

# Maricopa County Heat Morbidity Report 2006 - 2017



## Contents

Introduction .....	2
Results.....	3
Morbidity by Year .....	3
Morbidity by Month and Temperature .....	4
Demographics .....	7
Visit Details .....	10
Patient History .....	11
Injury Characteristics .....	12
Substance Use .....	13
Appendix .....	14
Methodology.....	14
Tables .....	16

## Introduction

Maricopa County is one of the largest urban centers to experience the nation's most extreme heat. According to the Centers for Disease Control and Prevention, extreme environmental heat can cause the body's natural cooling mechanisms fail resulting in dangerously high core temperature which can damage vital organs, including the brain. Extreme heat can also exacerbate existing underlying health conditions. Environmental heat is especially dangerous when temperatures remain elevated through nighttime as the body is unable to recover from daytime heat.

The purpose of this report is to discover the demographics and characteristics of heat related illnesses as well as explain risk factors associated with heat related illness in order to prevent future heat related injuries. Cases were identified using hospital discharge data using a variety of ICD-9 and ICD-10 codes as well as key terms related to environmental heat. More information on methodology can be found in the [Appendix](#).

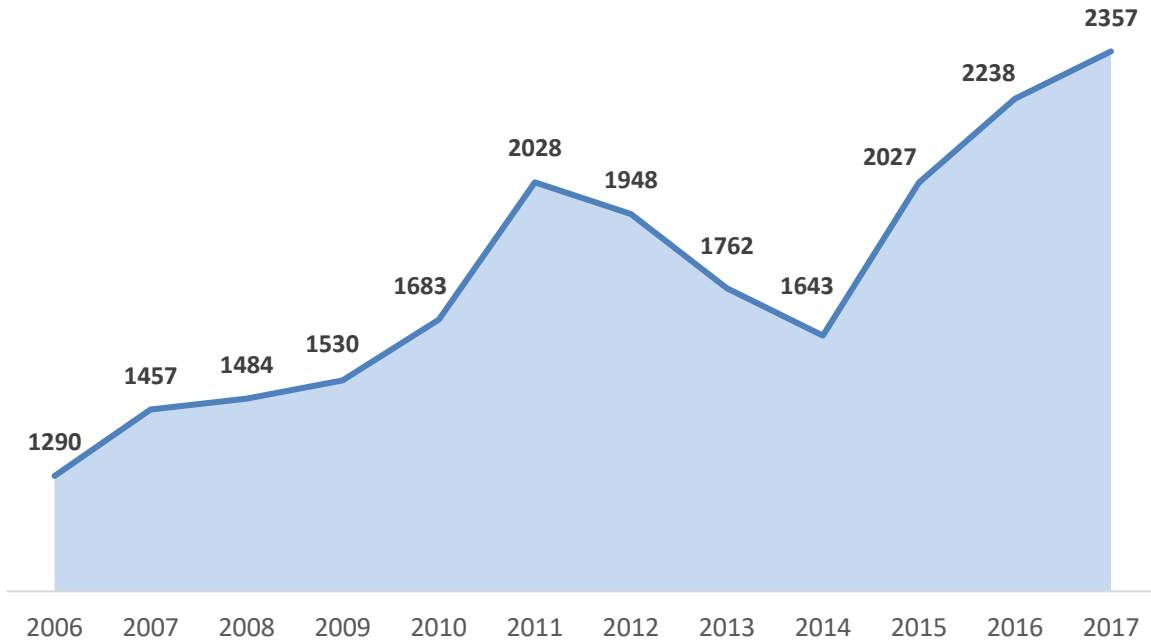
### **Maricopa County Extreme Heat Facts**

- Temperatures have exceeded 100°F as early in the year as March and as late as October.
- Each year Maricopa County experiences 110 days over 100°F and 26 days above 110°F.
- On average, there are 13 days each year where nighttime temperatures do not fall below 90°F.

## Results

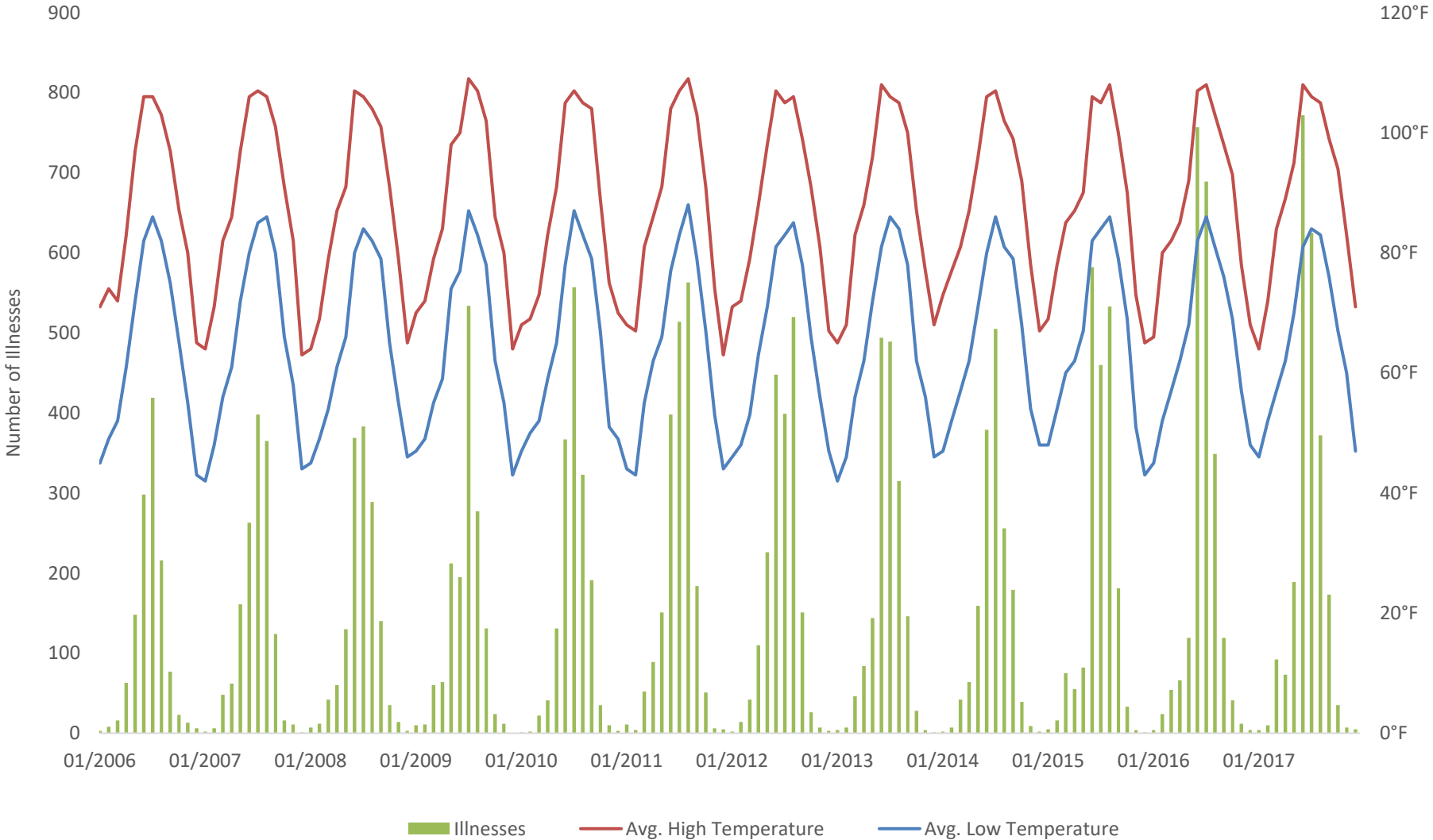
### Morbidity by Year

Graph 1. The number of heat-related hospital visits has been increasing since 2014. (N=21,447)

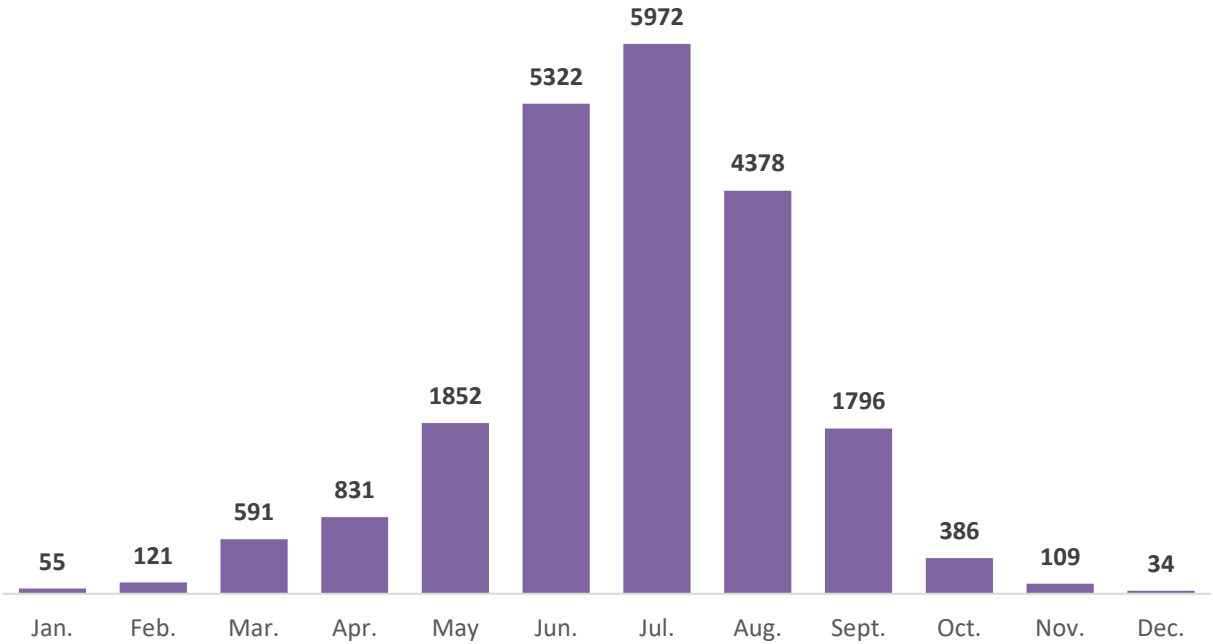


### Morbidity by Month and Temperature

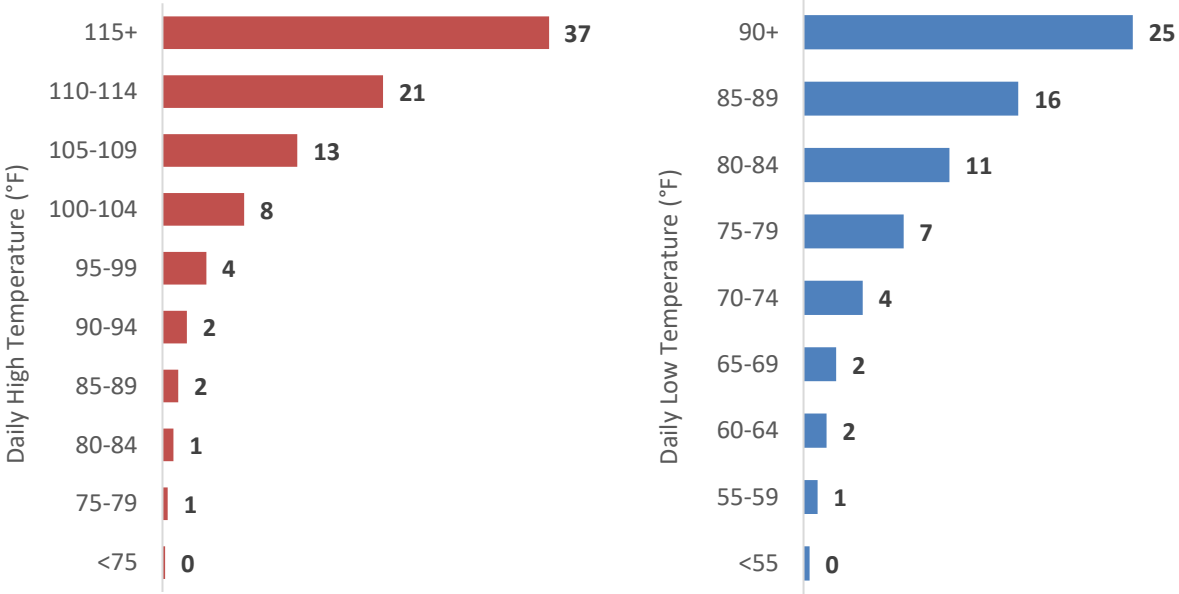
Graph 2. The number of heat-related illnesses spike each year during summer, when high and low temperatures are warmest.



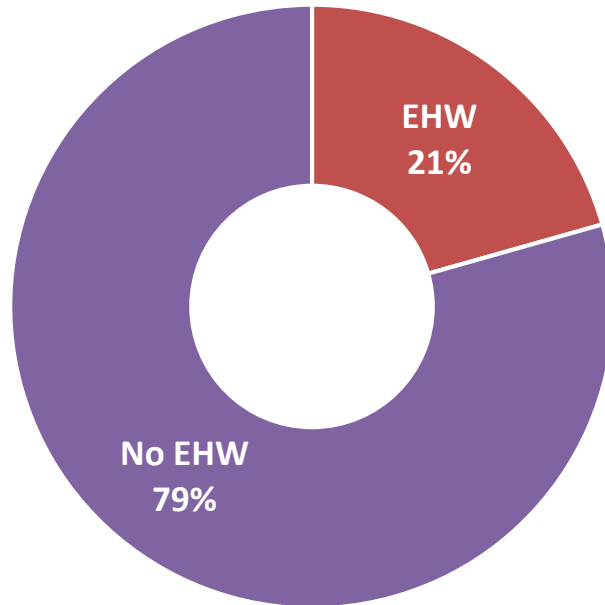
Graph 3. Seventy-three percent of all hospital visits related to environmental heat occurred in the months of June, July, or August. (N=15,672)



Graph 4. The average number of heat-related illnesses per day by high and low temperature increases as daytime and nighttime temperatures rise.

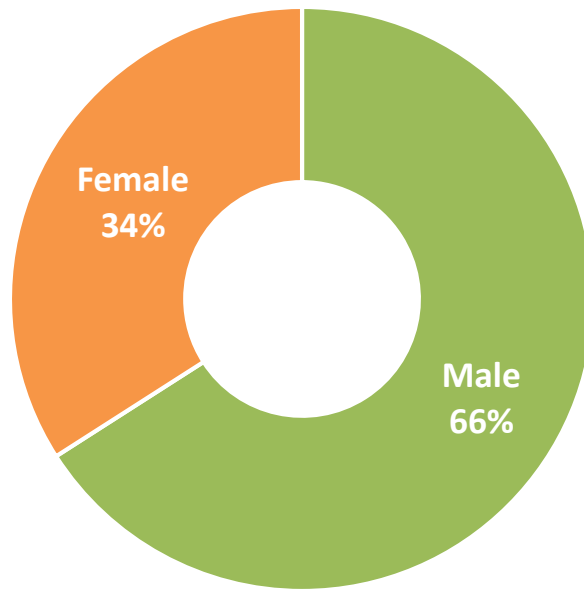


Graph 5. Most heat-related hospital visits occur on days for which no Excessive Heat Warning (EHW) has been issued by the National Weather Service.

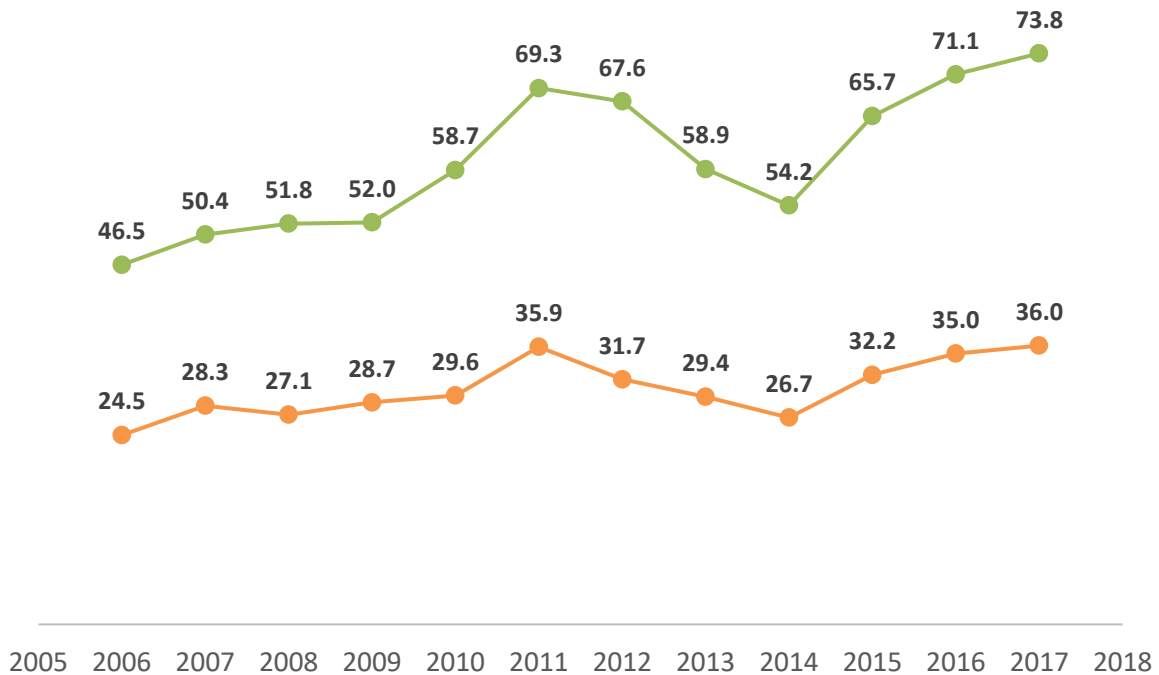


## Demographics

Graph 6. Men accounted for the majority of heat-related hospital visits.



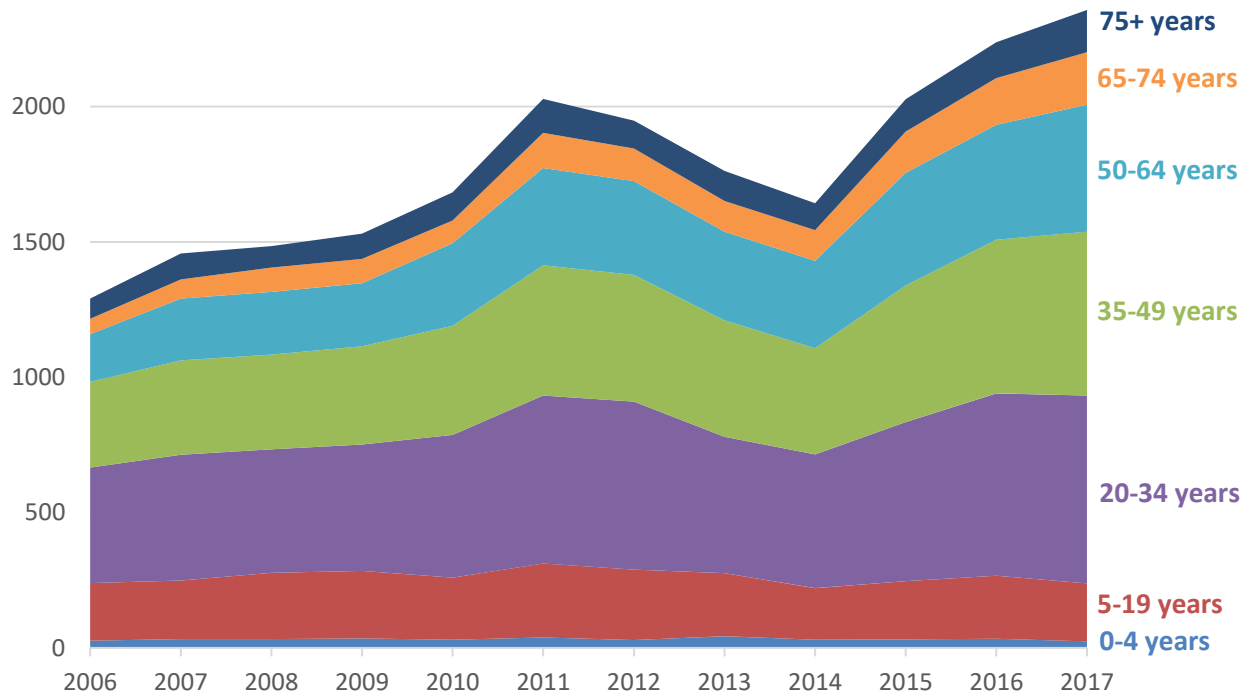
Graph 7. The rate of heat-related illness is consistently higher for men than for women.\*



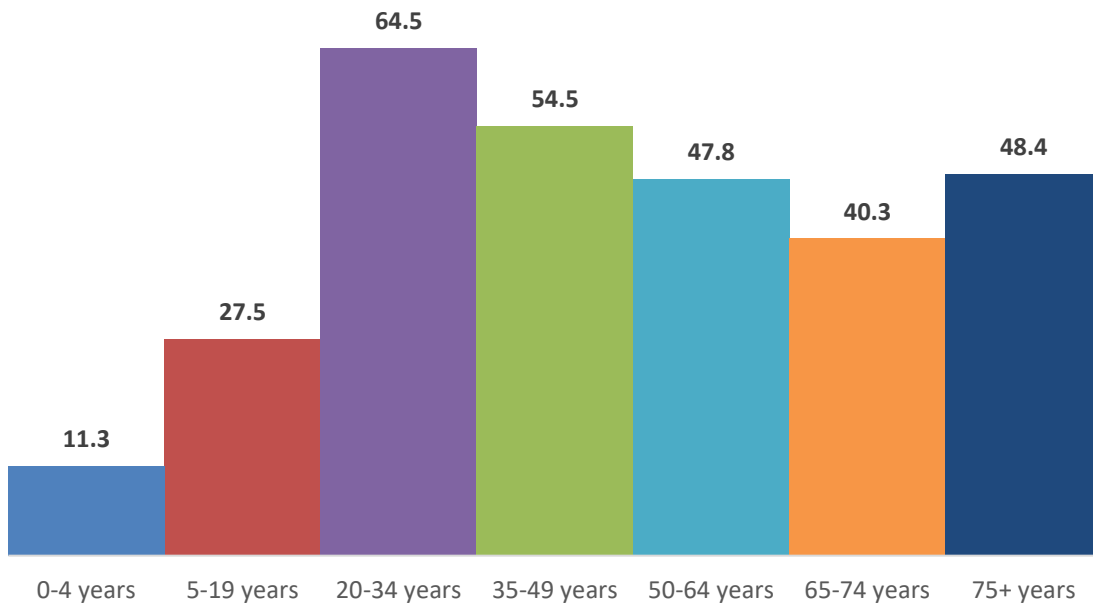
\*Rates calculated based on census population estimates.



Graph 8. Of all age groups, 20 to 34 year olds consistently accounted for the highest proportion of heat-related illness cases.

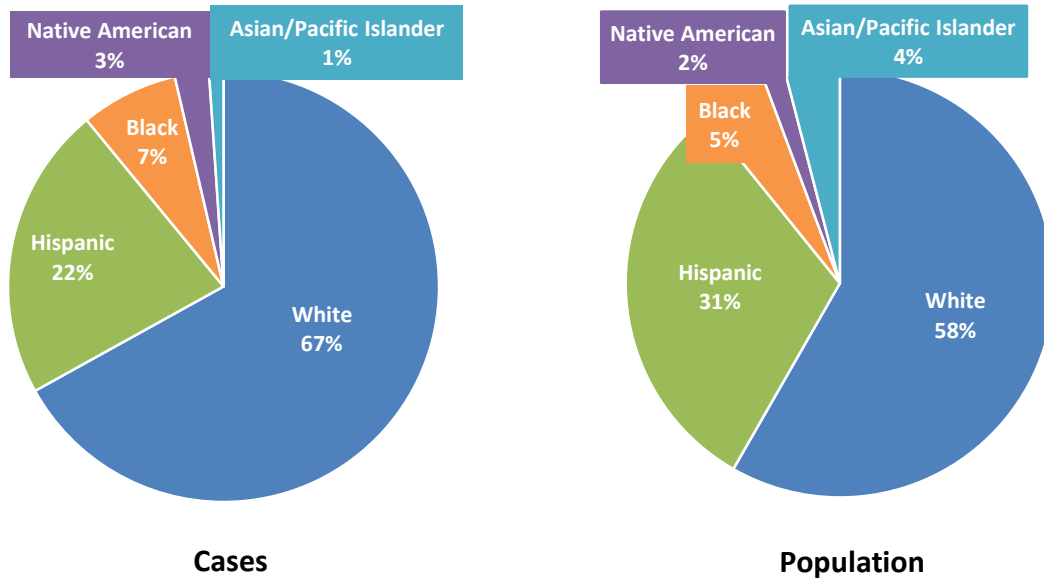


Graph 9. The average annual heat-related illness rate was lowest among those under 20 years of age.\*



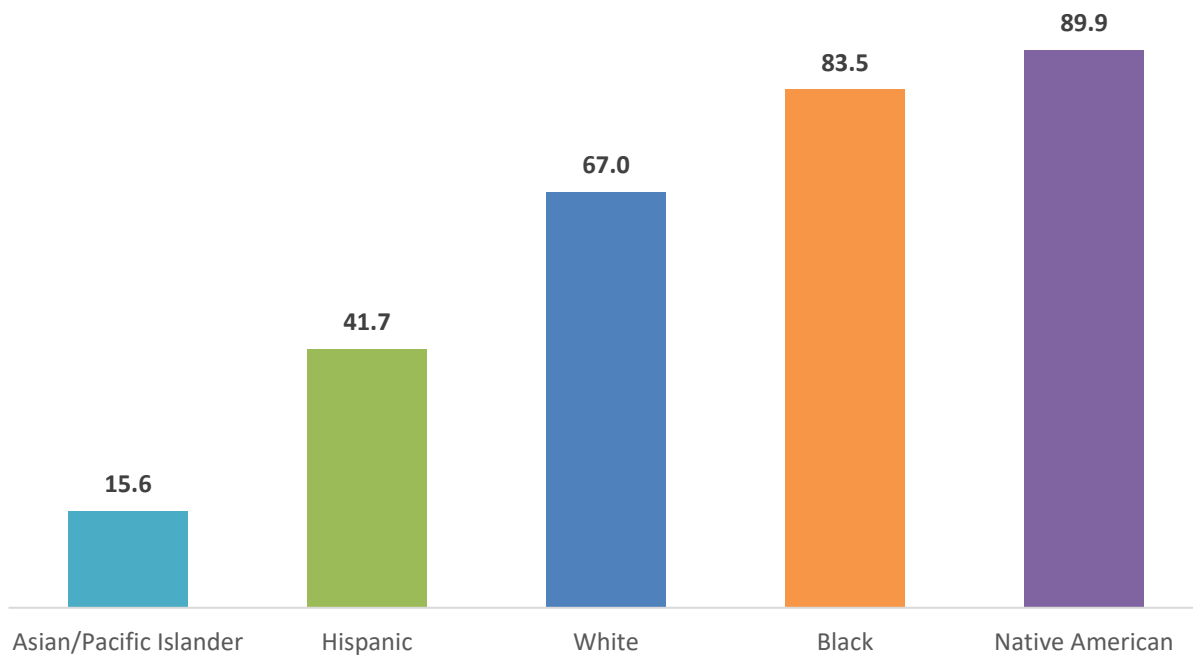
\*Rates calculated based on census population estimates.

Graph 10. Those who are white, black, or Native American are overrepresented among cases of heat-related illness.<sup>†</sup>



<sup>†</sup>Race/ethnicity statistics only include data from 2008 through 2017.

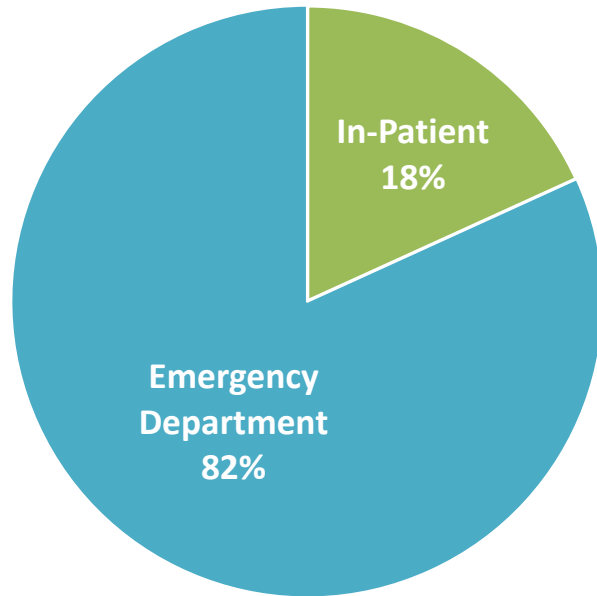
Graph 11. Rates of heat morbidity are highest among Native Americans.\*



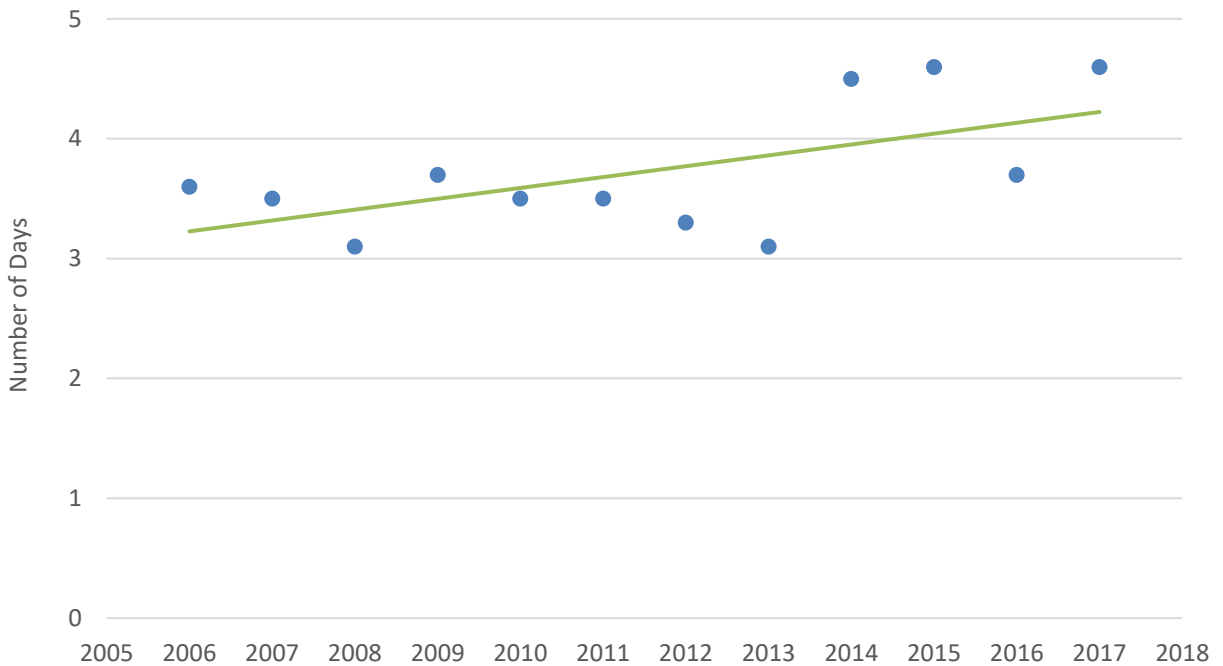
\*Rates calculated based on census population estimates for 2010 through 2017.

Visit Details

Graph 12. Less than twenty percent of all patients with heat-related illness were admitted as in-patients.

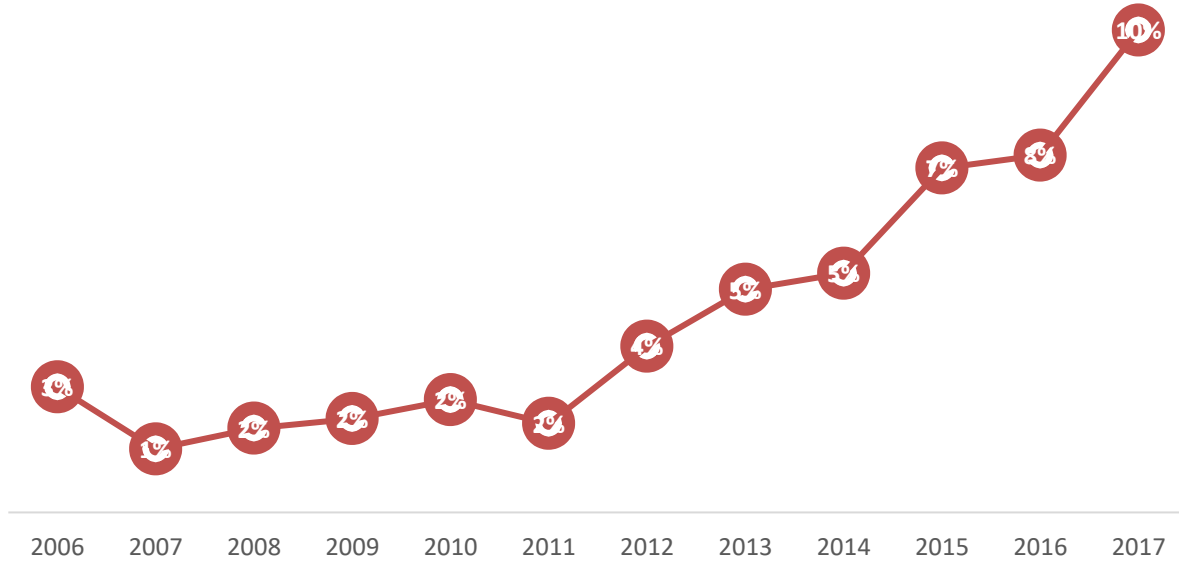


Graph 13. The mean length of stay for in-patients is three and a half days and has trended upwards in recent years.

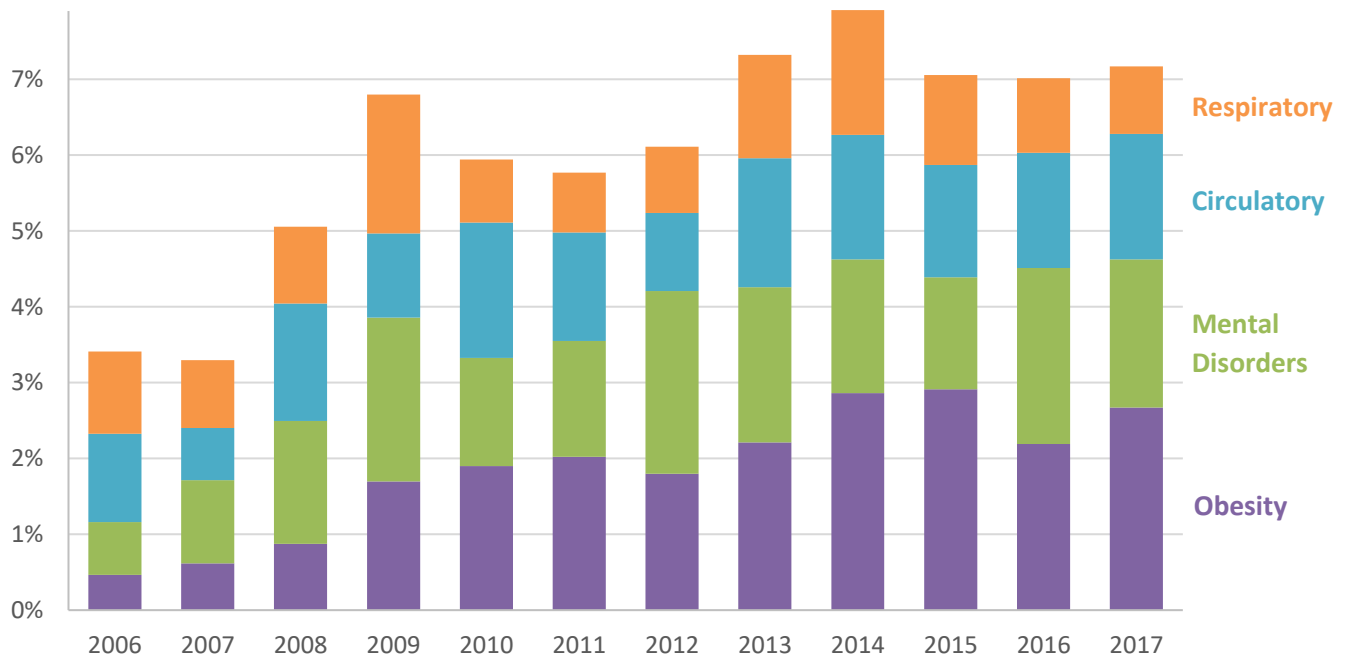


Patient History

Graph 14. The percent of heat-related illness patients experiencing homelessness has been increasing since 2011.

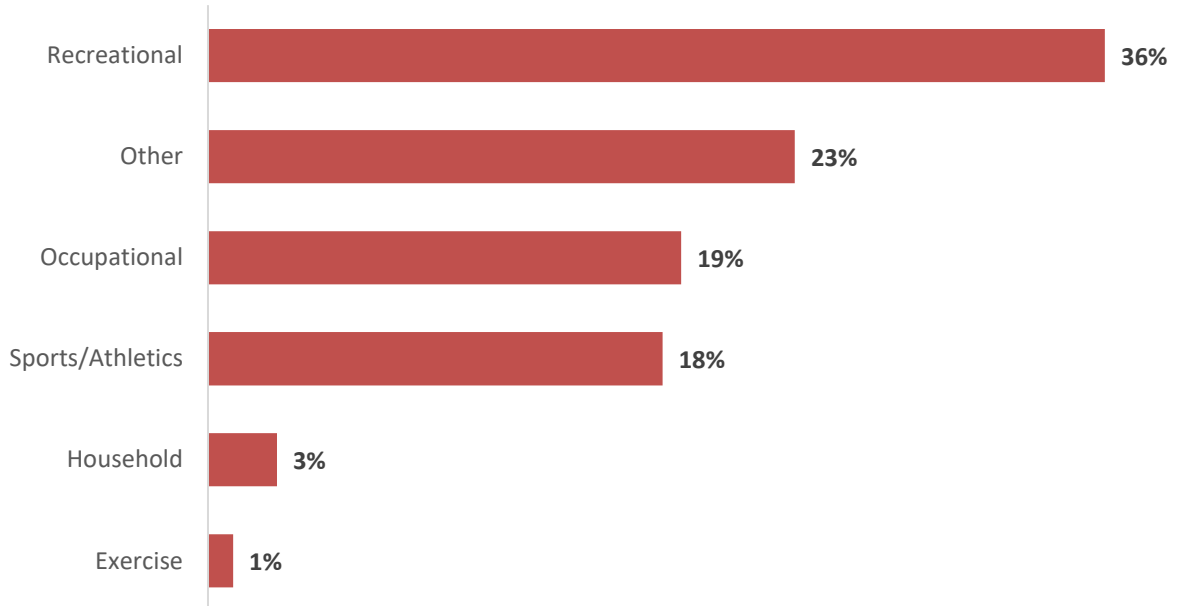


Graph 15. Obesity is an increasingly common comorbidity for patients with heat-related illness.

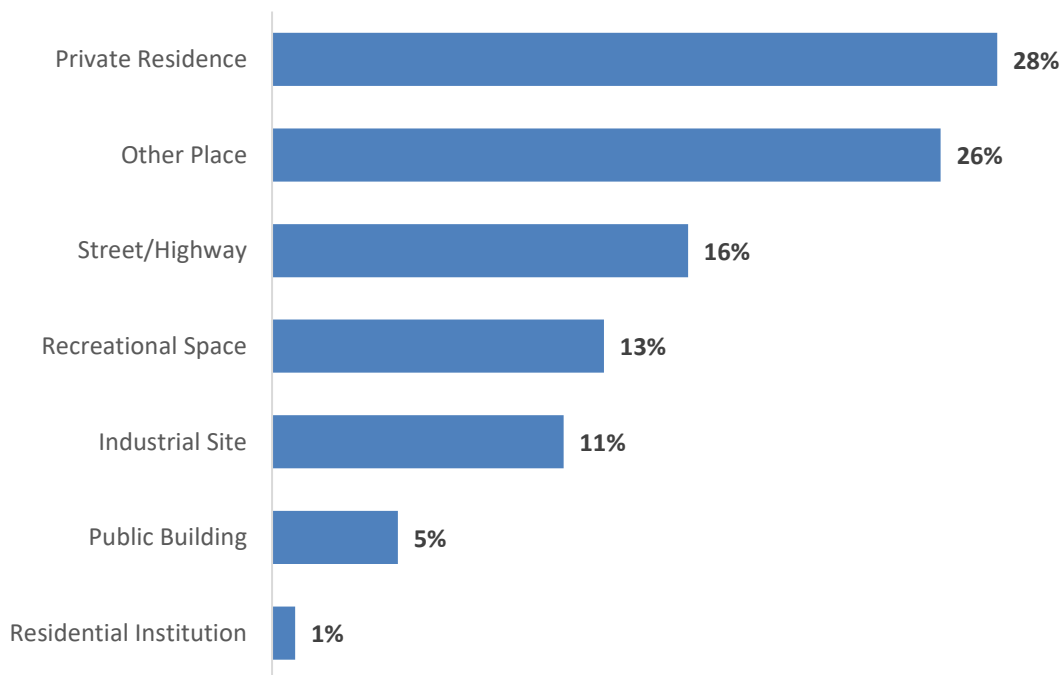


### Injury Characteristics

Graph 16. For visits with known activity history, heat-related illness most commonly occurred following recreational activities.

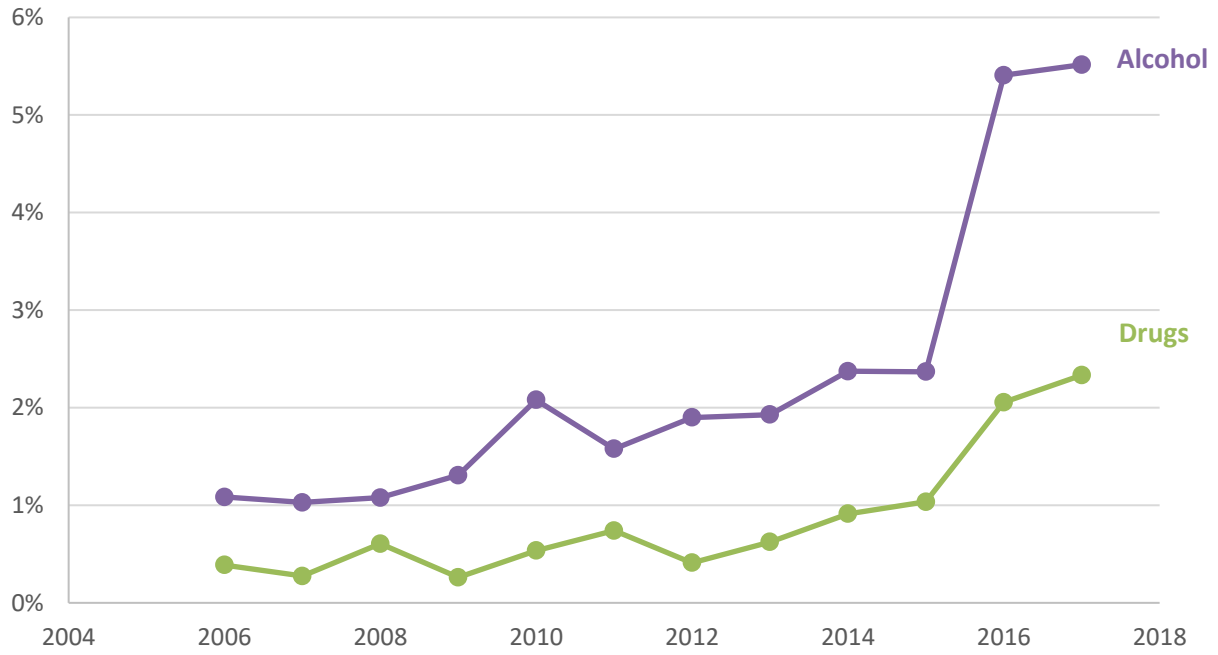


Graph 17. Among patients with known location of injury, private residences were most commonly reported.



### Substance Use

Graph 18. The proportion of heat-related illness cases involving substance use has increased in recent years.



## Appendix

### Methodology

#### Heat Morbidity Surveillance

Maricopa County experiences very hot temperatures throughout the year that can negatively impact the health of its residents and visitors. The Office of Epidemiology at the Maricopa County Department of Public Health (MCDPH) has been using surveillance practices that track heat and heat-associated deaths in the county for over a decade. The office has expanded these efforts to include heat-related illness (HRI) surveillance that could lead to improved response to the chronic heat experienced in Maricopa County.

#### Hospital Discharge Data

Hospital discharge data dating from 2006 to 2017 was analyzed to learn more about heat-related illness among patients seen at Maricopa County local hospitals. Specifically, the goal was to learn about the burden of heat illness in Maricopa County and to identify ways to best use this data in heat surveillance efforts.

Hospital discharge data from Maricopa County local hospitals were used to extract heat-related illnesses for this report. This data was gathered based on International Classification of Diseases (ICD) codes. The tables below list the ICD-9 and ICD-10 codes that were included in this query. ICD-9 codes were used for medical records prior to 2016. ICD-10 codes were used in records from late 2015 through 2017. Specific codes used to identify cases, comorbidities, patient activity, and place of injury are listed in [Appendix Tables 12-21](#).

A SAS program is used to identify heat-related illness cases as well as whether other specific morbidities are present. These morbidities are defined as follows:

- Heat-Related Illness: The presence of one heat related illness ICD code in the primary diagnosis, secondary diagnosis or external cause of injury in a medical record.
- Comorbidity of Interest: The presence of one ICD code for obesity, respiratory disease, circulatory disease, or mental disorders in any diagnosis field in a medical record.

During the process, the goal was to identify heat illness cases that present in the following variables:

- Primary diagnosis: Cases where the primary reason for hospitalization or ED visit is heat-related.
- Secondary diagnosis: Cases where heat is listed as one of the up to 24 secondary causes for hospitalization or ED visit.
- External cause of Injury: Heat is mentioned as the external cause of injury for the hospitalized person. There are up to 6 external causes of injury diagnoses per record in addition to primary and secondary diagnoses.

The SAS program scans individual hospital discharge records to see if the primary diagnosis variable contains a heat code. If it does, the record is coded as having a primary diagnosis of heat-related illness. If not, the program will then scan the record to see if any of the secondary diagnosis variables contain a heat-associated ICD code. If yes, then the record is coded as having a secondary diagnosis of heat-

related injury. If not, the program then checks the external cause of injury variables to see if the record was coded as having a heat-related injury. If yes, the record is coded as having a heat injury. If not, the program checks the primary diagnosis, secondary diagnosis and external causes of injury to see if there is any diagnosis of sunburn is present. If yes, the record is coded as having a heat injury. If no, the record is coded as not having any type of heat-related illness and is dropped from analysis. Resulting heat injury records are then scanned for the presence of any relevant comorbidities in any diagnosis field. Any comorbidity of interest that is detected in this step will result in an indicator being entered for the corresponding flag variable.



Tables

**Table 1.** Heat Related Illness Rates per 100,000 Residents by Gender, Maricopa County, 2006-2017

<b>YEAR</b>	<b>MALE (N)</b>	<b>FEMALE (N)</b>	<b>TOTAL (N)</b>
<b>2006</b>	46.5 (842)	24.5 (448)	35.4 (1290)
<b>2007</b>	50.4 (929)	28.3 (528)	39.3 (1457)
<b>2008</b>	51.8 (969)	27.1 (515)	39.4 (1484)
<b>2009</b>	52.0 (979)	28.7 (551)	40.2 (1530)
<b>2010</b>	58.7 (1111)	29.6 (572)	44.0 (1683)
<b>2011</b>	69.3 (1326)	35.9 (702)	52.4 (2028)
<b>2012</b>	67.6 (1317)	31.7 (631)	49.4 (1948)
<b>2013</b>	58.9 (1166)	29.4 (596)	44.0 (1762)
<b>2014</b>	54.2 (1092)	26.7 (551)	40.3 (1643)
<b>2015</b>	65.7 (1350)	32.2 (677)	48.8 (2027)
<b>2016</b>	71.1 (1489)	35.0 (749)	52.9 (2238)
<b>2017</b>	73.8 (1573)	36.0 (784)	54.7 (2357)
<b>TOTAL</b>	<b>60.3 (14143)</b>	<b>30.6 (7304)</b>	<b>45.3 (21447)</b>

**Table 2.** Heat Related Illness Rates per 100,000 Residents by Age Group, Maricopa County, 2006-2017

YEAR	AGE GROUP (N)						
	0-4	5-19	20-34	35-49	50-64	65-74	75+
<b>2006</b>	9.1 (27)	26.9 (212)	52.9 (427)	40.8 (317)	31.3 (176)	26.4 (57)	37.9 (74)
<b>2007</b>	10.7 (32)	26.9 (217)	57.2 (465)	44.3 (348)	39.2 (229)	31.3 (70)	48.4 (96)
<b>2008</b>	10.7 (32)	29.7 (245)	55.9 (457)	44.4 (350)	38.2 (231)	38.2 (90)	39.3 (79)
<b>2009</b>	12.1 (35)	30 (250)	57.3 (467)	45.8 (362)	37.4 (233)	36.4 (90)	45.5 (93)
<b>2010</b>	10.7 (30)	27.5 (230)	65.1 (527)	51.3 (403)	47.2 (305)	32.6 (84)	49.8 (104)
<b>2011</b>	14.1 (39)	32.9 (273)	75.2 (620)	61.1 (481)	53.8 (360)	48.4 (130)	58.3 (125)
<b>2012</b>	10.6 (29)	31 (260)	73.9 (621)	59.1 (468)	50.8 (347)	41.4 (120)	46.8 (103)
<b>2013</b>	15.7 (43)	27.5 (233)	59 (504)	54 (430)	46.9 (328)	36.7 (113)	48.9 (111)
<b>2014</b>	10.9 (30)	22.3 (191)	56.9 (494)	48.9 (392)	45.1 (323)	35.1 (114)	42.1 (99)
<b>2015</b>	11.2 (31)	25 (216)	66.7 (587)	62.1 (505)	56.7 (416)	44.7 (153)	48.6 (119)
<b>2016</b>	12.2 (34)	26.7 (233)	75.2 (673)	68.7 (568)	56.7 (424)	48.2 (173)	52.4 (133)
<b>2017</b>	8.6 (24)	24.4 (214)	76.4 (694)	72 (606)	61.6 (469)	51.9 (194)	59 (156)
<b>TOTAL</b>	<b>11.3 (386)</b>	<b>27.5 (2774)</b>	<b>64.5 (6536)</b>	<b>54.5 (5230)</b>	<b>47.8 (3841)</b>	<b>40.3 (1388)</b>	<b>48.4 (1292)</b>

**Table 3.** Heat Related Illness Rates by Race and Ethnicity per 100,000 Residents, Maricopa County, 2010-2017

YEAR	RACE/ETHNICITY (N)				
	WHITE	BLACK	HISPANIC	NATIVE AMERICAN	ASIAN/PACIFIC ISLANDER
<b>2010</b>	51.3 (1152)	66.3 (119)	30.9 (350)	52 (31)	12.4 (17)
<b>2011</b>	60.7 (1373)	77.7 (143)	37.7 (433)	82.1 (50)	10.5 (15)
<b>2012</b>	55.6 (1269)	78.5 (150)	36.9 (435)	93.8 (59)	15.4 (23)
<b>2013</b>	48.7 (1122)	68.4 (135)	34.6 (418)	76.9 (50)	14.7 (23)
<b>2014</b>	47.3 (1098)	60.3 (123)	28.9 (358)	55 (37)	8 (13)
<b>2015</b>	56.1 (1317)	68.9 (147)	36.8 (467)	88.4 (61)	14.1 (24)
<b>2016</b>	61.2 (1450)	84.3 (188)	37.8 (493)	97.8 (69)	12.4 (22)
<b>2017</b>	63.3 (1511)	89.2 (206)	38.4 (515)	95.8 (69)	16.7 (31)
<b>TOTAL</b>	67 (12406)	83.5 (1356)	41.7 (4094)	89.9 (474)	15.6 (200)

**Table 4.** Heat Related Illness by Visit Location, Maricopa County, 2006-2017

<b>YEAR</b>	<b>EMERGENCY DEPARTMENT (%)</b>	<b>IN-PATIENT (%)</b>	<b>TOTAL (%)</b>
<b>2006</b>	191 (15%)	1099 (85%)	1290 (100%)
<b>2007</b>	204 (14%)	1253 (86%)	1457 (100%)
<b>2008</b>	225 (15%)	1259 (85%)	1484 (100%)
<b>2009</b>	294 (19%)	1236 (81%)	1530 (100%)
<b>2010</b>	342 (20%)	1341 (80%)	1683 (100%)
<b>2011</b>	385 (19%)	1643 (81%)	2028 (100%)
<b>2012</b>	348 (18%)	1600 (82%)	1948 (100%)
<b>2013</b>	344 (20%)	1418 (80%)	1762 (100%)
<b>2014</b>	306 (19%)	1337 (81%)	1643 (100%)
<b>2015</b>	414 (20%)	1613 (80%)	2027 (100%)
<b>2016</b>	370 (17%)	1868 (83%)	2238 (100%)
<b>2017</b>	481 (20%)	1876 (80%)	2357 (100%)
<b>TOTAL</b>	<b>3904 (18%)</b>	<b>17543 (82%)</b>	<b>21447 (100%)</b>

**Table 5.** In-Patient Heat Related Illness Cases by Length of Stay, Maricopa County, 2006-2017

YEAR	LENGTH OF STAY (%)				TOTAL
	<24 HOURS	1-3 DAYS	4-6 DAYS	7+ DAYS	
<b>2006</b>	7 (4%)	132 (69%)	33 (17%)	19 (10%)	191 (100%)
<b>2007</b>	*	156 (76%)	23 (11%)	20 (10%)	*
<b>2008</b>	10 (4%)	161 (72%)	35 (16%)	19 (8%)	225 (100%)
<b>2009</b>	13 (4%)	201 (68%)	41 (14%)	39 (13%)	294 (100%)
<b>2010</b>	10 (3%)	235 (69%)	56 (16%)	41 (12%)	342 (100%)
<b>2011</b>	13 (3%)	263 (68%)	64 (17%)	45 (12%)	385 (100%)
<b>2012</b>	18 (5%)	250 (72%)	44 (13%)	36 (10%)	348 (100%)
<b>2013</b>	14 (4%)	246 (72%)	49 (14%)	35 (10%)	344 (100%)
<b>2014</b>	9 (3%)	190 (62%)	56 (18%)	51 (17%)	306 (100%)
<b>2015</b>	9 (2%)	234 (57%)	85 (21%)	86 (21%)	414 (100%)
<b>2016</b>	9 (2%)	222 (60%)	89 (24%)	50 (14%)	370 (100%)
<b>2017</b>	17 (4%)	278 (58%)	107 (22%)	79 (16%)	481 (100%)
<b>TOTAL</b>	*	<b>2568 (66%)</b>	<b>682 (17%)</b>	<b>520 (13%)</b>	<b>3904 (100%)</b>

\* Indicates a suppressed value of ≤5 or another value which would facilitate calculation of a suppressed value.

**Table 6.** Heat Related Illness Cases with Comorbidities, Maricopa County, 2006-2017

YEAR	COMORBIDITY (%)				TOTAL
	CIRCULATORY	RESPIRATORY	OBESE	MENTAL DISORDERS	
<b>2006</b>	15 (1.2%)	14 (1.1%)	6 (0.5%)	9 (0.7%)	44 (3.4%)
<b>2007</b>	10 (0.7%)	13 (0.9%)	9 (0.6%)	16 (1.1%)	48 (3.3%)
<b>2008</b>	23 (1.5%)	15 (1.0%)	13 (0.9%)	24 (1.6%)	75 (5.1%)
<b>2009</b>	17 (1.1%)	28 (1.8%)	26 (1.7%)	33 (2.2%)	104 (6.8%)
<b>2010</b>	30 (1.8%)	14 (0.8%)	32 (1.9%)	24 (1.4%)	100 (5.9%)
<b>2011</b>	29 (1.4%)	16 (0.8%)	41 (2.0%)	31 (1.5%)	117 (5.8%)
<b>2012</b>	20 (1.0%)	17 (0.9%)	35 (1.8%)	47 (2.4%)	119 (6.1%)
<b>2013</b>	30 (1.7%)	24 (1.4%)	39 (2.2%)	36 (2.0%)	129 (7.3%)
<b>2014</b>	27 (1.6%)	27 (1.6%)	47 (2.9%)	29 (1.8%)	130 (7.9%)
<b>2015</b>	30 (1.5%)	24 (1.2%)	59 (2.9%)	30 (1.5%)	143 (7.1%)
<b>2016</b>	34 (1.5%)	22 (1.0%)	49 (2.2%)	52 (2.3%)	157 (7.0%)
<b>2017</b>	39 (1.7%)	21 (0.9%)	63 (2.7%)	46 (2.0%)	169 (7.2%)
<b>TOTAL</b>	<b>304 (1.4%)</b>	<b>235 (1.1%)</b>	<b>419 (2.0%)</b>	<b>377 (1.8%)</b>	<b>1335 (6.2%)</b>

**Table 7.** Heat Related Illness Cases with Preceding Activity Type, Maricopa County, 2009-2017\*\*

YEAR	ACTIVITY TYPE (%)						UNKNOWN
	RECREATIONAL	OCCUPATIONAL	SPORTS/ ATHLETICS	EXERCISE	HOUSEHOLD	OTHER	
<b>2009</b>	7 (0%)	*	6 (0%)	*	*	*	1510 (99%)
<b>2010</b>	120 (7%)	53 (3%)	50 (3%)	*	9 (1%)	46 (3%)	1402 (83%)
<b>2011</b>	130 (6%)	65 (3%)	90 (4%)	*	16 (1%)	45 (2%)	1679 (83%)
<b>2012</b>	141 (7%)	52 (3%)	78 (4%)	*	11 (1%)	47 (2%)	1615 (83%)
<b>2013</b>	106 (6%)	54 (3%)	68 (4%)	*	9 (1%)	87 (5%)	1437 (82%)
<b>2014</b>	126 (8%)	57 (3%)	57 (3%)	*	*	110 (7%)	1283 (78%)
<b>2015</b>	149 (7%)	67 (3%)	51 (3%)	*	*	121 (6%)	1630 (80%)
<b>2016</b>	157 (7%)	120 (5%)	82 (4%)	6 (0%)	16 (1%)	93 (4%)	1764 (79%)
<b>2017</b>	169 (7%)	114 (5%)	78 (3%)	*	14 (1%)	169 (7%)	1809 (77%)
<b>TOTAL</b>	<b>1105 (6%)</b>	<b>*</b>	<b>560 (3%)</b>	<b>31 (0%)</b>	<b>85 (0%)</b>	<b>*</b>	<b>14129 (82%)</b>

\* Indicates a suppressed value of ≤5 or another value which would facilitate calculation of a suppressed value.

\*\* Data unavailable for 2006-2008.

**Table 8.** Heat Related Illness Cases with Preceding Activity Type and Age Group, Maricopa County, 2009-2017\*\*

AGE GROUP	ACTIVITY TYPE (%)					
	RECREATIONAL	OCCUPATIONAL	SPORTS/ ATHLETICS	EXERCISE	HOUSEHOLD	OTHER
<b>0-4</b>	18 (55%)	*	*	*	*	14 (42%)
<b>5-19</b>	194 (39%)	28 (6%)	199 (40%)	*	9 (2%)	68 (14%)
<b>20-34</b>	352 (39%)	204 (23%)	104 (12%)	8 (1%)	27 (3%)	204 (23%)
<b>35-49</b>	251 (35%)	146 (20%)	88 (12%)	13 (2%)	25 (3%)	192 (27%)
<b>50-64</b>	189 (34%)	120 (22%)	87 (16%)	*	13 (2%)	144 (26%)
<b>65-74</b>	43 (22%)	41 (21%)	55 (28%)	*	*	52 (26%)
<b>75+</b>	51 (31%)	43 (26%)	20 (12%)	*	6 (4%)	44 (27%)
<b>TOTAL</b>	<b>1098 (36%)</b>	*	*	<b>30 (1%)</b>	<b>85 (3%)</b>	<b>718 (23%)</b>

\* Indicates a suppressed value of  $\leq 5$  or another value which would facilitate calculation of a suppressed value.

\*\* Data unavailable for 2006-2008.



**Table 9.** Heat Related Illness Cases with Place of Injury, Maricopa County, 2006-2017

YEAR	PLACE OF INJURY (%)							
	PRIVATE RESIDENCE	STREET/HIGHWAY	RECREATIONAL SPACE	INDUSTRIAL SITE	PUBLIC BUILDING	RESIDENTIAL INSTITUTION	OTHER	UNKNOWN
<b>2006</b>	75 (6%)	32 (2%)	57 (4%)	67 (5%)	19 (1%)	*	167 (13%)	868 (67%)
<b>2007</b>	101 (7%)	37 (3%)	63 (4%)	75 (5%)	24 (2%)	*	181 (12%)	971 (67%)
<b>2008</b>	226 (15%)	75 (5%)	149 (10%)	103 (7%)	42 (3%)	*	284 (19%)	600 (40%)
<b>2009</b>	318 (21%)	117 (8%)	220 (14%)	120 (8%)	50 (3%)	9 (1%)	306 (20%)	390 (25%)
<b>2010</b>	325 (19%)	151 (9%)	215 (13%)	154 (9%)	60 (4%)	12 (1%)	340 (20%)	426 (25%)
<b>2011</b>	431 (21%)	163 (8%)	222 (11%)	170 (8%)	62 (3%)	14 (1%)	452 (22%)	514 (25%)
<b>2012</b>	346 (18%)	193 (10%)	219 (11%)	157 (8%)	66 (3%)	20 (1%)	380 (20%)	567 (29%)
<b>2013</b>	374 (21%)	244 (14%)	173 (10%)	183 (10%)	94 (5%)	6 (0%)	279 (16%)	409 (23%)
<b>2014</b>	342 (21%)	230 (14%)	172 (10%)	124 (8%)	88 (5%)	13 (1%)	217 (13%)	457 (28%)
<b>2015</b>	433 (21%)	253 (12%)	209 (10%)	148 (7%)	88 (4%)	11 (1%)	346 (17%)	539 (27%)
<b>2016</b>	517 (23%)	411 (18%)	85 (4%)	172 (8%)	52 (2%)	15 (1%)	425 (19%)	561 (25%)
<b>2017</b>	584 (25%)	430 (18%)	80 (3%)	164 (7%)	61 (3%)	15 (1%)	405 (17%)	618 (26%)
<b>TOTAL</b>	<b>4072 (19%)</b>	<b>2336 (11%)</b>	<b>1864 (9%)</b>	<b>1637 (8%)</b>	<b>706 (3%)</b>	<b>130 (1%)</b>	<b>3782 (18%)</b>	<b>6920 (32%)</b>

\* Indicates a suppressed value of ≤5.

**Table 10.** Heat Related Illness Cases with Discharge Status, Maricopa County, 2006-2017

YEAR	HOME/ SELF CARE	MEDICAL FACILITY	COMORBIDITY		EXPIRED
			HOSPICE	LAW ENFORCEMENT	
2006	1248 (97%)	28 (2%)	*	*	12 (1%)
2007	1422 (98%)	27 (2%)	*	*	*
2008	1447 (98%)	28 (2%)	*	*	8 (1%)
2009	1469 (96%)	44 (3%)	6 (0%)	*	11 (1%)
2010	1598 (95%)	61 (4%)	*	7 (0%)	13 (1%)
2011	1937 (96%)	69 (3%)	*	*	16 (1%)
2012	1875 (96%)	56 (3%)	6 (0%)	*	8 (0%)
2013	1696 (96%)	47 (3%)	*	*	11 (1%)
2014	1559 (95%)	66 (4%)	*	*	11 (1%)
2015	1901 (94%)	104 (5%)	*	*	12 (1%)
2016	2124 (95%)	91 (4%)	*	7 (0%)	12 (1%)
2017	2193 (93%)	129 (5%)	*	7 (0%)	23 (1%)
<b>TOTAL</b>	<b>20469 (95%)</b>	<b>750 (3%)</b>	<b>44 (0%)</b>	<b>43 (0%)</b>	<b>*</b>

\* Indicates a suppressed value of ≤5 or another value which would facilitate calculation of a suppressed value.

**Table 11.** Heat Related Illness Rates with Substance Use, Maricopa County, 2006-2017

<b>YEAR</b>	<b>DRUGS</b>	<b>ALCOHOL</b>	<b>TOTAL SUBSTANCE USE</b>
<b>2006</b>	*	14 (1.1%)	*
<b>2007</b>	*	15 (1.0%)	*
<b>2008</b>	9 (0.6%)	16 (1.1%)	25 (1.7%)
<b>2009</b>	*	20 (1.3%)	*
<b>2010</b>	9 (0.5%)	35 (2.1%)	44 (2.6%)
<b>2011</b>	15 (0.7%)	32 (1.6%)	47 (2.3%)
<b>2012</b>	8 (0.4%)	37 (1.9%)	45 (2.3%)
<b>2013</b>	11 (0.6%)	34 (1.9%)	45 (2.6%)
<b>2014</b>	15 (0.9%)	39 (2.4%)	54 (3.3%)
<b>2015</b>	21 (1.0%)	48 (2.4%)	69 (3.4%)
<b>2016</b>	46 (2.1%)	121 (5.4%)	167 (7.5%)
<b>2017</b>	55 (2.3%)	130 (5.5%)	185 (7.8%)
<b>TOTAL</b>	<b>202 (0.9%)</b>	<b>541 (2.5%)</b>	<b>743 (3.5%)</b>

\* Indicates a suppressed value of  $\leq 5$ .

Tables 12 & 13. ICD diagnosis codes used as inclusion criteria for heat-related illness.

ICD-9 CODE	DEFINITION
992.0	Heat stroke and sunstroke
992.1	Heat syncope
992.2	Heat cramps
992.3	Heat exhaustion, anhidrotic
992.4	Heat exhaustion due to salt depletion
992.5	Heat exhaustion, unspecified
992.6	Heat fatigue, transient
992.7	Heat edema
992.8	Other specified heat effects
992.9	Unspecified effects of heat and light
E900.0	Accident caused by excessive heat due to weather conditions
E900.9	Accidents due to excessive heat of unspecified origin
692.71	Sunburn
692.76	Sunburn of second degree
692.77	Sunburn of third degree
E900	Excessive heat

ICD-10 CODE	DEFINITION
T67.0	Heatstroke and sunstroke
T67.1	Heat syncope
T67.2	Heat cramp
T67.3	Heat exhaustion, anhidrotic
T67.4	Heat exhaustion due to salt depletion
T67.5	Heat exhaustion, unspecified
T67.6	Heat fatigue, transient
T67.7	Heat edema
T67.8	Other effects of heat and light
T67.9	Effect of heat and light, unspecified
X30	Exposure to excessive natural heat
X30	Exposure to excessive natural heat
L55.0	Sunburn of first degree
L55.1	Sunburn of second degree
L55.2	Sunburn of third degree
L55.9	Sunburn, unspecified

Tables 14 & 15. ICD diagnosis codes used as exclusion criteria for heat-related illness.

ICD-9 CODE	DEFINITION
E9001	Accidents due to excessive heat of man-made origin
940	Burns confined to eye and adnexa
941	Burn of face head and neck
942	Burn of trunk
943	Burn of upper limb except wrist and hand
944	Burn of wrist(s) and hand(s)
945	Burn of lower limb(s)
946	Burns of multiple specified sites
947	Burn of internal organs
948	Burns classified according to extent of body surface involved
949	Burn unspecified site
705	Disorders of sweat glands
995.86	Malignant hyperthermia
708.2	Urticaria due to cold and heat
276.50	Volume depletion, unspecified
276.51	Dehydration

ICD-10 CODE	DEFINITION
W92	Excessive heat of man-made origin
T26	Burn and corrosion confined to eye and adnexa
T20	Burn and corrosion of heat, face, and neck
T21	Burn and corrosion of trunk
T22	Burn and corrosion of shoulder and upper limb, except wrist and hand
T23	Burn and corrosion of wrist and hand
T24, T25	Burn and corrosion of lower limb, except ankle and foot, burn and corrosion of ankle and foot
T27,T28	Burn and corrosion of respiratory tract, burn and corrosion of other internal organs
T31	Burns classified according to extent of body surface involved
T30	Burn and corrosion, body region unspecified
T88.3XXA	Malignant hyperthermia due to anesthesia, initial encounter
L50.2	Urticaria due to cold and heat
E86.9	Volume depletion, unspecified
E86.0	Dehydration

Tables 16 & 17. ICD diagnosis codes used to define specific comorbidities.

ICD-9 CODE	DEFINITION
278.X	Overweight and obesity
290-319	Mental disorders
390-459	Diseases of the circulatory system
460-519	Diseases of the respiratory system

ICD-10 CODE	DEFINITION
E66	Overweight and obesity
FXX	Mental, behavioral, and neurodevelopmental disorders
IXX	Diseases of the circulatory system
JXX	Diseases of the respiratory system

Tables 18 & 19. ICD diagnosis codes used to define preceding activity type.

ICD-9 CODE	DEFINITION
E001-E005, E018	Recreational
E006-E008	Sports/Athletics
E009, E010	Exercise
E013-E015, E019	Household Activities
E011, E012, E016	Occupational
E017, E029, E030	Other
BLANK	Not Listed

ICD-10 CODE	DEFINITION
Y93.0-Y93.4, Y93.J	Recreational
Y93.5-Y93.7	Sports/Athletics
Y93.A, Y93.B	Exercise
Y93.E-Y93.G, Y93.K	Household Activities
Y93.C, Y93.D, Y93.H	Occupational
Y93.I, Y93.8, Y93.9	Other
BLANK	Not Listed

Tables 20 & 21. ICD diagnosis codes used to identify place of injury category.

ICD-9 CODE	DEFINITION
E8490	Home Accidents
E8491	Farm Accidents
E8492	Mine and quarry accidents
E8493	Accidents occurring in industrial place and premises
E8494	Accidents occurring in place for recreation and sport
E8495	Street and highway accidents
E8496	Accidents occurring in public building
E8497	Accidents occurring in residential institution
E8498	Accidents occurring in other specified places
E8499	Accidents occurring in unspecified place

ICD-10 CODE	DEFINITION
Y92.0	Non-institutional (private) residence as the place of occurrence of the external cause
Y92.1	Institutional (non-private) residence as the place of occurrence of the external cause
Y92.2	School, other institution and public administrative area as the place of occurrence of the external cause
Y92.3	Sports and athletics area as the place of occurrence of the external cause
Y92.4	Street, highway and other paved roadways as the place of occurrence of the external cause
Y92.5	Trade and service area as the place of occurrence of the external cause
Y92.6	Industrial and construction area as the place of occurrence of the external cause
Y92.7	Farm as the place of occurrence of the external cause
Y92.8	Other places as the place of occurrence of the external cause
Y92.9	Unspecified place or not applicable