



Emergency Department Visits  
for Diagnoses Directly Indicating Heat Exposure:  
Variation Across Counties in the United States, 2016–2020

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## OVERVIEW

With climate change, there has been an increase in the number and intensity of climate-related events, such as heat waves, wildfires, hurricanes, droughts, flooding, and poor air quality. These climate-related events have a significant impact on the physical and behavioral health and well-being of individuals, and they place increased demands on healthcare systems.<sup>1-5</sup> Recently, more than 200 medical journals issued a joint statement calling for emergency action on climate change, including a data-driven approach to understanding the optimal public health response to climate change.<sup>6</sup>

Climate change is expected to continue, with an increase in the frequency, severity, and duration of heat waves in the coming decades.<sup>7</sup> Heat-related conditions can occur when someone is exposed to high temperatures and his or her body is unable to cool itself sufficiently through sweating. Symptoms can range from mild rashes, swelling, and cramps to potentially fatal heat stroke and heat exhaustion.<sup>8</sup> Heat is responsible for more fatalities than all other types of weather events in the United States.<sup>9</sup> According to the Centers for Disease Control and Prevention (CDC), an average of 702 heat-related deaths (i.e., deaths with heat as the underlying cause or a contributing cause as listed on the death certificate) occur each year.<sup>10</sup> Moreover, mortality studies focused on estimates of excess deaths have suggested that the number of annual deaths attributable to heat may range between 5,600 and 12,000 across the United States, with population rates of excess deaths varying substantially by region and county.<sup>11,12</sup> Additionally, the CDC reports that about 67,500 emergency department (ED) visits each year are due to heat and more than 9,200 people are hospitalized due to heat.<sup>13</sup> A recent, more detailed study shows that the relationship between the heat index and cause-specific hospitalizations varies widely by geographic region.<sup>14</sup>

Understanding geographic variation in ED utilization for diagnoses directly indicating heat exposure can help inform policy and target prevention efforts, such as heat alert protocols and action plans, changes to the built environment, and public education programs.<sup>15</sup> This report uses the [Healthcare Cost and Utilization Project \(HCUP\) 2016–2020 State Emergency Department Databases \(SEDD\)](#) and [State Inpatient Databases \(SID\)](#) and is presented in two parts. Part I provides the population-based rates of ED visits due to diagnoses directly indicating heat exposure for residents of counties across 39 States and the District of Columbia. Part II focuses the analysis on U.S. counties that include Tribal lands.

## PART I: COUNTIES IN 39 STATES AND THE DISTRICT OF COLUMBIA

### Methods

County- and State-level population rates of ED visits with a diagnosis directly indicating heat exposure were derived from the HCUP 2016–2020 SEDD and SID. The SEDD capture information on treat-and-release ED visits that do not result in an admission (i.e., encounters for patients who were treated in the ED and then released from the ED, transferred to another hospital or health facility, left against medical advice, or died being treated in the ED). The SID contain information on patients seen in the ED and admitted to the hospital. Appendix A lists the HCUP Partner organizations. Appendix B provides background on the HCUP databases.

This analysis was limited to records of ED visits, regardless of hospital admission, at community hospitals, excluding rehabilitation and long-term acute care facilities, with any-listed diagnosis directly indicating heat exposure. **Diagnoses include those for heat-related syncope, cramps, exhaustion, fatigue, and edema, in addition to effects of heat and light and exposure to excessive natural heat and sunlight (Appendix C).** In 2019, there were about 80,000 ED visits with a diagnosis directly indicating heat exposure across 39 States and the District of Columbia. Because case identification is based on an explicit diagnosis code indicating heat exposure that often can be treated in the outpatient setting, the population rates of ED visits reflected in this brief are conservative, representing only a fraction of all heat-related ED visits and a fraction of all outpatient (e.g., primary care, urgent care, ED) visits related to heat exposure.

Counts of ED visits are summarized by the *patient's* county and State of residence, with one exception. In the cases in which people are exposed to heat while away from home (defined as the patient receiving care outside of their state of residence and more than 100 miles away from their ZIP code of residence), the encounter is counted in the *hospital's* county and State.<sup>a</sup> Based on 2019 HCUP data, almost 90 percent of ED visits with a diagnosis directly indicating heat exposure are treated within 50 miles of the patient's residence. Because the HCUP databases are state specific, the ED encounters were combined across States and then reallocated by patient or hospital county and State, as appropriate, within a data year.

The urban-rural classification scheme for U.S. counties developed by the National Center for Health Statistics is used to identify counties as one of the following:

- Large metro including counties in metropolitan service areas (MSAs) with 1 million or more residents.
- Medium and small metro including counties in MSAs with less than 1 million residents.
- Micropolitan including counties in micropolitan service areas of 10,000–49,999 residents
- Rural including counties not in a metropolitan or micropolitan service area.<sup>16</sup>

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<sup>a</sup> Note: Due to border crossing, ED encounters are not counted if the patient was treated in a State for which data are unavailable.

This analysis includes ED data from 2,550 counties in 39 States and the District of Columbia, representing 85 percent of the population and 81 percent of all counties in the United States in 2019.

**Table 1. Distribution of the Resident Population by Urban-Rural Classification of Counties, 2019**

Urban-Rural Classification of Counties	Total in the U.S., 2019			Represented in this Analysis, 2019		
	Number of Counties	Total Population	Mean of County Population	Number of Counties (Percent)	Total Population (Percent)	Mean of County Population
Large metro	436	183,510,068	420,895	344 (78.9%)	161,571,662 (88.0%)	469,685
Medium and small metro	730	98,746,811	135,270	556 (76.2%)	79,076,839 (80.1%)	142,225
Micropolitan	641	27,304,537	42,597	528 (82.4%)	21,901,003 (80.2%)	41,479
Rural	1,337	18,777,932	14,045	1,122 (83.9%)	15,262,566 (81.3%)	13,603
All counties	3,144	328,339,348	104,434	2,550 (81.1%)	277,812,070 (84.6%)	108,946

Source: Annual Resident Population Estimates for States and Counties: April 1, 2010 to July 1, 2020 (CC-EST2020-ALL), U.S. Census Bureau. Release Date: May 2021. Accessed March 12, 2022.

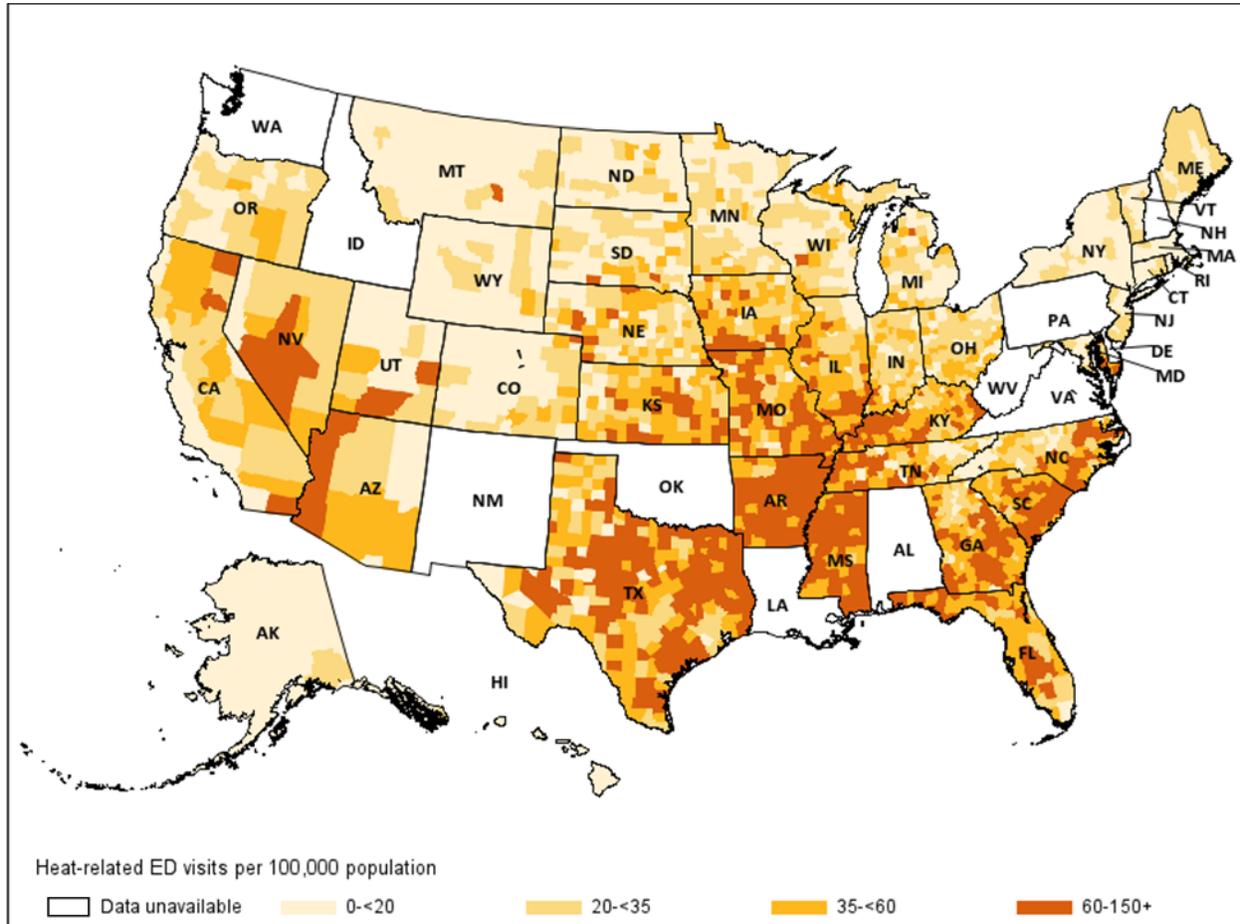
Population rates of ED visits were calculated using the HCUP data (numerator) and estimates of the annual resident population available from the U.S. Census Bureau (denominator).<sup>17</sup> Quartiles for displaying the population rates of ED visits with a diagnosis directly indicating heat exposure were derived using the 2,550 counties with at least one ED visit in the 2016–2019 SEDD and SID (0-<20, 20-<35, 35-<60, and 60-150+ per 100,000 population). Sensitivity analysis to determine if higher population rates are due to small numerators (defined as less than 10 heat-related ED visits) shows the following distribution of counties with small numerators: 46.1 percent in the first (lowest) quartile, 32.1 percent in the second quartile, 16.2 percent in the third quartile, and 5.6 percent in the fourth (highest) quartile. The same criteria are applied to an analysis of 2020 data that are currently available.

## Results

### *County-Level Information on Emergency Department Visits with a Diagnosis Directly Indicating Heat Exposure per 100,000 Population, 2016–2019*

Figures 1 and 2 display the county-level population rates of ED visits with a diagnosis directly indicating heat exposure per 100,000 population by the years 2016–2019 combined and then individually.

**Figure 1. Emergency Department Visits with a Diagnosis Directly Indicating Heat Exposure per 100,000 Population, 2016–2019**

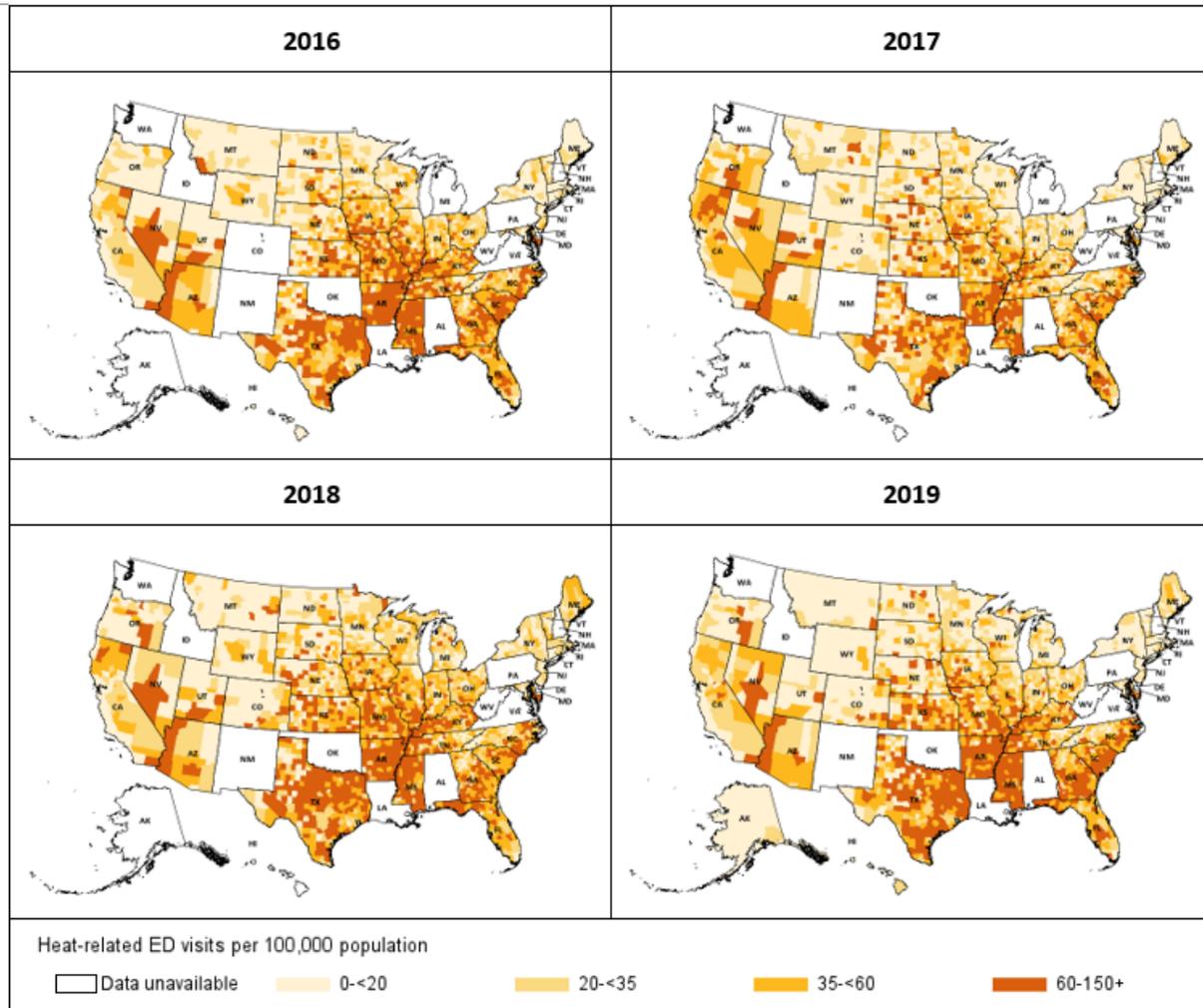


Source: Agency for Healthcare Research and Quality (AHRQ), Healthcare Cost and Utilization Project (HCUP), State Emergency Department Databases (SEDD) and State Inpatient Databases (SID), 2016–2019

Abbreviation: ED, emergency department

Notes: Quartiles for the population rates of ED visits with a diagnosis directly indicating heat exposure were derived using the 2,550 counties with at least one ED visit in the 2016–2019 SEDD and SID. Diagnoses directly indicating heat exposure include heat-related syncope, cramps, exhaustion, fatigue, and edema, in addition to effects of heat and light and exposure to excessive natural heat and sunlight.

**Figure 2. Emergency Department Visits with a Diagnosis Directly Indicating Heat Exposure per 100,000 Population by Year, 2016–2019**



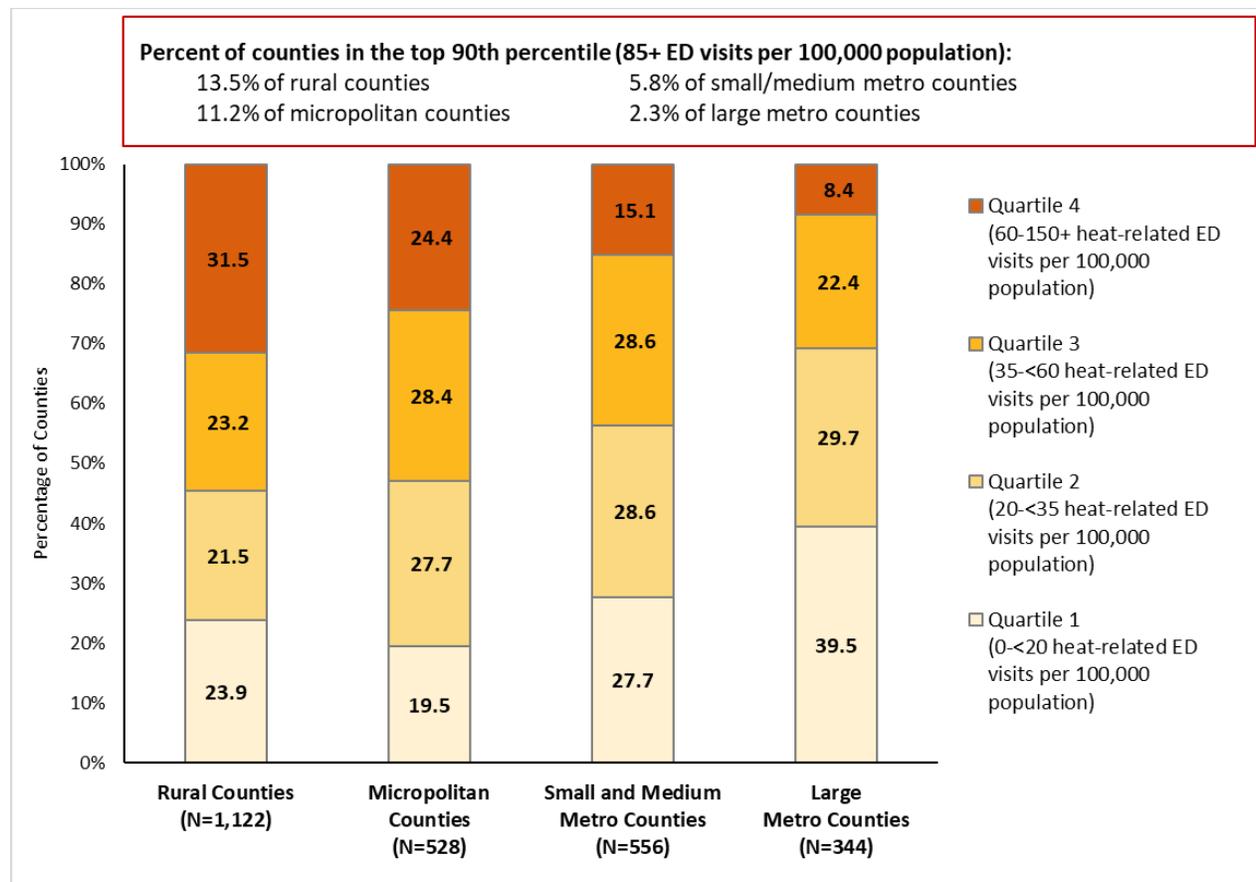
Source: Agency for Healthcare Research and Quality (AHRQ), Healthcare Cost and Utilization Project (HCUP), State Emergency Department Databases (SEDD) and State Inpatient Databases (SID), 2016–2019

Abbreviation: ED, emergency department

Notes: Quartiles for the population rates of ED visits with a diagnosis directly indicating heat exposure were derived using the 2,550 counties with at least one ED visit in the 2016–2019 SEDD and SID. Diagnoses directly indicating heat exposure include heat-related syncope, cramps, exhaustion, fatigue, and edema, in addition to effects of heat and light and exposure to excessive natural heat and sunlight.

The average population of counties in 2019 with the highest heat-related population rate of ED visits (quartile 4) was 34,322 residents (rural: 14,484; micropolitan: 36,004; small/medium metro: 90,799; large: 67,827). In contrast, the average population of counties with lowest heat-related population rate of ED visits (quartile 1) was 161,428 residents (rural: 10,589; micropolitan: 41,742; small/medium metro: 165,327; large metro: 671,159).

**Figure 3. Distribution of Counties by the Population Rate of Emergency Department Visits with a Diagnosis Directly Indicating Heat Exposure per 100,000 Population, by Urban-Rural Location, 2016–2019**



Source: Agency for Healthcare Research and Quality (AHRQ), Healthcare Cost and Utilization Project (HCUP), State Emergency Department Databases (SEDD) and State Inpatient Databases (SID), 2016–2019

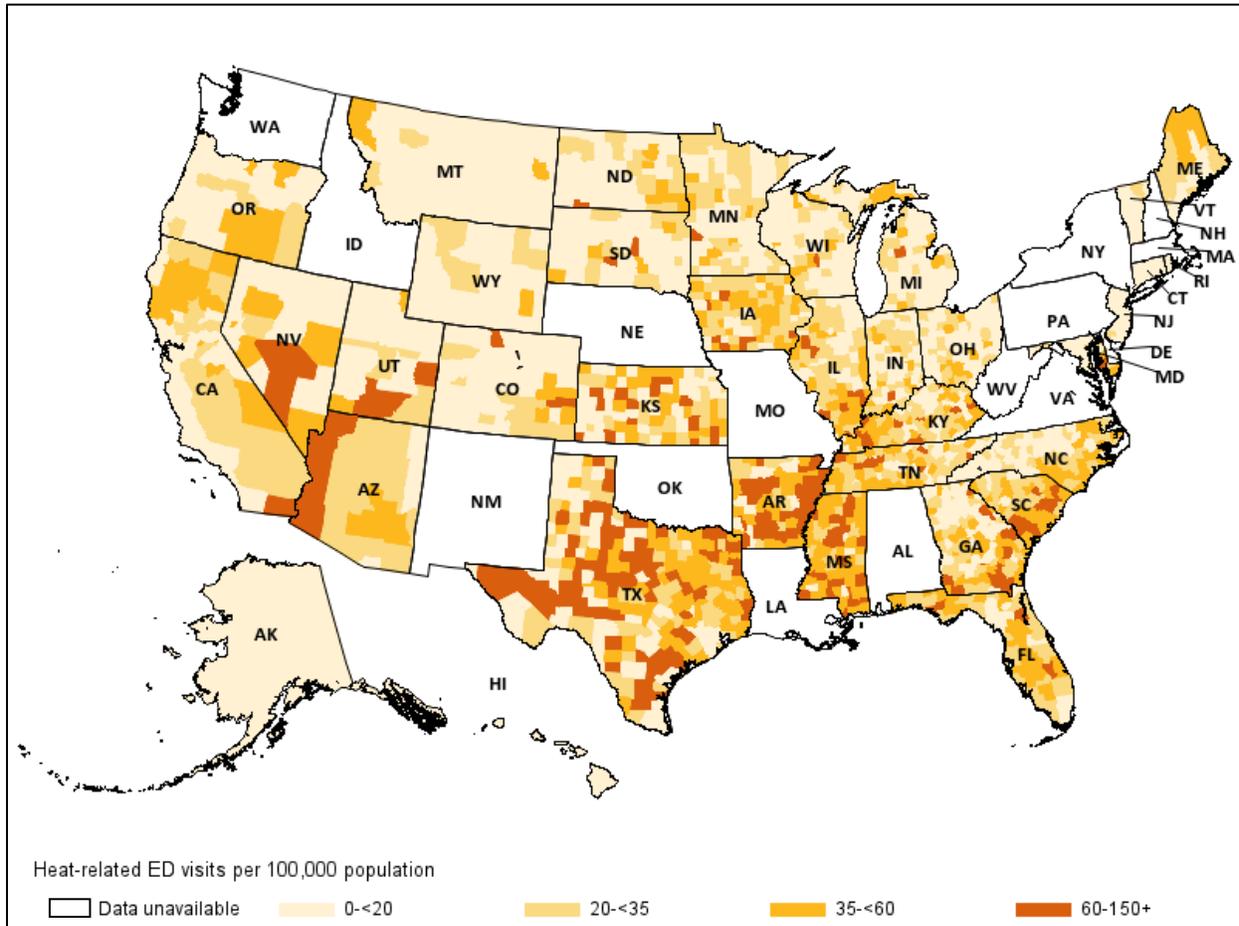
Abbreviation: ED, emergency department

Notes: Quartiles for the population rates of ED visits with a diagnosis directly indicating heat exposure were derived using the 2,550 counties with at least one ED visit in the 2016–2019 SEDD and SID. Diagnoses directly indicating heat exposure include heat-related syncope, cramps, exhaustion, fatigue, and edema, in addition to effects of heat and light and exposure to excessive natural heat and sunlight.

*County-Level Map of Emergency Department Visits with a Diagnosis Directly Indicating Heat Exposure per 100,000 Population, 2020*

Figure 4 shows the 2020 population rates of ED visits with a diagnosis directly indicating heat exposure per 100,000 population. Because of the COVID-19 pandemic, ED visits overall in 2020 were much lower than in prior years.

**Figure 4. Emergency Department Visits with a Diagnosis Directly Indicating Heat Exposure per 100,000 Population, 2020**



Source: Agency for Healthcare Research and Quality (AHRQ), Healthcare Cost and Utilization Project (HCUP), State Emergency Department Databases (SEDD) and State Inpatient Databases (SID), 2020

Abbreviation: ED, emergency department

Notes: Quartiles for the population rates of ED visits with a diagnosis directly indicating heat exposure were derived using the 2,550 counties with at least one ED visit in the 2016–2019 SEDD and SID. Diagnoses directly indicating heat exposure include heat-related syncope, cramps, exhaustion, fatigue, and edema, in addition to effects of heat and light and exposure to excessive natural heat and sunlight.

*State-Level Rates of Emergency Department Visits with a Diagnosis Directly Indicating Heat Exposure per 100,000 Population*

Table 2 presents State-level rates (and associated rank) of ED visits with a diagnosis directly indicating heat exposure per 100,000 population for 2016–2019. Table 3 provides similar information for 2020.

**Table 2. Emergency Department Visits with a Diagnosis Directly Indicating Heat Exposure per 100,000 Population by Patient State of Residence, 2016–2019**

Rate of ED Visits with a Diagnosis Directly Indicating Heat Exposure Based on Healthcare Cost and Utilization Project State Emergency Department Databases (SEDD) and State Inpatient Databases (SID)								
Year	2016		2017		2018		2019	
State	Rate <sup>a</sup>	Rank <sup>b</sup>						
Alabama	c		c		c		c	
Alaska	c		c		c		8.5	40
Arizona	46.9	6	44.7	4	47.3	6	42.5	8
Arkansas	83.1	2	58.6	2	77.6	2	78.8	2
California	15.8	28	23.0	16	18.0	29	16.6	24
Colorado	c		9.7	36	12.5	37	11.2	36
Connecticut	14.9	31	12.4	31	18.9	26	16.2	26
Delaware	c		c		c		c	
District of Columbia	27.2	17	17.8	19	17.8	30	19.1	21
Florida	37.8	12	38.2	7	35.0	12	39.2	11
Georgia	36.9	13	28.9	13	33.3	13	41.4	9
Hawaii	9.0	37	c		c		12.9	32
Idaho	c		c		c		c	
Illinois	24.0	21	16.5	24	26.3	20	20.0	19
Indiana	28.8	16	20.8	17	31.6	15	25.0	16
Iowa	39.6	9	31.6	11	39.3	11	32.7	13
Kansas	42.1	7	30.8	12	41.8	9	40.8	10
Kentucky	52.2	5	34.5	8	51.9	4	47.2	4
Louisiana	c		c		c		c	
Maine	15.6	29	17.1	22	27.2	18	19.3	20
Maryland	26.1	18	17.4	20	25.4	21	22.6	18
Massachusetts	13.1	33	11.0	35	17.2	31	12.8	33
Michigan	c		c		18.9	27	13.6	31
Minnesota	15.9	27	13.1	29	19.2	25	14.1	30
Mississippi	88.4	1	64.4	1	84.9	1	94.8	1
Missouri	58.4	4	40.0	6	55.5	3	46.5	5
Montana	12.8	34	17.3	21	11.1	38	10.7	37
Nebraska	28.9	15	25.6	15	27.4	17	27.8	15
Nevada	38.1	11	41.3	5	40.5	10	36.0	12
New Hampshire	c		c		c		c	

Rate of ED Visits with a Diagnosis Directly Indicating Heat Exposure Based on Healthcare Cost and Utilization Project State Emergency Department Databases (SEDD) and State Inpatient Databases (SID)								
Year	2016		2017		2018		2019	
State	Rate <sup>a</sup>	Rank <sup>b</sup>						
New Jersey	17.8	25	11.5	33	16.3	33	15.4	28
New Mexico	c		c		c		c	
New York	11.4	36	7.9	37	13.5	36	10.5	38
North Carolina	36.5	14	25.8	14	32.3	14	32.7	14
North Dakota	17.7	26	13.0	30	20.1	24	15.6	27
Ohio	25.5	19	16.2	25	27.8	16	22.7	17
Oklahoma	c		c		c		c	
Oregon	13.9	32	20.1	18	16.8	32	12.6	35
Pennsylvania	c		c		c		c	
Rhode Island	18.8	24	11.6	32	18.0	28	16.7	23
South Carolina	63.6	3	49.5	3	51.8	5	57.2	3
South Dakota	24.9	20	17.1	23	21.8	23	18.1	22
Tennessee	41.9	8	32.2	10	43.1	7	44.1	7
Texas	39.6	10	32.4	9	42.9	8	45.8	6
Utah	15.4	30	15.3	26	14.9	34	12.8	34
Vermont	22.4	22	13.8	27	26.4	19	14.3	29
Virginia	c		c		c		c	
Washington	c		c		c		c	
West Virginia	c		c		c		c	
Wisconsin	19.9	23	13.4	28	23.5	22	16.3	25
Wyoming	12.1	35	11.4	34	14.0	35	9.3	39

Source: Agency for Healthcare Research and Quality (AHRQ), Healthcare Cost and Utilization Project (HCUP), State Emergency Department Databases (SEDD) and State Inpatient Databases (SID), 2016–2019

Abbreviation: ED, emergency department

Notes: Cells within the table are coded based on the distribution of the State-specific heat-related population rates in 2019: the first quartile (lightest yellow) includes rates from 0–<15, second quartile (yellow) includes rates from 15–<20, third quartile (orange) includes rates from 20–<40, and fourth quartile (red) includes rates ≥40.

<sup>a</sup> Rate of ED visits with a diagnosis directly indicating heat exposure per 100,000 population. Diagnoses directly indicating heat exposure include heat-related syncope, cramps, exhaustion, fatigue, and edema, in addition to effects of heat and light and exposure to excessive natural heat and sunlight.

<sup>b</sup> Rank of the population rate within year

<sup>c</sup> No HCUP data are available for this State and year combination.

**Table 3. Emergency Department Visits with a Diagnosis Directly Indicating Heat Exposure per 100,000 Population by Patient State of Residence, 2020**

Rate of ED Visits with a Diagnosis Directly Indicating Heat Exposure Based on Healthcare Cost and Utilization Project State Emergency Department Databases (SEDD) and State Inpatient Databases (SID)					
2020					
State	Rate <sup>a</sup>	Rank <sup>b</sup>	State	Rate <sup>a</sup>	Rank <sup>b</sup>
Alabama	c		Montana	9.3	32
Alaska	1.6	36	Nebraska	c	
Arizona	37.3	4	Nevada	40.8	3
Arkansas	45.7	2	New Hampshire	c	
California	15.2	18	New Jersey	9.4	31
Colorado	8.1	33	New Mexico	c	
Connecticut	9.8	30	New York	c	
Delaware	c		North Carolina	20.1	12
District of Columbia	12.6	24	North Dakota	18.2	14
Florida	27.2	9	Ohio	15.4	17
Georgia	20.1	13	Oklahoma	c	
Hawaii	7.3	34	Oregon	10.7	29
Idaho	c		Pennsylvania	c	
Illinois	13.9	22	Rhode Island	6.8	35
Indiana	16.6	16	South Carolina	33.9	5
Iowa	29.0	6	South Dakota	14.2	20
Kansas	27.4	8	Tennessee	26.9	11
Kentucky	28.8	7	Texas	27.0	10
Louisiana	c		Utah	13.1	23
Maine	17.9	15	Vermont	10.7	28
Maryland	14.3	19	Virginia	c	
Massachusetts	c		Washington	c	
Michigan	11.6	26	West Virginia	c	
Minnesota	12.6	25	Wisconsin	14.0	21
Mississippi	48.3	1	Wyoming	11.3	27
Missouri	c				

Source: Agency for Healthcare Research and Quality (AHRQ), Healthcare Cost and Utilization Project (HCUP), State Emergency Department Databases (SEDD) and State Inpatient Databases (SID), 2020

Abbreviation: ED, emergency department

Notes: Cells within the table are coded based on the distribution of the State-specific heat-related population rates in 2019: the first quartile (lightest yellow) includes rates from 0–<15, second quartile (yellow) includes rates from 15–<20, third quartile (orange) includes rates from 20–<40, and fourth quartile (red) includes rates ≥40.

<sup>a</sup> Rate of ED visits with a diagnosis directly indicating heat exposure per 100,000 population. Diagnoses directly indicating heat exposure include heat-related syncope, cramps, exhaustion, fatigue, and edema, in addition to effects of heat and light and exposure to excessive natural heat and sunlight.

<sup>b</sup> Rank of the population rate within year

<sup>c</sup> No HCUP data are available for this State and year combination.

## PART II: TRIBAL LANDS

### Methods

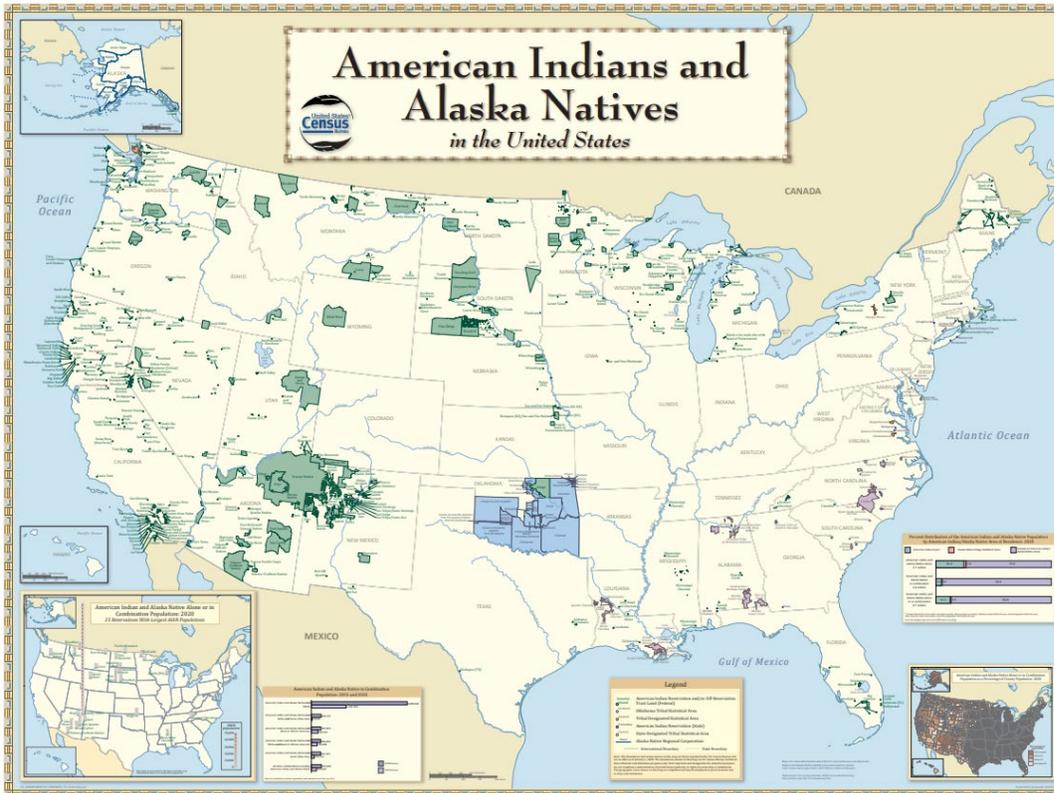
The following provides population rates of ED visits in Tribal lands with a diagnosis directly indicating heat exposure. Tribal lands include American Indian Reservations, Off-Reservation Trust Land, Tribal Statistical Entity, and Hawaiian home lands. This analysis used the U.S. Census Bureau Definition of American Indian, Alaska Native, and Native Hawaiian Areas (AIANNHAs) to identify these geographic areas.<sup>17</sup> Tribal lands often cross U.S. State and county borders (Figure 5a). For example, the Ute Mountain reservation expands across portions of four unique counties in three different states, Colorado, New Mexico, and Utah. For this analysis we needed to define the Tribal areas by FIPS county because the HCUP SEDD and SID include the FIPS State and county code of patient's residence. The U.S. Board on Geographic Names provides a data file (National Federal Codes)<sup>18</sup> that identifies Tribal lands as defined by the Census with the FIPScodes for which counties intersect with AIANNH areas. Because we used county to designate Tribal areas, the identified regions in blue in Figure 5b are much larger than the specific Tribal lands in Figure 5a.

It is possible that more than one Tribal land can be present in the same county. For this analysis, Tribal areas that shared counties were combined into one reporting unit. As an example, the Ute Mountain Reservation (spanning 4 counties) and Southern Ute Reservation (spanning 3 counties) are both part of La Plata County, CO, and therefore are combined into a Tribal area with 6 counties represented by one single calculated rate of heat-related ED visits. With these aggregated rates, we lose information and thus present an approximation with less specificity.

Rates were estimated from the HCUP 2016-2020 SEDD and SID. The methods to derive rates were consistent with those outlined in Part I. As noted previously, rates were based on county of residence. This same clinical definition of heat-related illness was used in Part I and Part II. The rates are divided into quartiles based on the distribution of counties used in Part I (0-20, 20-<35, 35-<60, 60-150+ per 100,000 population).

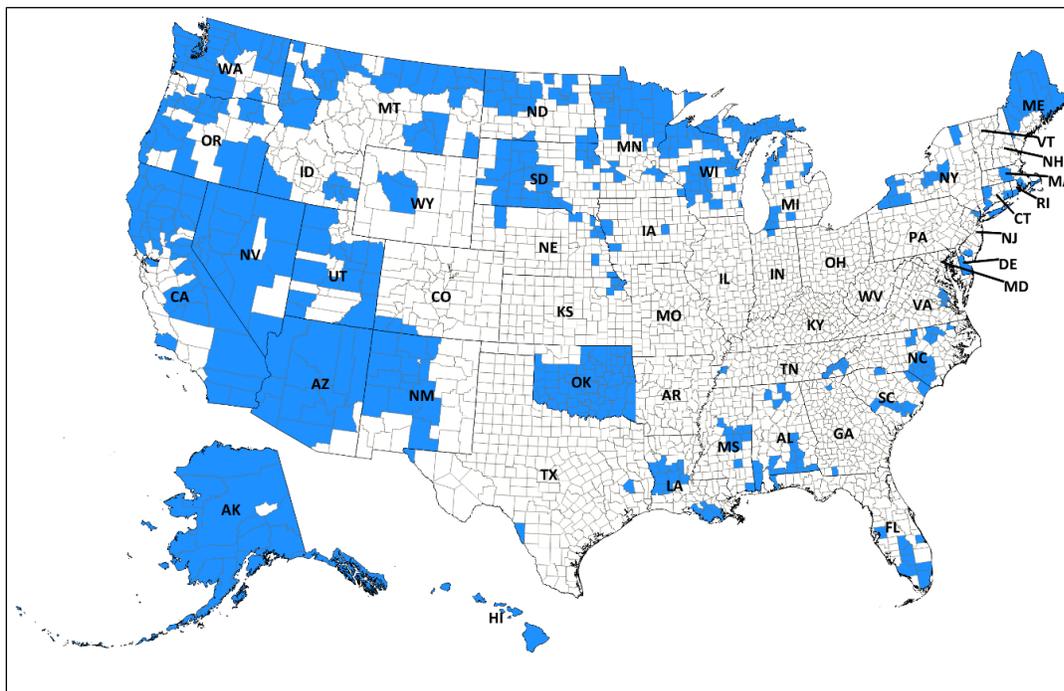
Information on outpatient clinic visits, including urgent care facilities and visits to Indian Health Service facilities, are not included in the SEDD and SID and therefore, are not part of the calculated rates. In addition, several states with Tribal areas (Washington, Oklahoma, New Mexico, Louisiana and Virginia) do not provide ED data to HCUP. These five states in addition to two states that do not provide any hospital data to HCUP (Idaho and Alabama) are therefore not represented in this analysis.

Figure 5a. American Indian and Alaska Native Tribal Lands in the United States



Source: U.S. Census Bureau. [2010 American Indians and Alaska Natives in the United States Map](#). Online. Accessed November 12, 2022.

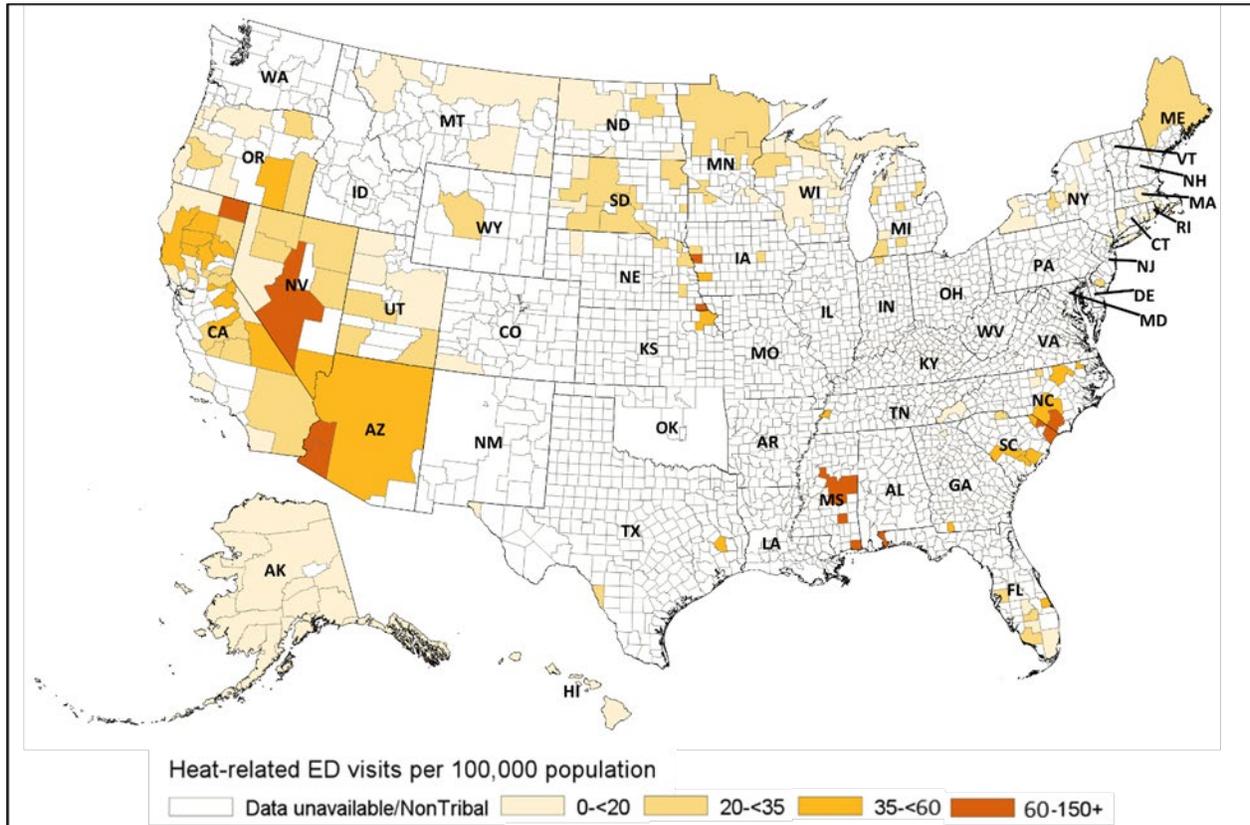
Figure 5b. Tribal Lands as Identified by U.S. State and County FIPS Codes



## Results

The Figures below include maps providing population rates of ED visits with a diagnosis directly indicating heat exposure per 100,000 population across all five years 2016-2020 (Figure 6) as well as by each individual year (Figure 7).

**Figure 6. Emergency Department Visits with a Diagnosis Directly Indicating Heat Exposure per 100,000 Population in Counties Associated with Tribal Lands, 2016–2020**

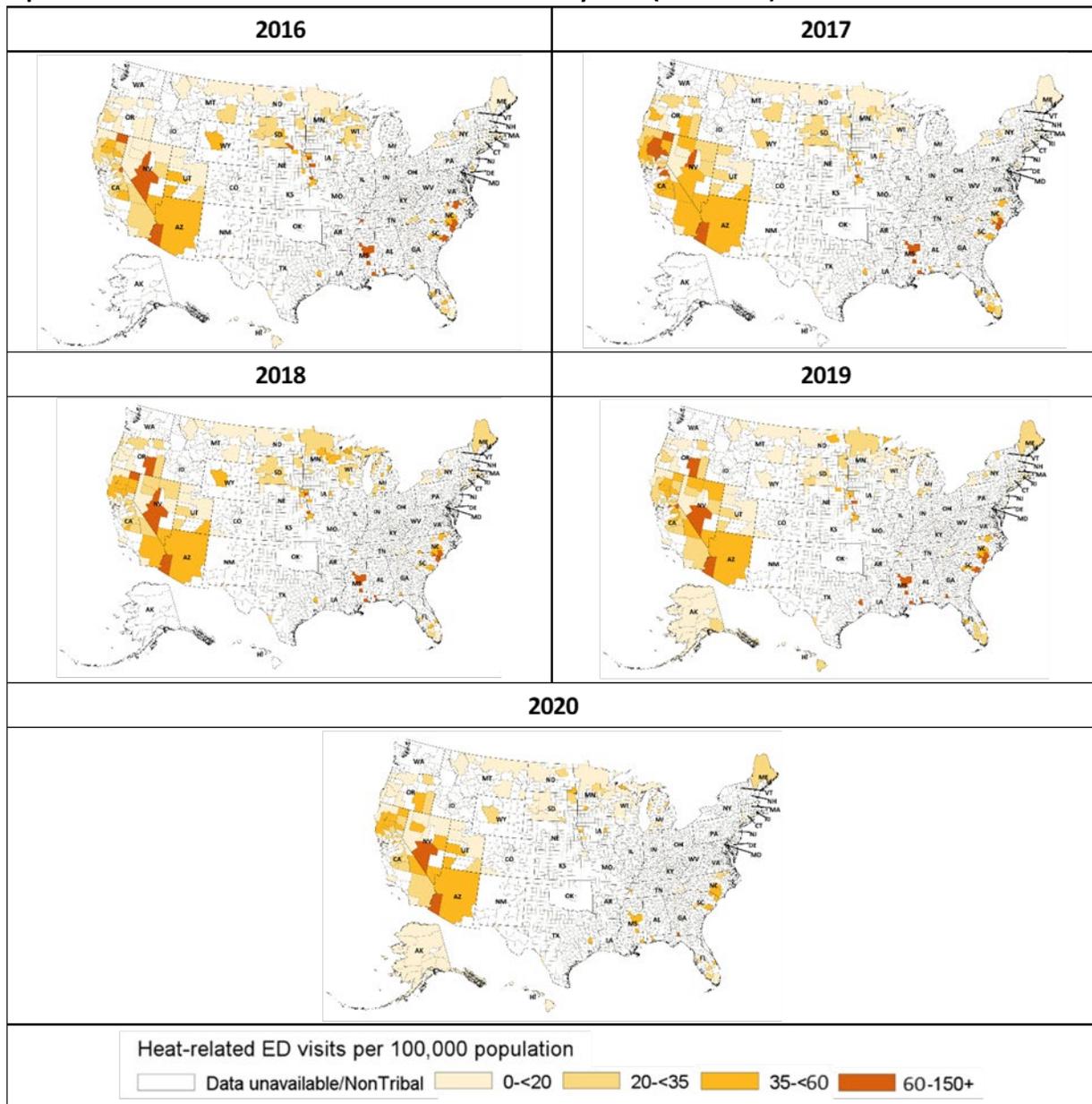


Source: Agency for Healthcare Research and Quality (AHRQ), Healthcare Cost and Utilization Project (HCUP), State Emergency Department Databases (SEDD) and State Inpatient Databases (SID), 2020

Abbreviation: ED, emergency department

Notes: Quartiles for the population rates of ED visits with a diagnosis directly indicating heat exposure were derived using national data on ED visit in the 2016–2019 SEDD and SID. Because we used county to designate Tribal lands, the identified areas are much larger than the specific Tribal lands. Diagnoses directly indicating heat exposure include heat-related syncope, cramps, exhaustion, fatigue, and edema, in addition to effects of heat and light and exposure to excessive natural heat and sunlight.

**Figure 7. Emergency Department Visits with a Diagnosis Directly Indicating Heat Exposure per 100,000 Population in Counties Associated with Tribal Lands by Year (2016-2020)**



Source: Agency for Healthcare Research and Quality (AHRQ), Healthcare Cost and Utilization Project (HCUP), State Emergency Department Databases (SEDD) and State Inpatient Databases (SID), 2020

Abbreviation: ED, emergency department

Notes: Quartiles for the population rates of ED visits with a diagnosis directly indicating heat exposure were derived using national data on ED visit in the 2016–2019 SEDD and SID. Because we used county to designate Tribal lands, the identified areas are much larger than the specific Tribal lands. Diagnoses directly indicating heat exposure include heat-related syncope, cramps, exhaustion, fatigue, and edema, in addition to effects of heat and light and exposure to excessive natural heat and sunlight.

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## APPENDIX A. HCUP PARTNER ORGANIZATIONS

**Alaska** Department of Health  
**Alaska** Hospital and Healthcare Association  
**Arizona** Department of Health Services  
**Arkansas** Department of Health  
**California** Department of Health Care Access and Information  
**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 Hawaii 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 (provides data for Minnesota and North Dakota)  
**Mississippi** State Department of Health  
**Missouri** Hospital Industry Data Institute  
**Montana** Hospital Association  
**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  
**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** Health Authority  
**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  
**West Virginia** Department of Health and Human Resources  
**Wisconsin** Department of Health Services  
**Wyoming** Hospital Association

## APPENDIX B. HEALTHCARE COST AND UTILIZATION PROJECT (HCUP) DATABASES

The Healthcare Cost and Utilization Project (HCUP) 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.

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 capture information on all types of inpatient discharges, including those admitted through the ED of the hospital, direct admissions, and transfers from acute care hospitals and other types of health facilities. Researchers and policymakers use the SID to investigate questions related to inpatient care unique to one or more States, to conduct market area research or small variation analyses, and to identify State-specific trends.

The HCUP **State Emergency Department Databases (SEDD)** include information from hospital-owned EDs from data organizations that provide ED data to HCUP, translated into a uniform format to facilitate multistate comparisons and analyses. The SEDD capture information on ED visits that do not result in an admission to the same hospital (i.e., encounters for patients who are treated in the ED and then discharged, are transferred to another hospital or health facility, left against medical advice, or died receiving treatment in the ED). Researchers and policymakers use the SEDD to investigate questions related to ED care unique to one or more States, to conduct market area research or small variation analyses, and to identify State-specific trends.

The HCUP databases contain more than 100 clinical and nonclinical data elements included in an ED visit or hospital discharge abstract, such as the following:

- First-listed/principal and secondary diagnoses and procedures
- Admission type and discharge status
- Patient demographic characteristics (e.g., sex, age, and, for some States, race and ethnicity)
- Expected payment source
- Total charges
- Length of stay

More information is available on the HCUP User Support website ([www.hcup-us.ahrq.gov/](http://www.hcup-us.ahrq.gov/)).

## APPENDIX C. ICD-10-CM CODES INDICATING HEAT EXPOSURE

Diagnoses directly indicating heat exposure were identified by any of the codes listed in Table C.1 as a first-listed or secondary diagnosis on the hospital record.

**Table C.1. Coding Criteria for Diagnoses Directly Indicating Heat Exposure**

ICD-10-CM Code	ICD-10-CM Code Description
T671XXA	Heat syncope, initial encounter
T671XXD	Heat syncope, subsequent encounter
T671XXS	Heat syncope, sequela
T672XXA	Heat cramp, initial encounter
T672XXD	Heat cramp, subsequent encounter
T672XXS	Heat cramp, sequela
T673XXA	Heat exhaustion, anhydrotic, initial encounter
T673XXD	Heat exhaustion, anhydrotic, subsequent encounter
T673XXS	Heat exhaustion, anhydrotic, sequela
T674XXA	Heat exhaustion due to salt depletion, initial encounter
T674XXD	Heat exhaustion due to salt depletion, subsequent encounter
T674XXS	Heat exhaustion due to salt depletion, sequela
T675XXA	Heat exhaustion, unspecified, initial encounter
T675XXD	Heat exhaustion, unspecified, subsequent encounter
T675XXS	Heat exhaustion, unspecified, sequela
T676XXA	Heat fatigue, transient, initial encounter
T676XXD	Heat fatigue, transient, subsequent encounter
T676XXS	Heat fatigue, transient, sequela
T677XXA	Heat edema, initial encounter
T677XXD	Heat edema, subsequent encounter
T677XXS	Heat edema, sequela
T678XXA	Other effects of heat and light, initial encounter
T678XXD	Other effects of heat and light, subsequent encounter
T678XXS	Other effects of heat and light, sequela
T679XXA	Effect of heat and light, unspecified, initial encounter
T679XXD	Effect of heat and light, unspecified, subsequent encounter
T679XXS	Effect of heat and light, unspecified, sequela
X30XXXA	Exposure to excessive natural heat, initial encounter
X30XXXD	Exposure to excessive natural heat, subsequent encounter
X30XXXS	Exposure to excessive natural heat, sequela
X32XXXA	Exposure to sunlight, initial encounter
X32XXXD	Exposure to sunlight, subsequent encounter
X32XXXS	Exposure to sunlight, sequela

Abbreviation: ICD-10-CM: International Classification of Diseases, Tenth Revision, Clinical Modification