane traveled directly, based on information from the National Oceanic and Atmospheric Administration[4,5]
- Near path: those disaster-designated counties not in the direct path but that were affected by a hurricane wind speed of 34 knots per hour or greater
- Remote: those disaster-designated counties that were neither in the direct path nor near the path of the hurricane

The percentage change in the population rate of injury-related ED visits pre- versus posthurricane is presented for two types of ED visits: those in which the patient was treated and then released ("treat-and-release ED visits") and those in which the patient was admitted to the same hospital ("ED visits resulting in admission"). The prehurricane rate was calculated as an average during the 4 weeks immediately preceding the hurricane. The posthurricane rate was examined for four time periods: the week that the hurricane made landfall in the State and each of the following 3 weeks (1, 2, and 3 weeks posthurricane). The pre- and

posthurricane rates reported by hurricane proximity were population-weighted to account for the differences in the size of the counties. All pre- versus posthurricane percentage change in population rates noted in the text are 10 percent or larger.

Findings

County and prehurricane ED visit characteristics, 2005–2016

This Statistical Brief is based on all available HCUP ED utilization data (from the SID and SEDD) that cover hurricane-affected counties from 11 States: Florida, Georgia, Maine, Maryland, Massachusetts, New Jersey, New York, North Carolina, Rhode Island, South Carolina, and Vermont. Table 1 summarizes the characteristics of hurricane disaster counties included in this analysis. The table includes information on the population represented in the data for the counties affected by the seven hurricanes by county proximity to the hurricane (in the direct path of the hurricane, near the hurricane path, or remote from the hurricane path). The average prehurricane population rate of injury-related treat-and-release ED visits and the average prehurricane population rate of injury-related ED visits resulting in admission are provided for each of three age groups: 0–17 years, 18–64 years, and 65 years and older.

Table 1. Characteristics for hurricane disaster counties, by county proximity to the hurricane, 2005–2016

Characteristic	County proximity to hurricane		
	Direct path	Near path	Remote
Counties affected			
Total number of counties affected by the 7 hurricanes	48	316	421
Counties included in analysis			
Number	21	184	139
%	43.8	58.2	33.0
Population affected			
Total population of counties affected by the 7 hurricanes	15,571,789	73,671,930	38,737,408
Population included in analysis			
Number	13,354,505	53,974,967	21,307,790
%	85.8	73.3	55.0
Prehurricane rate* of injury-related treat-and-release ED visits (per 100,000 population)			
All ages	149.6	154.8	172.7
Ages 0–17 years	174.6	196.8	205.9
Ages 18–64 years	149.3	146.2	171.1
Ages 65+ years	110.3	125.2	132.8
Prehurricane rate* of injury-related ED visits resulting in admission (per 100,000 population)			
All ages	9.3	9.2	9.1
Ages 0–17 years	3.7	3.2	3.4
Ages 18–64 years	7.9	7.2	7.7
Ages 65+ years	26.7	28.4	27.0

Abbreviation: ED, emergency department

* The prehurricane rate is based on the average rate for the 4 weeks immediately prior to the hurricane making landfall.

Notes: Direct-path counties were those through which the hurricane traveled. Near-path counties were those not in the direct path but affected by a hurricane wind speed of 34 knots per hour or greater. Remote counties were other counties in a hurricane-affected State that were neither in the direct path nor near the path of the hurricane.

Sources: Agency for Healthcare Research and Quality (AHRQ), Healthcare Cost and Utilization Project (HCUP), State Inpatient Databases (SID) and State Emergency Department Databases (SEDD), 11 States, 2005–2016; National Oceanic and Atmospheric Administration (NOAA) Best Track data

- **Data for approximately half of hurricane disaster counties and three-fourths of the population affected by seven hurricanes were included in this analysis.**

  This Statistical Brief was based on ED utilization data from 11 States affected by seven hurricanes between 2005 and 2016. In the aggregate, the data available to be included encompassed information on ED visits for individuals from 43.8 percent of hurricane disaster counties and 85.8 percent of the population living in the direct path of the hurricane and from 58.2 percent of hurricane disaster counties and 73.3 percent of the population living near the path of the hurricane. Not all hurricane disaster counties were included in this analysis because some hurricane-affected States were not HCUP partners or did not contribute ED data to HCUP at the time of the hurricane.

- **The prehurricane injury-related ED visit rate varied by type of ED visit, patient age, and county proximity to the hurricane.**

  Overall, the prehurricane injury-related ED visit rate was higher for treat-and-release ED visits than for ED visits resulting in admission (ranging from 149.6 to 172.7 per 100,000 population vs. 9.1 to 9.3 per 100,000 population across all ages and hurricane proximity groups).

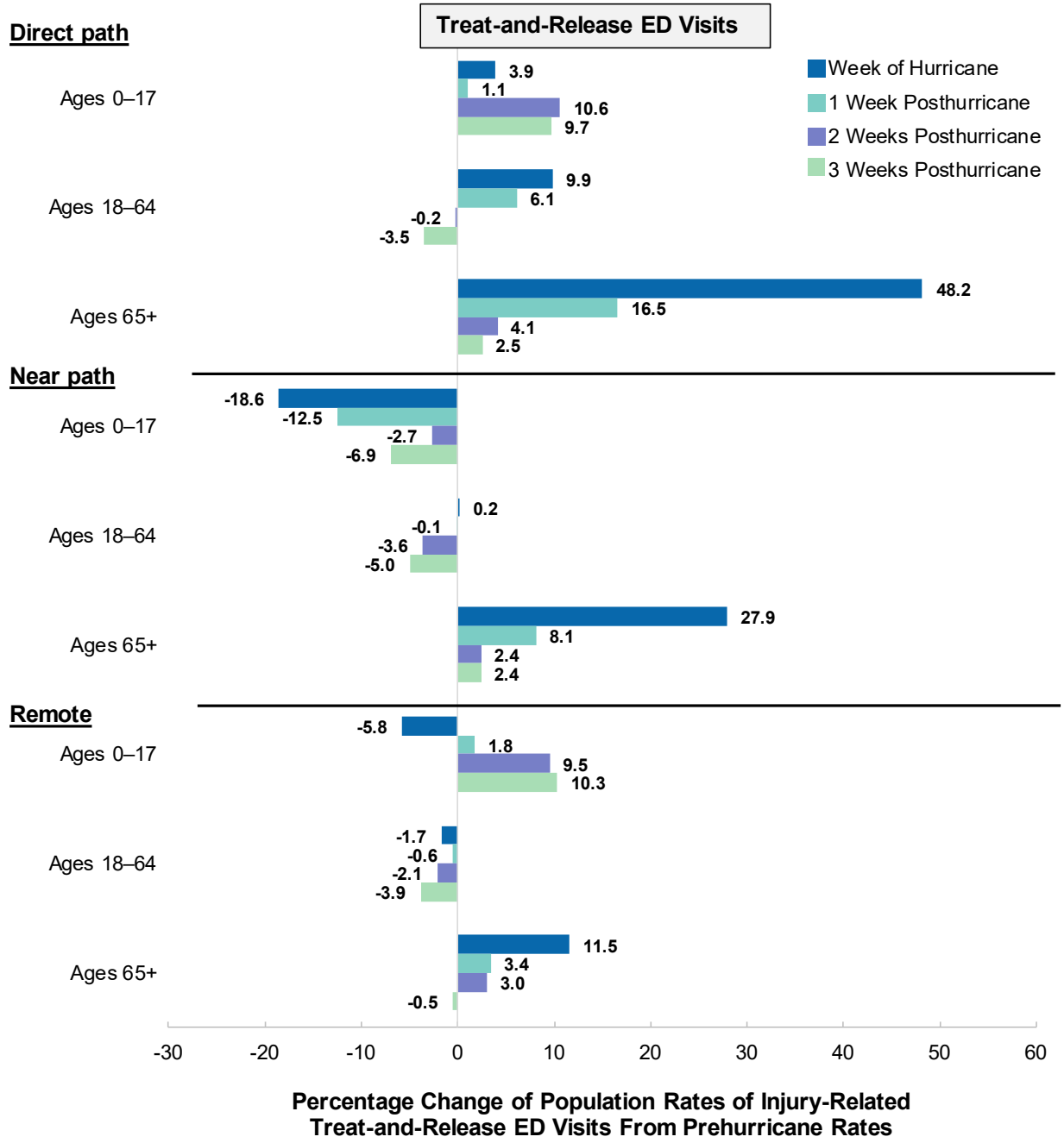
  The rate of prehurricane injury-related treat-and-release ED visits varied by age group as well as by county proximity to the hurricane. The prehurricane rate was highest among children aged 0–17 years (ranging from 174.6 to 205.9 per 100,000 population, based on county proximity to the hurricane, compared with 110.3 to 132.8 for adults aged 65 years and older). The prehurricane rate also varied by hurricane proximity, indicating differences in injury-related treat-and-release ED utilization among counties prior to the hurricane event. Across age groups, the prehurricane rate was higher among counties remote from the path of the hurricane than among counties in the direct path or near the path of the hurricane (172.7 vs. 149.6 and 154.8 per 100,000 population).

  The rate of prehurricane injury-related ED visits resulting in admission varied by age group but was generally similar by county proximity to the hurricane. The prehurricane rate was highest among adults aged 65 years and older (ranging from 26.7 to 28.4 per 100,000 population, based on county proximity to the hurricane, compared with 3.2 to 3.7 for children aged 0–17 years).

Posthurricane ED visit impact, 2005–2016

Figure 1 presents the percentage change from the prehurricane population rate of injury-related treat-and-release ED visits to the rate the week of the hurricane and 1 to 3 weeks after the hurricane, by county proximity to the hurricane (in the direct path, near the hurricane path, or remote from the path). Results are shown for three age groups: 0–17 years, 18–64 years, and 65 years and older.

Figure 1. Percentage change in the population rates of injury-related treat-and-release emergency department (ED) visits after a hurricane, by county proximity to the hurricane and age group, 2005–2016



Abbreviation: ED, emergency department

Notes: Direct-path counties were those through which the hurricane traveled. Near-path counties were those not in the direct path but affected by a hurricane wind speed of 34 knots per hour or greater. Remote counties were other counties in a hurricane-affected State that were neither in the direct path nor near the path of the hurricane.

Sources: Agency for Healthcare Research and Quality (AHRQ), Healthcare Cost and Utilization Project (HCUP), State Emergency Department Databases (SEDD), 11 States, 2005–2016; National Oceanic and Atmospheric Administration (NOAA) Best Track data

- **Among people residing in the direct path of the hurricane, the injury-related treat-and-release ED visit rate increased during the week of and first week after the hurricane for the oldest adults and increased 2 weeks after the hurricane for children.**

  The rate of injury-related treat-and-release ED visits increased pre- versus posthurricane for the oldest adults and for children who resided in the direct path of the hurricane. For adults aged 65 years and older, the rate increased 48.2 percent in the week of the hurricane and increased 16.5 percent the first week after the hurricane. For children aged 0–17 years, the rate increased 10.6 percent in the second week after the hurricane.

- **Among people residing in the near path of the hurricane, the injury-related treat-and-release ED visit rate increased for the oldest adults but decreased for children during the week of the hurricane.**

  The injury-related treat-and-release ED visit rate increased pre- versus posthurricane for the oldest adults but decreased for children who resided near the path of the hurricane. For adults aged 65 years and older, the rate increased 27.9 percent in the week of the hurricane. In contrast, for children aged 0–17 years, the rate decreased 18.6 percent in the week of the hurricane and decreased 12.5 percent the first week after the hurricane.

- **Among people residing remote from the hurricane path, the injury-related treat-and-release ED visit rate increased during the week of the hurricane for the oldest adults and increased 3 weeks after the hurricane for children.**

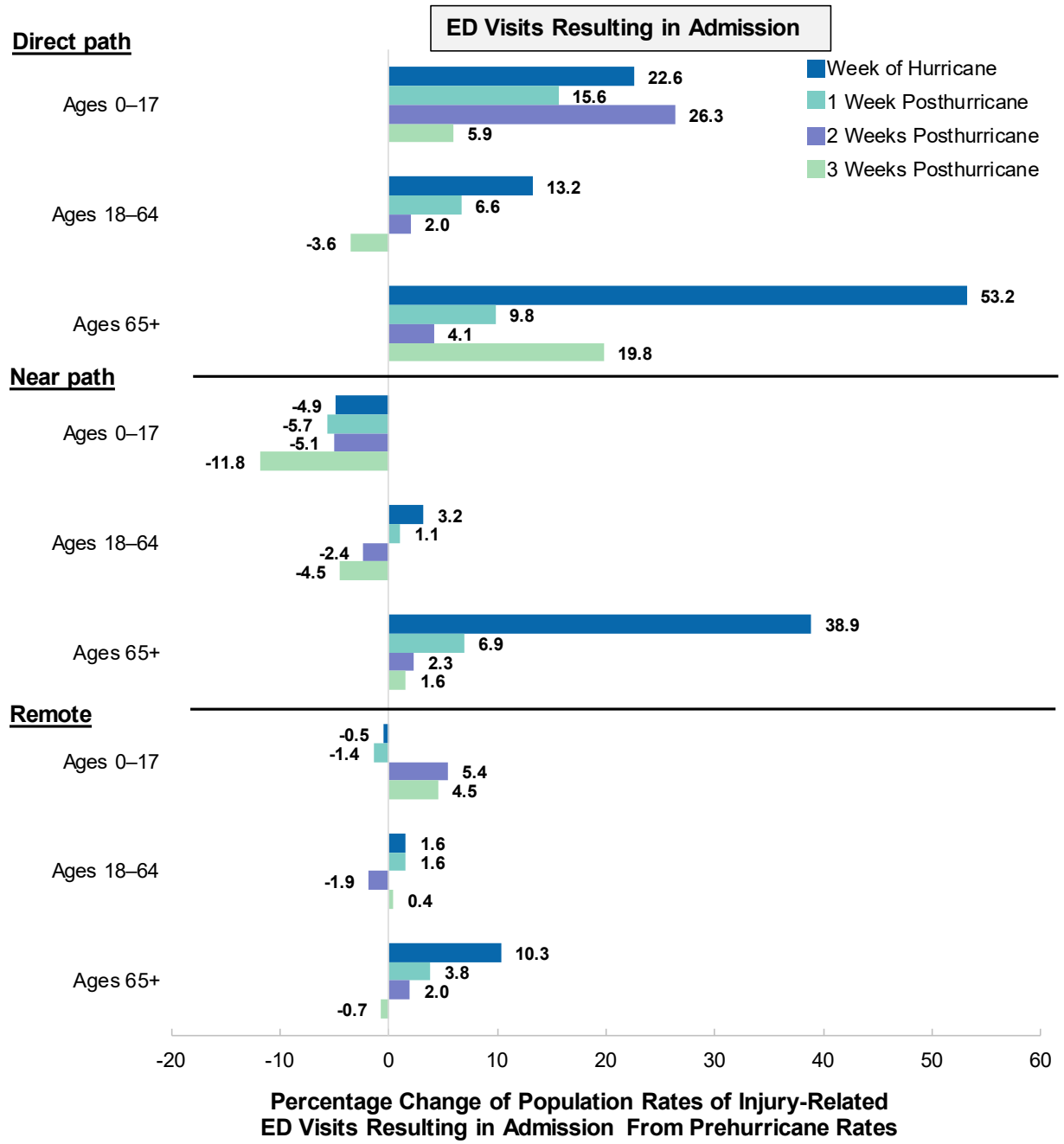
  The rate of injury-related treat-and-release ED visits increased pre- versus posthurricane for the oldest adults and for children who resided remote from the hurricane path. For adults aged 65 years and older, the rate increased 11.5 percent in the week of the hurricane. For children aged 0–17 years, the rate increased 10.3 percent in the third week after the hurricane.

- **For adults aged 18–64 years, the injury-related treat-and-release ED visit rate did not vary substantially during the week of or any of the 3 weeks after the hurricane.**

  The rate of injury-related treat-and-release ED visits did not differ substantially pre- versus posthurricane in the week of the hurricane or any of the 3 weeks after the hurricane for adults aged 18–64 years who resided in any of the hurricane proximity groups (direct path, near path, or remote).

Figure 2 presents the percentage change from the prehurricane population rate of injury-related ED visits resulting in admission to the rate the week of the hurricane and 1 to 3 weeks after the hurricane, by county proximity to the hurricane (in the direct path, near the hurricane path, or remote from the path). Results are shown for three age groups: 0–17 years, 18–64 years, and 65 years and older.

Figure 2. Percentage change in the population rates of injury-related emergency department (ED) visits resulting in admission after a hurricane, by county proximity to the hurricane and age group, 2005–2016



Abbreviation: ED, emergency department

Notes: Direct-path counties were those through which the hurricane traveled. Near-path counties were those not in the direct path but affected by a hurricane wind speed of 34 knots per hour or greater. Remote counties were other counties in a hurricane-affected State that were neither in the direct path nor near the path of the hurricane.

Sources: Agency for Healthcare Research and Quality (AHRQ), Healthcare Cost and Utilization Project (HCUP), State Inpatient Databases (SID), 11 States, 2005–2016; National Oceanic and Atmospheric Administration (NOAA) Best Track data

- **Among people residing in the direct path of the hurricane, the rate of injury-related ED visits resulting in admission increased in the week of the hurricane for all age groups.**

  The rate of injury-related ED visits resulting in admission increased pre- versus posthurricane for all age groups residing in the direct path of the hurricane. The largest increase was among adults aged 65 years and older, with a 53.2 percent increase in the rate in the week of the hurricane. The oldest adults also had a 19.8 percent increase in the rate in the third week after the hurricane. For children aged 0–17 years, the rate increased in the week of the hurricane and the first 2 weeks after the hurricane (22.6, 15.6, and 26.3 percent increases, respectively). For adults aged 18–64 years, the rate increased 13.2 percent in the week of the hurricane.

- **Among people residing in the near path of the hurricane, the rate of injury-related ED visits resulting in admission increased during the week of the hurricane for the oldest adults but decreased 3 weeks after the hurricane for children.**

  The rate of injury-related ED visits resulting in admission increased pre- versus posthurricane for the oldest adults but decreased for children who resided near the path of the hurricane. For adults aged 65 years and older, the rate increased 38.9 percent in the week of the hurricane. For children aged 0–17 years, the rate decreased 11.8 percent in the third week after the hurricane.

- **Among people residing remote from the hurricane path, the rate of injury-related ED visits resulting in admission increased in the week of the hurricane for the oldest adults.**

  The rate of injury-related ED visits resulting in admission increased 10.3 percent in the week of the hurricane, compared with the prehurricane rate, for adults aged 65 years and older who resided remote from the hurricane path.

Table 2 provides a summary of the pre- versus posthurricane changes in population rates that were 10 percent or larger, by county proximity to the hurricane and age group, for injury-related treat-and-release ED visits (from Figure 1) and injury-related ED visits resulting in admission (from Figure 2).

Table 2. Percentage changes in the population rate of injury-related emergency department (ED) visits after a hurricane, by county proximity to the hurricane and age group, 2005–2016

County proximity to hurricane	Age group, years	Treat-and-release ED visits				ED visits resulting in admission			
		HW	Wk1	Wk2	Wk3	HW	Wk1	Wk2	Wk3
Direct path	Ages 0–17			10.6		22.6	15.6	26.3	
	Ages 18–64					13.2			
	Ages 65+	48.2	16.5			53.2			19.8
Near path	Ages 0–17	–18.6	–12.5						–11.8
	Ages 18–64								
	Ages 65+	27.9				38.9			
Remote path	Ages 0–17				10.3				
	Ages 18–64								
	Ages 65+	11.5				10.3			

Abbreviations: ED, emergency department; HW, hurricane week (week of hurricane); Wk, week posthurricane

Notes: Direct-path counties were those through which the hurricane traveled. Near-path counties were those not in the direct path but affected by a hurricane wind speed of 34 knots per hour or greater. Remote counties were other counties in a hurricane-affected State that were neither in the direct path nor near the path of the hurricane.

Sources: Agency for Healthcare Research and Quality (AHRQ), Healthcare Cost and Utilization Project (HCUP), State Inpatient Databases (SID) and State Emergency Department Databases (SEDD), 11 States, 2005–2016; National Oceanic and Atmospheric Administration (NOAA) Best Track data

- **Among people residing in the direct path of the hurricane, the rate of injury-related ED visits resulting in admission increased in the week of the hurricane for all age groups.**

  For people residing in the direct path of the hurricane, the injury-related ED visit rate resulting in hospital admission increased the week of the hurricane for all age groups and also increased in later weeks for those aged 0–17 and 65+ years. The injury-related treat-and-release ED visit rate increased the week of and first week after the hurricane for those aged 65 years and older and increased 2 weeks posthurricane for those aged 0–17 years.

- **Among people residing in the near path of the hurricane, the rate of injury-related ED visits increased in the week of the hurricane for adults aged 65 years and older.**

  For people residing near the path of the hurricane, the injury-related rate of ED visits resulting in admission increased in the week of the hurricane for those aged 65 years and older but decreased 3 weeks after the hurricane for those aged 0–17 years. The injury-related treat-and-release ED visit rate increased the week of the hurricane for those aged 65 years and older but decreased in the week of and first week after the hurricane for those aged 0–17 years.

- **Among people residing remote from the hurricane path, the rate of injury-related ED visits increased in the week of the hurricane for adults aged 65 years and older.**

  For people residing remote from the hurricane path, the injury-related ED visit rate resulting in admission and the injury-related treat-and-release ED visit rate both increased in the week of the hurricane for those aged 65 years and older. The injury-related treat-and-release ED visit rate also increased in the third week after the hurricane for those aged 0–17 years.

References

[1] Heslin KC, Barrett ML, Hensche M, Pickens G, Ringel JS, Karaca Z, Owens PL. Effects of hurricanes on emergency department utilization: an analysis across 7 U.S. storms. Disaster Medicine and Public Health Preparedness. First View published October 7, 2020. https://doi.org/10.1017/dmp.2020.281.
[2] Healthcare Cost and Utilization Project. HCUP Fast Stats, Hurricane Impact on Hospital Use. www.hcup-us.ahrq.gov/faststats/HurricaneImpactServlet. Accessed March 30, 2020.
[3] Federal Emergency Management Agency. Disasters. www.fema.gov/disasters. Accessed June 20, 2019.
[4] National Oceanic and Atmospheric Administration. Storm Events Database. www.ncdc.noaa.gov/stormevents/ftp.jsp. Accessed February 19, 2018.
[5] National Oceanic and Atmospheric Administration. Best Track Data (HURDAT2). www.nhc.noaa.gov/data/#hurdat. Accessed May 1, 2018.

About Statistical Briefs

Healthcare Cost and Utilization Project (HCUP) Statistical Briefs provide basic descriptive statistics on a variety of topics using HCUP administrative healthcare data. Topics include hospital inpatient, ambulatory surgery, and emergency department (ED) use and costs, quality of care, access to care, medical conditions, procedures, and patient populations, among other topics. The reports are intended to generate hypotheses that can be further explored in other research; the reports are not designed to answer in-depth research questions using multivariate methods.

Data Source

The estimates in this Statistical Brief are based upon data from the HCUP 2005–2016 State Inpatient Databases (SID) and State Emergency Department Databases (SEDD) for 11 States, as listed in Table 3, for seven hurricanes:

Table 3. Hurricanes, their years, and affected States included in analysis

Hurricane	Year	States
Dennis	2005	Florida
Wilma	2005	Florida
Gustav	2008	Florida
Irene	2011	Maine, Maryland, Massachusetts, New Jersey, New York, North Carolina, Rhode Island, Vermont
Isaac	2012	Florida
Sandy	2012	Maryland, Massachusetts, New Jersey, New York, Rhode Island
Matthew	2016	Florida, Georgia, North Carolina, South Carolina

Counties included in this analysis were limited to those that the Federal Emergency Management Agency designated as disaster areas.[a] Data from the National Oceanic and Atmospheric Administration was used to classify the disaster counties into direct path, near path, and remote from the hurricane path and to determine the start date of the hurricane in each State.[b,c]

Supplemental sources included population denominator data for use with HCUP databases, derived from information available from Claritas, a vendor that produces population estimates and projections based on data from the U.S. Census Bureau.[d]

[a] Federal Emergency Management Agency. Disasters. www.fema.gov/disasters. Accessed June 20, 2019.
[b] National Oceanic and Atmospheric Administration. Storm Events Database. www.ncdc.noaa.gov/stormevents/ftp.jsp. Accessed February 19, 2018.
[c] National Oceanic and Atmospheric Administration. Best Track Data (HURDAT2). www.nhc.noaa.gov/data/#hurdat. Accessed May 1, 2018. www.nhc.noaa.gov/data/hurdat/hurdat2-1851-2017-050118.txt. Accessed April 9, 2018.
[d] Claritas. Claritas Demographic Profile by ZIP Code. https://claritas360.claritas.com/mybestsegments/. Accessed January 4, 2019.

Definitions

Diagnoses, ICD-9-CM, and ICD-10-CM
For emergency department (ED) visits that are treated and released, the *first-listed diagnosis* represents the condition, symptom, or problem identified in the medical record to be chiefly responsible for the ED services provided. In cases where the first-listed diagnosis is a symptom or problem, a diagnosis has not been established (confirmed) by the provider. For ED visits that result in an inpatient admission, the first-listed diagnosis is the *principal diagnosis*, the condition established after study to be chiefly responsible for the patient's admission to the hospital. *Secondary diagnoses* are conditions that coexist at the time of the ED visit or inpatient admission, that require or affect patient care treatment received or management, or that develop during the inpatient stay. *All-listed diagnoses* include the first-listed (principal) diagnosis plus the secondary conditions.

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

ICD-10-CM is the International Classification of Diseases, Tenth Revision, Clinical Modification. In October 2015, ICD-10-CM replaced the ICD-9-CM diagnosis coding system for most inpatient and outpatient medical encounters. There are over 70,000 ICD-10-CM diagnosis codes.

Case definition
In this Statistical Brief, injuries were identified using the principal diagnosis for ED visits resulting in admission and the first-listed diagnosis for treat-and-release ED visits. Injuries were defined based on the ICD-9-CM and ICD-10-CM diagnosis codes shown in Table 4. For six of the hurricanes, which occurred between 2005 and 2012 (Dennis through Sandy), injuries were identified using ICD-9-CM diagnosis codes. For Hurricane Matthew, which occurred in 2016, injuries were identified using ICD-10-CM diagnosis codes.

Table 4. ICD-9-CM and ICD-10-CM diagnosis codes defining injury

Clinical diagnosis code	Description
ICD-9-CM	
800–909.2, 909.4, 909.9	Fracture of skull, spine, trunk, upper limb, and lower limb; dislocation; sprains and strains of joints and adjacent muscles; intracranial injury, excluding those with skull fracture; internal injury of chest, abdomen, and pelvis; open wound of the head, neck, trunk, upper limb, and lower limb; injury to blood vessels; late effects of injury, poisonings, toxic effects, and other external causes, excluding those of complications of surgical and medical care and adverse effect of drugs, medicinal or biological substance
910–994.9	Superficial injury; contusion with intact skin surface; crushing injury; effects of foreign body entering through orifice; burns; injury to nerves and spinal cord; certain traumatic complications and unspecified injuries; poisoning by drugs, medicinals and biological substances; toxic effects of substances chiefly nonmedicinal as to source; other and unspecified effects of external causes
995.50–995.59	Child maltreatment syndrome
995.80–995.85	Adult maltreatment, unspecified; adult physical abuse; adult emotional/ psychological abuse; adult sexual abuse; adult neglect (nutritional); other adult abuse and neglect
ICD-10-CM	
S00 series	• Injuries to the head; neck; thorax; abdomen, lower back, lumbar spine, pelvis and external genitals; shoulder and upper arm; elbow and forearm; wrist, hand and fingers; hip and thigh; knee and lower leg; ankle and foot • Includes initial encounters, subsequent encounters, and sequela
T07–T34 series	• Injuries involving multiple body regions; injury of unspecified body region; effects of foreign body entering through natural orifice; burns and corrosions of external body surface, specified by site; burns and corrosions confined to eye

Clinical diagnosis code	Description
	and internal organs; burns and corrosions of multiple and unspecified body regions; frostbite • Includes initial encounters, subsequent encounters, and sequela
T36–T50 series	• Poisoning by, adverse effect of and underdosing of drugs, medicaments, and biological substances • Includes only codes with a 6th character of 1, 2, 3, or 4 indicating poisoning • Excludes adverse effects and underdosing of drugs, medicaments and biological substances (codes with the 6th character of 5 or 6 with the following exceptions: T36.9, T37.9, T39.9, T41.4, T42.7, T43.9, T45.9, T47.9, and T49.9 with a 5th character of 1, 2, 3, or 4) • Includes initial encounters, subsequent encounters, and sequela
T51–T76 series	• Toxic effects of substances chiefly nonmedicinal as to source; other and unspecified effects of external causes: radiation sickness, unspecified; effects of heat and light; hypothermia; other effects of reduced temperature; effects of air pressure and water pressure; asphyxiation; effects of other deprivation; adult and child abuse, neglect and other maltreatment, confirmed; other and unspecified effects of other external causes; adult and child abuse, neglect and other maltreatment, suspected • Includes initial encounters, subsequent encounters, and sequela
T79 series	• Certain early complications of trauma, not elsewhere classified • Includes initial encounters, subsequent encounters, and sequela

Abbreviations: ICD-9-CM, International Classification of Diseases, Ninth Revision, Clinical Modification; ICD-10-CM, International Classification of Diseases, Tenth Revision, Clinical Modification

Note: The injury definition used in this Statistical Brief is based on the current injury definition used by the Centers for Disease Control and Prevention (CDC) but does not include ICD-10-CM diagnosis codes O9A (obstetric injuries) or M97 and T84.04 (prosthetic injuries and complications of orthopedic devices).[e] These codes were not part of the CDC injury definition at the time the hurricane analyses that are reported in this Statistical Brief were conducted.

Types of hospitals included in HCUP State Inpatient Databases

This analysis used State Inpatient Databases (SID) for all types of hospitals, including community hospitals and long-term care facilities. Community hospitals are defined as short-term, non-Federal, general, and other hospitals, excluding hospital units of other institutions (e.g., prisons). Community hospitals include obstetrics and gynecology, otolaryngology, orthopedic, cancer, pediatric, public, and academic medical center hospitals. Long-term care facilities include rehabilitation, psychiatric, and alcoholism and chemical dependency hospitals.

Types of hospitals included in HCUP State Emergency Department Databases

This analysis used State Emergency Department Databases (SEDD) for all types of hospitals, including community hospitals and long-term care facilities with a hospital-owned emergency department. Community hospitals are defined as short-term, non-Federal, general, and other hospitals, excluding hospital units of other institutions (e.g., prisons). Community hospitals include specialty, pediatric, public, and academic medical center hospitals. Long-term care facilities include rehabilitation, psychiatric, and alcoholism and chemical dependency hospitals.

Treat-and-release ED visits and ED visits resulting in admission

Treat-and-release ED visits were defined as those ED visits in which patients were treated and then released from the ED; that is, patients were not admitted to the specific hospital associated with the ED. The majority of treat-and-release ED visits involved patients who were discharged home. A small number of treat-and-release ED visits involved patients who were transferred to another acute care facility, left against medical advice, were discharged to another type of long-term or intermediate care facility (nursing

[e] Hedegaard H, Johnson RL, Warner M, Chen L-H, Annest JL. Proposed Framework for Presenting Injury Data Using the International Classification of Disease Tenth Revision, Clinical Modification (ICD-10-CM) Diagnosis Codes. National Health Statistics Report #89. January 22, 2016. Centers for Disease Control and Prevention, National Center for Health Statistics. www.cdc.gov/nchs/data/nhsr/nhsr089.pdf. Accessed July 26, 2019.

home or psychiatric treatment facility), were referred to home health care, died, or were discharged alive but the destination was unknown.

ED visits resulting in admission were defined as those ED visits in which patients were admitted to the same hospital at which they were seen in the ED.

Unit of analysis
For *treat-and-release ED visits*, the unit of analysis is the ED visit, not a person or patient. This means that a person who is seen in the ED multiple times in 1 year will be counted each time as a separate visit to the ED. For *ED visits resulting in admission*, the unit of analysis is the hospital discharge (i.e., the hospital stay), not a person or patient. This means that a person who is admitted to the hospital multiple times in 1 year will be counted each time as a separate discharge from the hospital.

About HCUP

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

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

Alaska Department of Health and Social Services
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
Delaware Division of Public Health
District of Columbia Hospital Association
Florida Agency for Health Care Administration
Georgia Hospital Association
Hawaii Laulima Data Alliance
Hawaii University of Hawai'i at Hilo
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
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 State Department of Health
Nevada Department of Health and Human Services
New Hampshire Department of Health & Human Services
New Jersey Department of Health
New Mexico Department of Health
New York State Department of Health
North Carolina Department of Health and Human Services
North Dakota (data provided by the Minnesota Hospital Association)
Ohio Hospital Association
Oklahoma State Department of Health
Oregon Association of Hospitals and Health Systems
Oregon Office of Health Analytics
Pennsylvania Health Care Cost Containment Council
Rhode Island Department of Health
South Carolina Revenue and Fiscal Affairs Office
South Dakota Association of Healthcare Organizations
Tennessee Hospital Association
Texas Department of State Health Services
Utah Department of Health
Vermont Association of Hospitals and Health Systems
Virginia Health Information
Washington State Department of Health

Missouri Hospital Industry Data Institute
Montana Hospital Association
Nebraska Hospital Association
West Virginia Department of Health and Human Resources, West Virginia Health Care Authority
Wisconsin Department of Health Services
Wyoming Hospital Association

About the SID

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

About the SEDD

The HCUP State Emergency Department Databases (SEDD) include information from hospital-owned emergency departments (EDs) from data organizations participating in HCUP, translated into a uniform format to facilitate multistate comparisons and analyses. The SEDD capture the universe of records on ED visits in participating HCUP States that do not result in an admission to the same hospital (i.e., patients who are treated in the ED and then discharged, transferred to another hospital, left against medical advice, or died). The SEDD contain a core set of clinical and nonclinical information on all patients, including individuals covered by Medicare, Medicaid, or private insurance, as well as those whose stays were not expected to be covered by insurance. The SEDD can be used to investigate questions unique to one State, to compare data from two or more States, to conduct market-area variation analyses, and to identify State-specific trends in injury surveillance, emerging infections, and other conditions treated in the ED.

For More Information

For other information on emergency department visits and inpatient stays related to injuries, refer to the HCUP Statistical Briefs located at www.hcup-us.ahrq.gov/reports/statbriefs/sb_injuries.jsp and www.hcup-us.ahrq.gov/reports/statbriefs/sb_injurypoisoning.jsp.

For additional HCUP statistics, visit:

- HCUP Fast Stats at www.hcup-us.ahrq.gov/faststats/landing.jsp for easy access to the latest HCUP-based statistics for healthcare information topics. HCUP Fast Stats includes a topic specifically focused on hurricane impact on hospital use.
- HCUPnet, HCUP's interactive query system, at www.hcupnet.ahrq.gov/

For more information about HCUP, visit www.hcup-us.ahrq.gov/.

For a detailed description of HCUP and more information on the design of the State Inpatient Databases (SID) and State Emergency Department Databases (SEDD), please refer to the following database documentation:

Agency for Healthcare Research and Quality. Overview of the State Inpatient Databases (SID). Healthcare Cost and Utilization Project (HCUP). Rockville, MD: Agency for Healthcare Research and Quality. Updated November 2019. www.hcup-us.ahrq.gov/sidoverview.jsp. Accessed February 3, 2020.

Agency for Healthcare Research and Quality. Overview of the State Emergency Department Databases (SEDD). Healthcare Cost and Utilization Project (HCUP). Rockville, MD: Agency for Healthcare Research and Quality. Updated January 2020. www.hcup-us.ahrq.gov/seddoverview.jsp. Accessed February 3, 2020.

For a more detailed description of the study that supported the analyses used in this HCUP Statistical Brief, please see:

- Heslin KC, Barrett ML, Hensche M, Pickens G, Ringel JS, Karaca Z, Owens PL. Effects of hurricanes on emergency department utilization: an analysis across 7 U.S. storms. Disaster Medicine and Public Health Preparedness. First View published October 7, 2020. https://doi.org/10.1017/dmp.2020.281.

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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 healthcare 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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