Heat-Associated Deaths in Maricopa County, AZ
Multiyear Report for 2006-2013

Photograph by Dan Sorensen:
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Maricopa County Department of Public Health
http://www.maricopa.gov/publichealth/

Maricopa County
Department of Public Health

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I. Acknowledgements

The Maricopa County Department of Public Health (MCDPH), Office of Epidemiology would like to thank the following agencies for their contributions to this report's findings:

Maricopa County Office of the Medical Examiner (OME)

Maricopa County Office of Vital Registration (OVR)

Arizona Department of Health Services (ADHS), Office of Vital Registration

National Weather Service (NWS)

Maricopa Association of Governments (MAG)

Local hospitals (infection preventionists, emergency departments, social worker staff)

II. Introduction

This report gives an overview of heat-associated deaths in Maricopa County from 2006 to 2013. Mortality from environmental heat is a significant public health problem, as it is largely preventable. Maricopa County has conducted heat surveillance since 2006. Each year, the enhanced heat surveillance season usually begins in May and ends in October. The main goals of heat surveillance are to identify the demographic characteristics of heat-associated deaths and the risk factors for mortality. Sharing this information helps community stakeholders to design interventions in an effort to prevent heat-associated deaths among vulnerable populations.

The two main sources of data for heat surveillance are: preliminary reports of death (PRODs) from the Office of the Medical Examiner (OME) and death certificates from the MCDPH Office of Vital Registration.

Heat-associated deaths are classified as heat-caused or heat related. Heat-caused deaths are those in which environmental heat was directly involved in the sequence of conditions causing deaths. Heat-related deaths are those in which environmental heat contributed to the deaths but was not in the sequence of conditions causing these deaths.

III. Methodology

Surveillance data is obtained from the following sources:

1. The Maricopa County Office of the Medical Examiner (OME) forwards suspected heat-related deaths to MCDPH and provides data including demographics, preliminary information regarding how the death occurred, and the circumstances of death. In the past, this information came solely as a weekly line list with limited information for each case. However, in February of 2012, MCDPH started receiving all preliminary reports of death (PRODs) from the OME. These reports provide expanded information on a daily basis and have changed the screening methods used by MCDPH staff to ensure that all potential heat-related deaths are documented.

2. The MCDPH Office of Vital Registration registers all Maricopa County death certificates in the Arizona Department of Health Services vital records database. The MCDPH Office of Epidemiology searches this database looking for causes of death associated with environmental heat. A Statistical Analysis Software (SAS) program looks for the key phrases and International Classification of Disease-10 (ICD-10) codes listed below.

Key Phrases
HEAT EXPOSURE
ENVIRON
EXHAUSTION
SUN
HEAT STRESS
HEAT STROKE
HYPERTHERMIA

ICD 10 Code	Corresponding Definition
X30	Exposure to excessive natural heat
T67.X	Effects of heat and light
P810	Environmental hyperthermia of newborn

3. Hospital and media reports can sometimes initiate a heat death investigation, for example, if a child is reportedly left in a hot car.

Once data are received, analysis of the information is required to identify only those deaths caused as a result of environmental heat. Environmental heat is heat generated by the climate (sun, humidity, etc.) rather than heat from man-made sources such as ovens or manufacturing equipment. Heat-associated deaths are categorized based on the classification criteria listed below:

Heat-caused (HC) deaths are those in which environmental heat was directly involved in the sequence of conditions causing deaths. These are deaths where environmental heat terms were indicated in ***Part I***[1] of the death certificate causes of death (diseases or conditions in the direct sequence causing death), for cause of death variables (*cod_a, cod_b, cod_c, or cod_d).* County of death: Maricopa.

Heat-related (HR) deaths are those in which environmental heat contributed to the deaths but was not in the sequence of conditions causing these deaths. These are cases where environmental heat terms were mentioned in ***Part II***[2] of the death certificate causes of death (diseases and conditions contributing but not directly resulting in the death sequence), but not in any of the Part I death variables (*cod_a, cod_b, cod_c, or cod_d*). County of death: Maricopa.

For the purposes of this report, heat-caused and heat-related deaths are combined and referred to as "heat-associated deaths." Please note that most jurisdictions report only heat-caused deaths. This should be considered when comparing Maricopa County data with data from other locations.

Death certificate data, in combination with the OME notes, are used to produce the information that is contained in this report. Total case count, demographics, residency, drug/alcohol use, and years lived in Arizona are directly retrieved from death certificate data. Place of death location, indoor/outdoor occurrence, air conditioning use, and homelessness are retrieved based on explicit notations made in the death certificate and/or OME notes.

Homelessness is defined as having an address on the death certificate that matches a homeless shelter, government agency, business, or an intersection. Cases are also classified as homeless if there is an indication on the death certificate. If the address is listed as unknown on the death certificate then an examination of the medical examiner's notes is made to determine if there is a reference to an address - if none, then the person is classified as homeless. If the address is listed as out of jurisdiction then time spent in Arizona, as provided by the death certificate, is taken into consideration.

Once classification is completed, the data are summarized for the production and dissemination of reports. Reports are generated weekly during the season and posted to the MCDPH website which can be found at: http://www.maricopa.gov/publichealth/Services/EPI/Reports/heat.aspx

[1] **Part I of the death certificate:** cod a – is the immediate cause (final disease or condition resulting in death) cod b, cod c, cod d – are sequentially listed conditions leading to the cause listed on cod a.

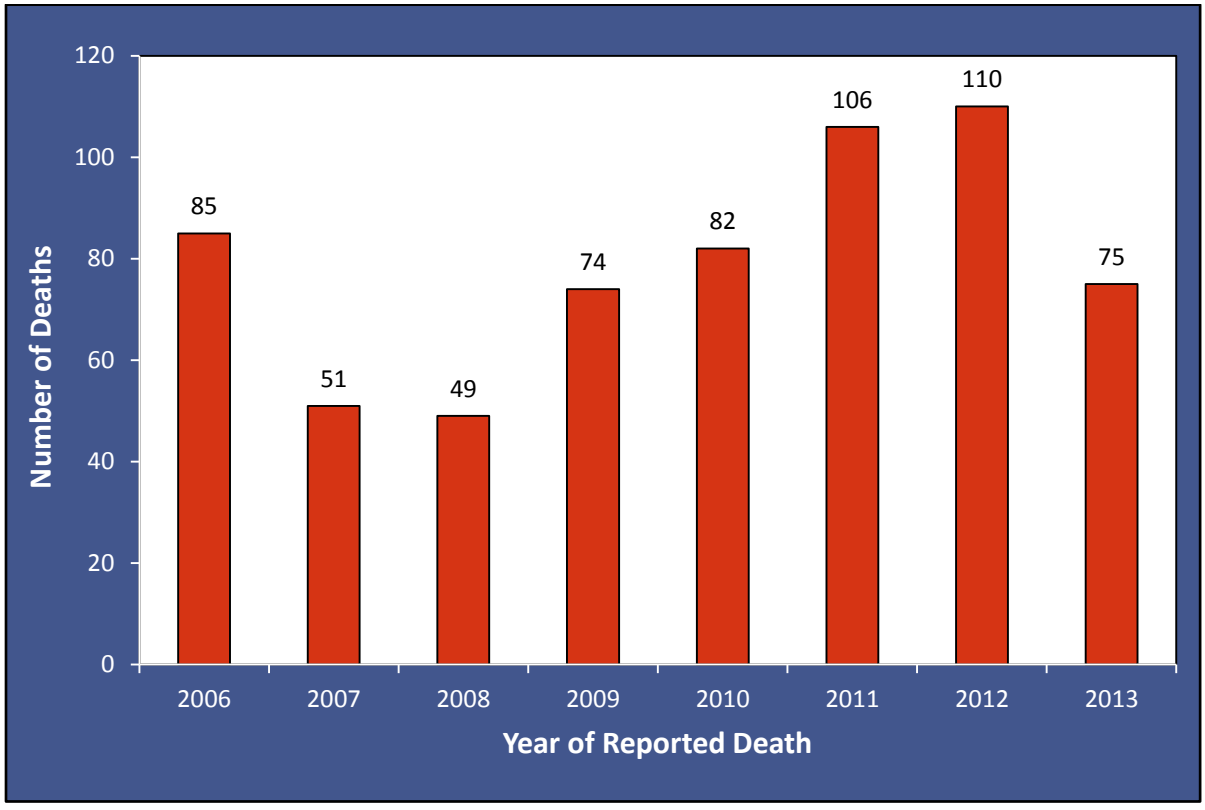
[2] **Part II of the death certificate:** Other significant conditions contributing to death but not resulting in the underlying cause given in Part I.

IV. Results

Heat Associated Deaths by Year

- Of the 1,049 cases investigated between 2006 and 2013, 632 (60%) were confirmed as heat-associated deaths.
- The number of heat associated-deaths peaked in 2012, when 110 deaths were recorded.
- There has been an average of 79 heat-associated deaths each year during this period.
- See Appendix, Table A for more information on investigation status.

Graph 1. Heat-Associated Deaths by Year (n=632), Maricopa County, 2006-2013*



Data Sources: Maricopa County, Office of Vital Registration and Office of Medical Examiner; Arizona Department of Health Services, Office of Vital Registration

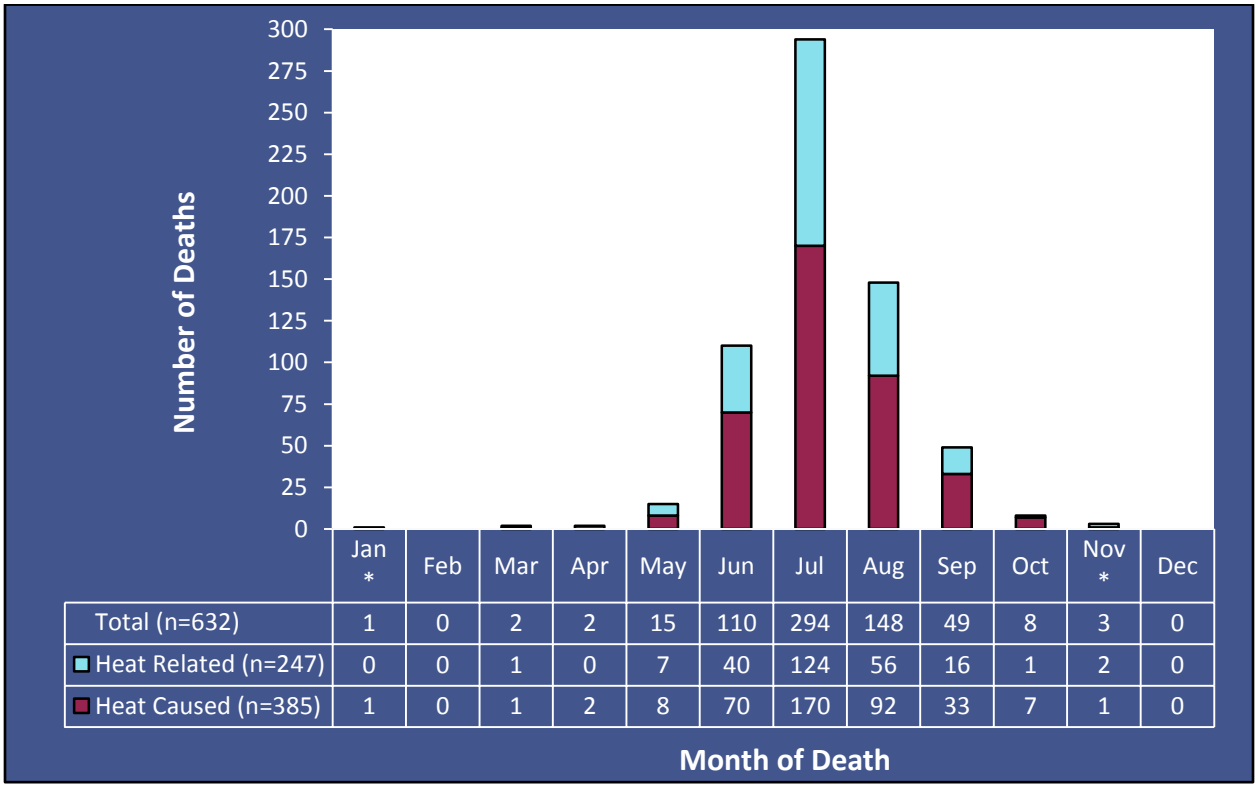
* The numbers reported here are for heat-associated deaths reported to MCDPH as of 1/26/2015

† One case from 2013 still pending a final cause of death

Heat Associated Deaths by Month

- Most heat-associated deaths occurred between June and August.
- The month with the highest number of deaths was July (n=294).
- The majority of deaths were classified as heat caused (61%); the remainder was classified as heat related (39%).

Graph 2. Heat-Associated Deaths by Month and Classification (n=632), Maricopa County, 2006-2013*



	Jan *	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov *	Dec
Total (n=632)	1	0	2	2	15	110	294	148	49	8	3	0
Heat Related (n=247)	0	0	1	0	7	40	124	56	16	1	2	0
Heat Caused (n=385)	1	0	1	2	8	70	170	92	33	7	1	0

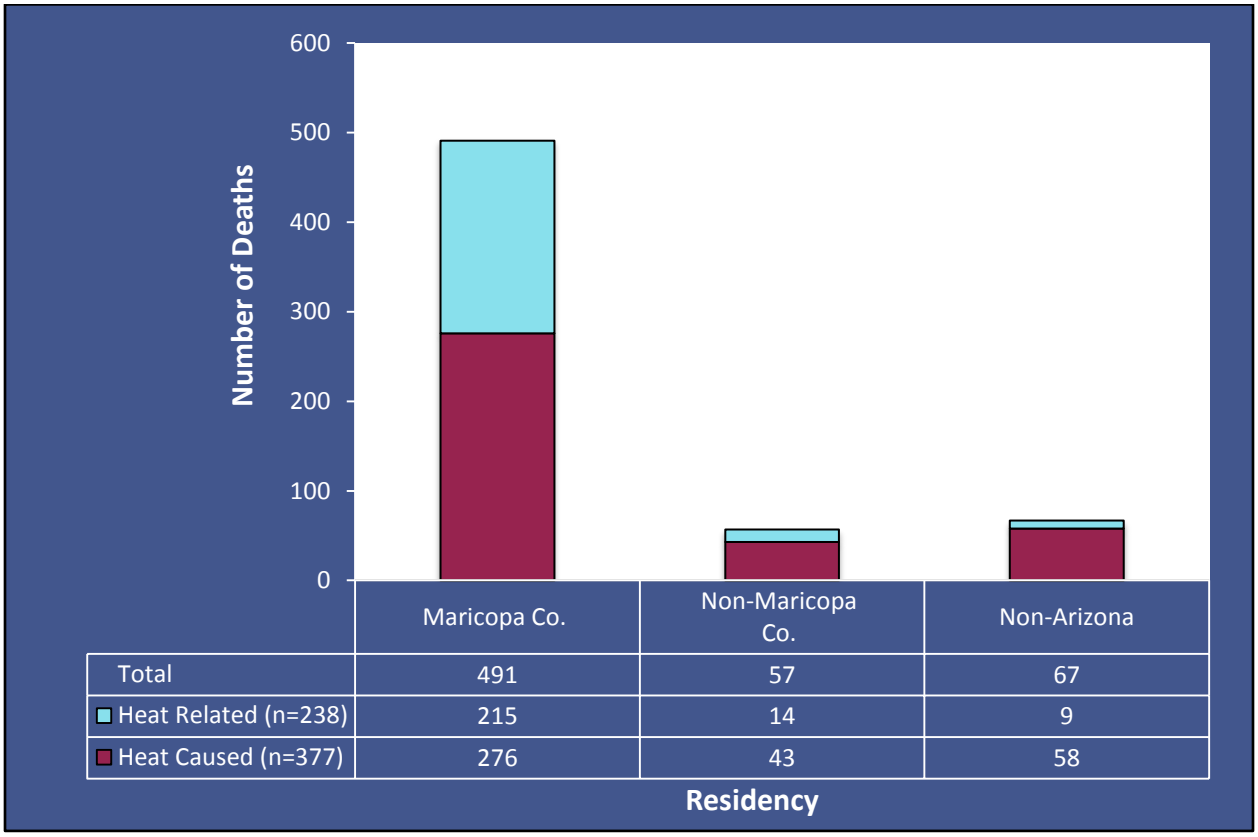
*The deaths that occurred in January and November were results of heat-associated injuries that occurred over the summer.

- The National Weather Service (NWS) issues excessive heat warnings for days with higher than normal temperatures.
- Over this 8-year period, 43 excessive heat warnings were issued; 183 (29%) of the deaths occurred during an excessive heat warning day.
- See Appendix, Table C for more information on excessive heat warnings and deaths.

Heat-Associated Deaths by Residency

- Maricopa County residents accounted for 78% (n=491) of all heat-associated deaths from 2006-2013.
- There were 57 residents of Arizona who lived outside of Maricopa County.
- Non-Arizona residents included 43 U.S residents and 24 non-U.S. residents.
- See Appendix, Table D for more information on residency status.

Graph 3. Heat-Associated Deaths by Residency (n=615)*, Maricopa County, 2006-2013

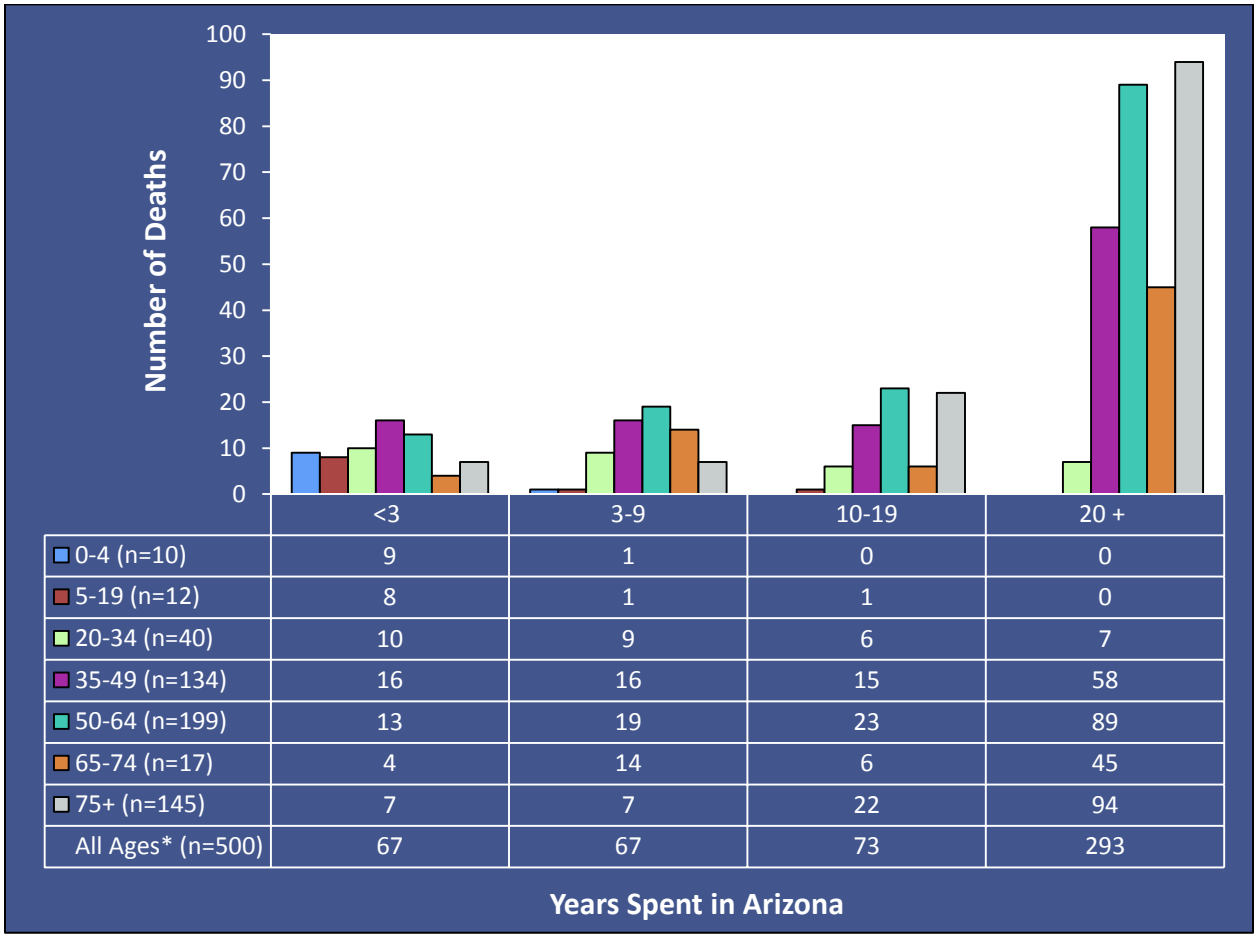


*Excludes 17 case s with unknown residency status

Heat-Associated Death by Years of Life Spent in Arizona

- Of the 500 decedents for whom time spent in Arizona was known, 59% (n=293) resided in Arizona for 20 years or more.
- Overall, the majority of decedents had lived in Arizona for 3 years or longer.

Graph 4. Heat-Associated Deaths by Years of Life Spent in Arizona and Age Group (n=500)*, Maricopa County, 2006-2013



	<3	3-9	10-19	20 +
0-4 (n=10)	9	1	0	0
5-19 (n=12)	8	1	1	0
20-34 (n=40)	10	9	6	7
35-49 (n=134)	16	16	15	58
50-64 (n=199)	13	19	23	89
65-74 (n=17)	4	14	6	45
75+ (n=145)	7	7	22	94
All Ages* (n=500)	67	67	73	293

*Excludes 126 cases for which time spent in Arizona was unknown and 6 cases for which age was unknown

Demographic Characteristics of Heat-Associated Deaths

- The majority of deaths were male (73%, n=459).
- Twenty-two deaths occurred in people 19 years old or younger.
- Most deaths occurred in the 50-64 years old age group (31%, n=199).
- Most cases were White (63%, n=399).
- See Appendix, Table B for more information on the characteristics of heat-associated deaths.

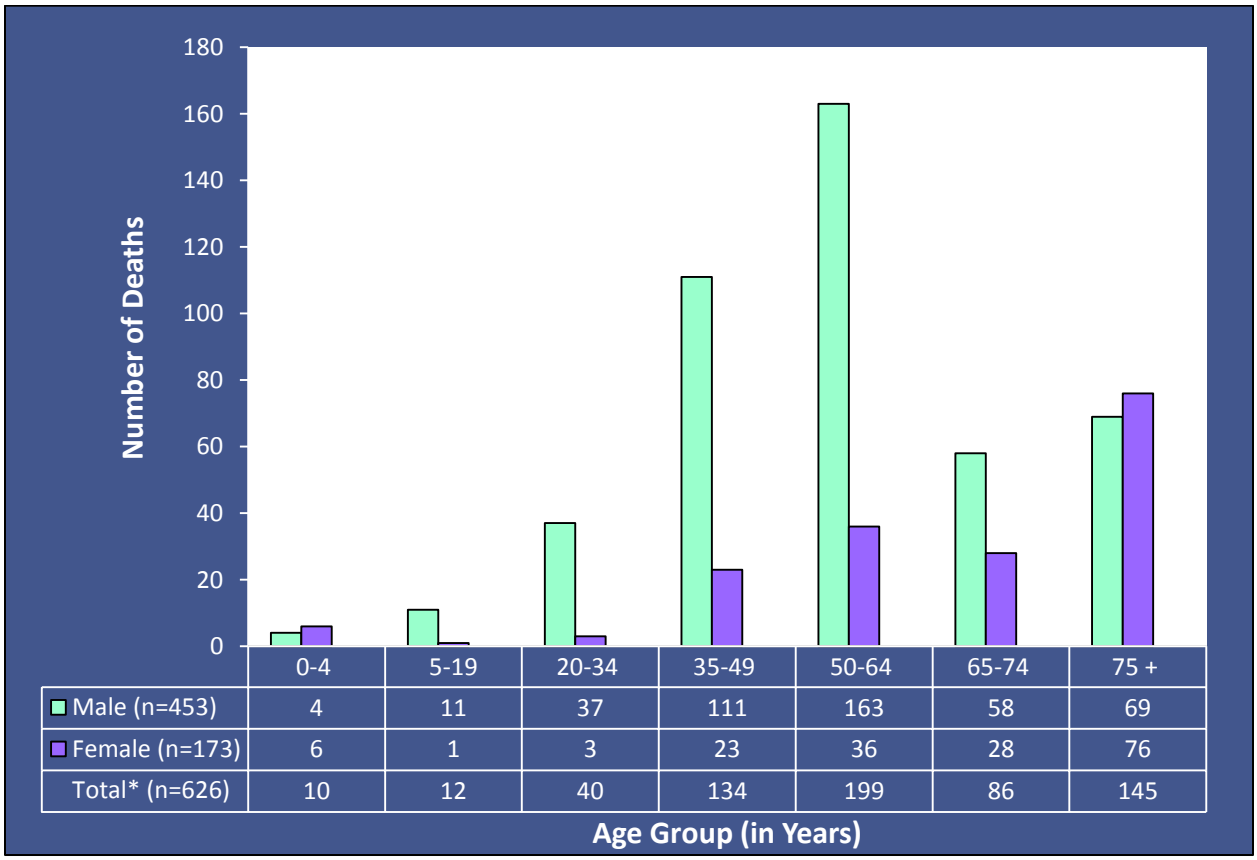
Table 1. Heat-Associated Deaths by Gender, Age, and Race/Ethnicity; Maricopa County, 2006-2013

	TOTAL	%
GENDER		
Male	459	73%
Female	173	27%
Total	**632**	**100%**
AGE GROUP		
0-4 years old	10	2%
5-19 years old	12	2%
20-34 years old	40	6%
35-49 years old	134	21%
50-64 years old	199	31%
65-74 years old	86	14%
75+ years old	145	23%
Unknown	6	1%
Total	**632**	**100%**
RACE/ETHNICITY		
White	399	63%
Hispanic	132	21%
African American	50	8%
Native American	26	4%
Asian/Pacific Islander	6	1%
Multiple/Other	3	0%
Unknown	16	3%
Total	**632**	**100%**

Heat-Associated Deaths by Age Group and Gender

- The highest incidence of heat-associated death occurred among individuals 50-64 years old (32%) followed by those 35-49 years old (21%).
- Female cases were generally older than male cases; 44% (n=76) of all females who died were aged 75 or older.
- There were seventeen pediatric (i.e., 0-17 years old) deaths during this eight-year period.
- See Appendix, Table E for more information on deaths by age and gender.

Graph 5. Heat-Associated Deaths by Age Group and Gender (n=626)*, Maricopa County, 2006-2013



	0-4	5-19	20-34	35-49	50-64	65-74	75 +
Male (n=453)	4	11	37	111	163	58	69
Female (n=173)	6	1	3	23	36	28	76
Total* (n=626)	10	12	40	134	199	86	145

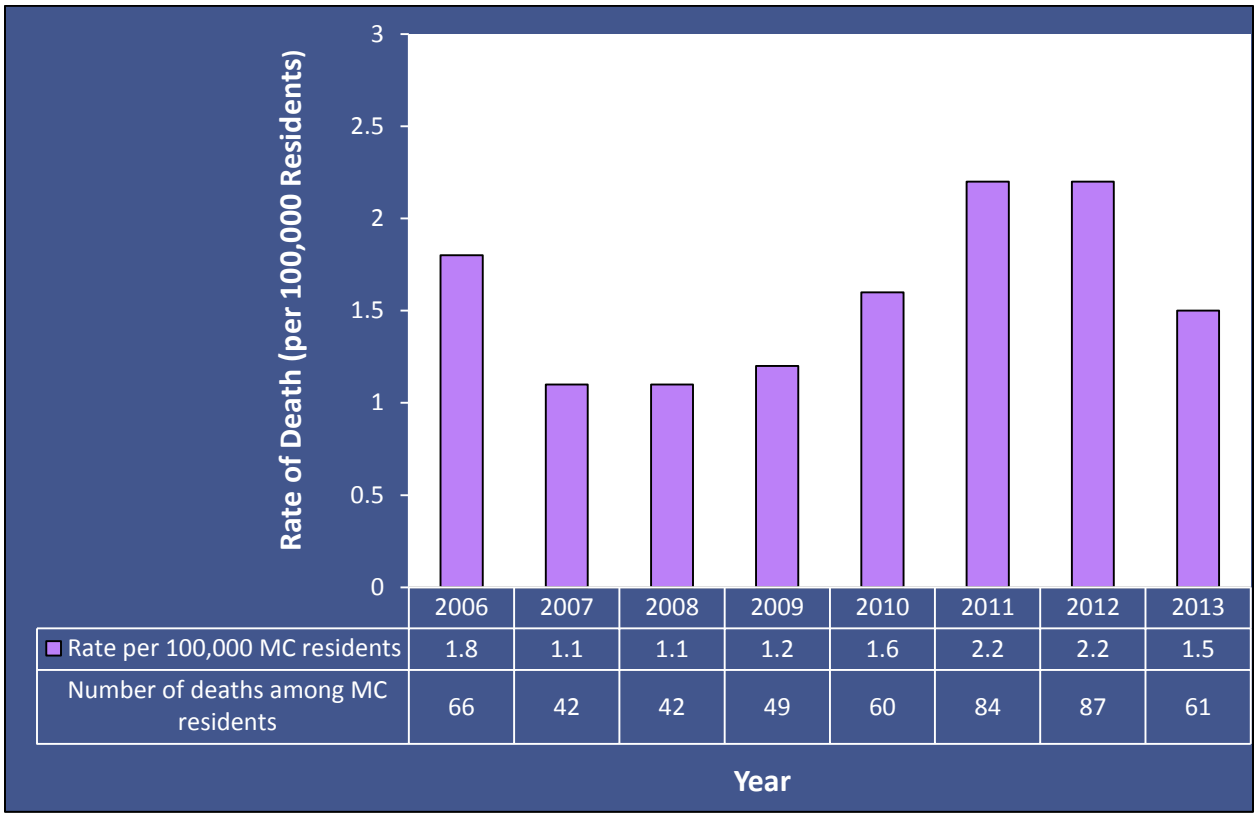
*Excludes 6 cases for which age was unknown

Heat-Associated Deaths Rates

Heat-Associated Death Rates by Year

- The graph below and all other graphs involving death rates only include Maricopa County residents.
- The years that had the highest death rate among Maricopa County residents was 2011 and 2012. The years with the lowest death rate were 2007 and 2008.
- The overall death rate from 2006-2013 was 1.6 per 100,000 Maricopa County residents.

Graph 6. Heat-Associated Crude Death Rate per 100,000 Maricopa County Residents by Year (n=491)*, Maricopa County, 2006-2013



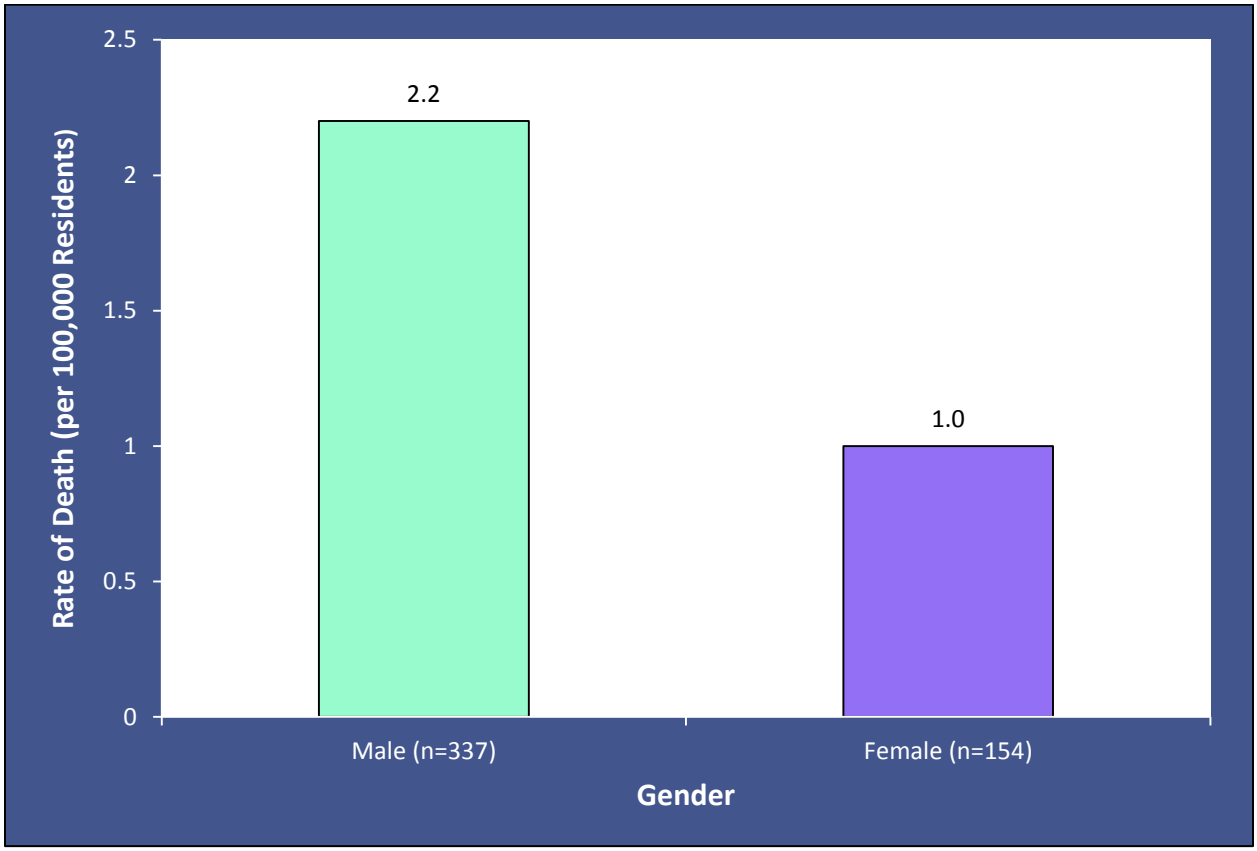
	2006	2007	2008	2009	2010	2011	2012	2013
Rate per 100,000 MC residents	1.8	1.1	1.1	1.2	1.6	2.2	2.2	1.5
Number of deaths among MC residents	66	42	42	49	60	84	87	61

*Based on Census population estimates for Maricopa County. Excludes 141 cases that were not Maricopa County residents.

Heat-Associated Death Rates by Gender

- The majority (69%) of deaths among Maricopa County residents occurred among males.
- The mortality rate for males was 2.2 times greater than the rate for females.
- See Appendix, Table F and Table H for more information on death rates by gender.

Graph 7. Heat-Associated Crude Death Rate per 100,000 Maricopa County Residents by Gender (n=491)*, Maricopa County, 2006-2013

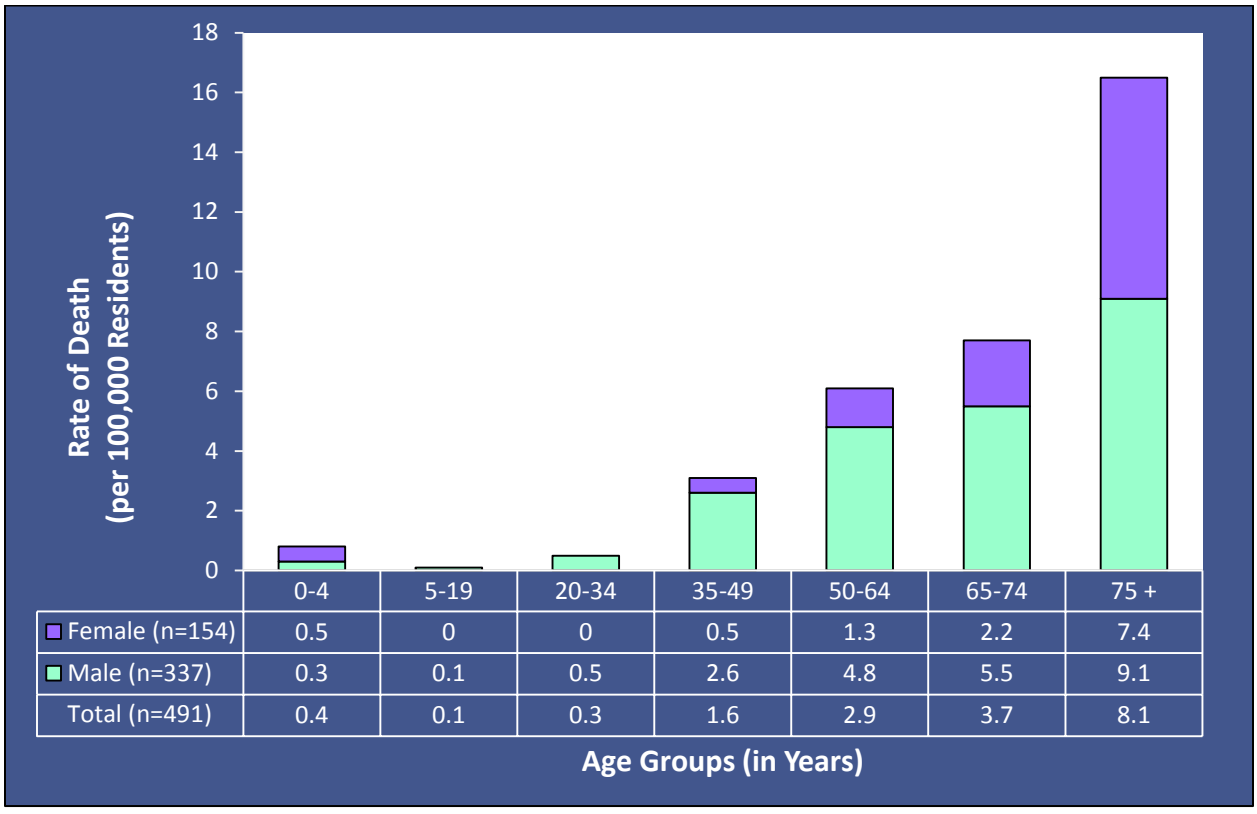


* Based on Census population estimates for Maricopa County; excludes 141 cases that were not Maricopa County residents.

Heat-Associated Death Rates by Age Group and Gender

- The heat-associated mortality rate increases with age.
- People ages 75 and older had the highest mortality rate, at 8.1 per 100,000 residents.
- The mortality rate for males was higher than that of females for all age group except for the 0-4 year old age group.
- See Appendix, Table F and Table G for more information on death rates by age.

Graph 8. Heat-Associated Death Rate per 100,000 Maricopa County Residents by Gender and Age Group (n=491)*, Maricopa County, 2006-2013



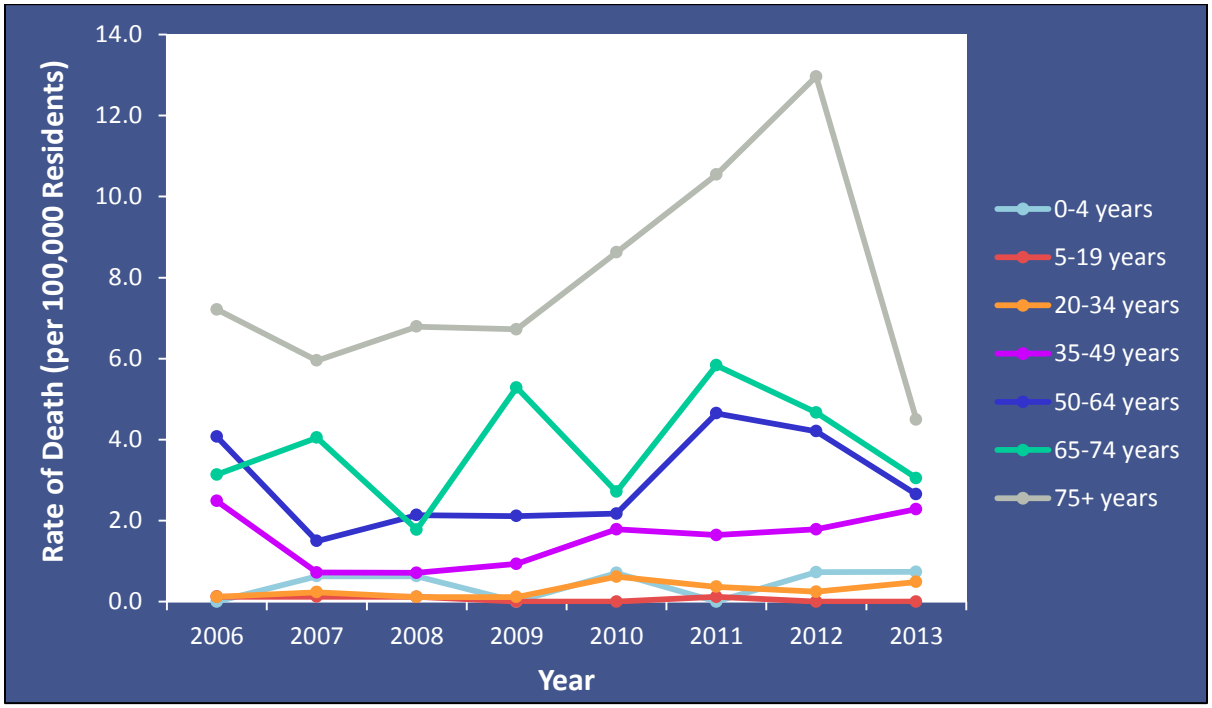
	0-4	5-19	20-34	35-49	50-64	65-74	75 +
Female (n=154)	0.5	0	0	0.5	1.3	2.2	7.4
Male (n=337)	0.3	0.1	0.5	2.6	4.8	5.5	9.1
Total (n=491)	0.4	0.1	0.3	1.6	2.9	3.7	8.1

* Based on Census population estimates for Maricopa County; excludes 141 cases that were not Maricopa County residents.

Heat-Associated Death Rates by Age Group and Year

• For every year between 2006 and 2013, adults aged 75 years and older consistently had the highest heat-associated death rate. The death rate for this age group peaked in 2012, when it was 13.0 per 100,000 Maricopa County residents.

Graph 9. Heat-Associated Crude Death Rate per 100,000 Maricopa County Residents by Age Group and Year (n=491)*, Maricopa County, 2006-2013

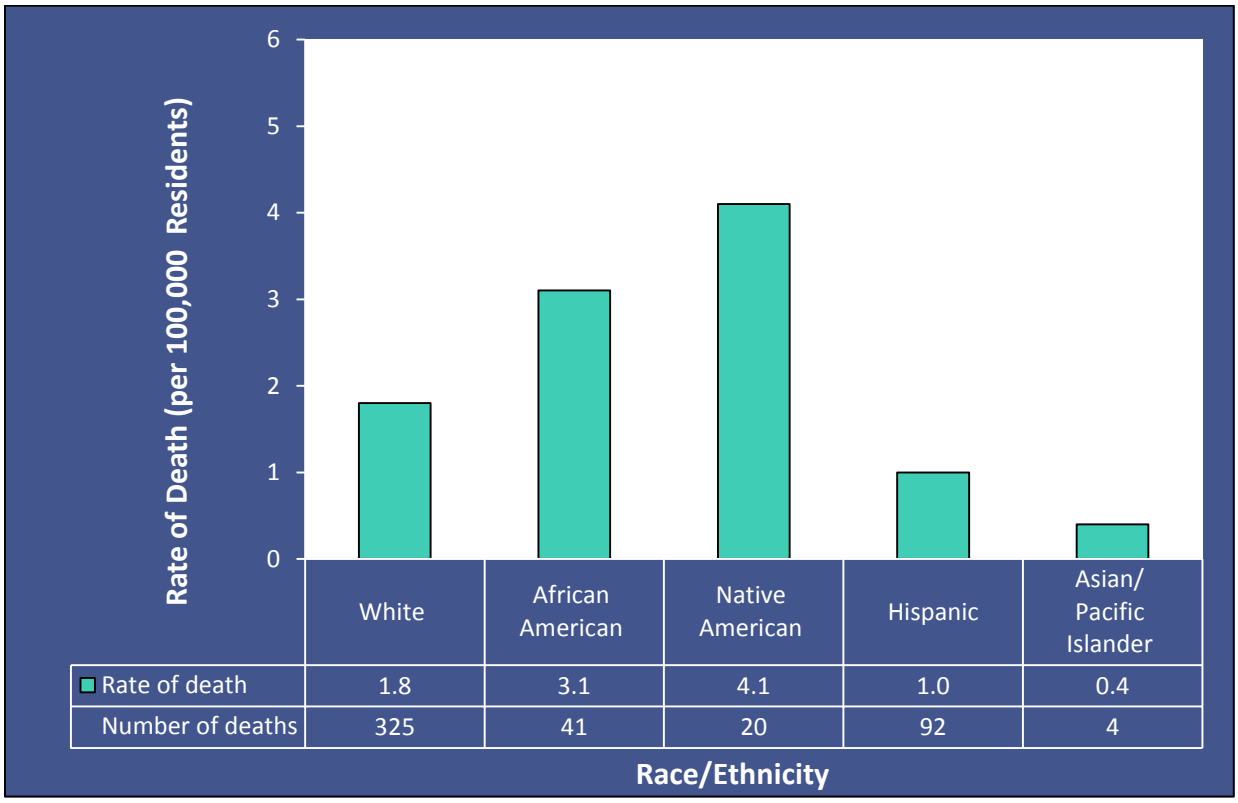


* Based on Census population estimates for Maricopa County; excludes 141 cases that were not Maricopa County residents.

Heat-Associated Death Rates by Race

- For Maricopa County residents, most of the deaths occurred among Whites.
- However, Native Americans had the highest rate of death of all races (4.1 per 100,000 Maricopa County residents).
- See Appendix, Table G and Table H for more information on death rates by race.

Graph 10. Heat-Associated Crude Death Rate per 100,000 Maricopa County Residents by Race/Ethnicity (n=482)*, Maricopa County, 2006-2013

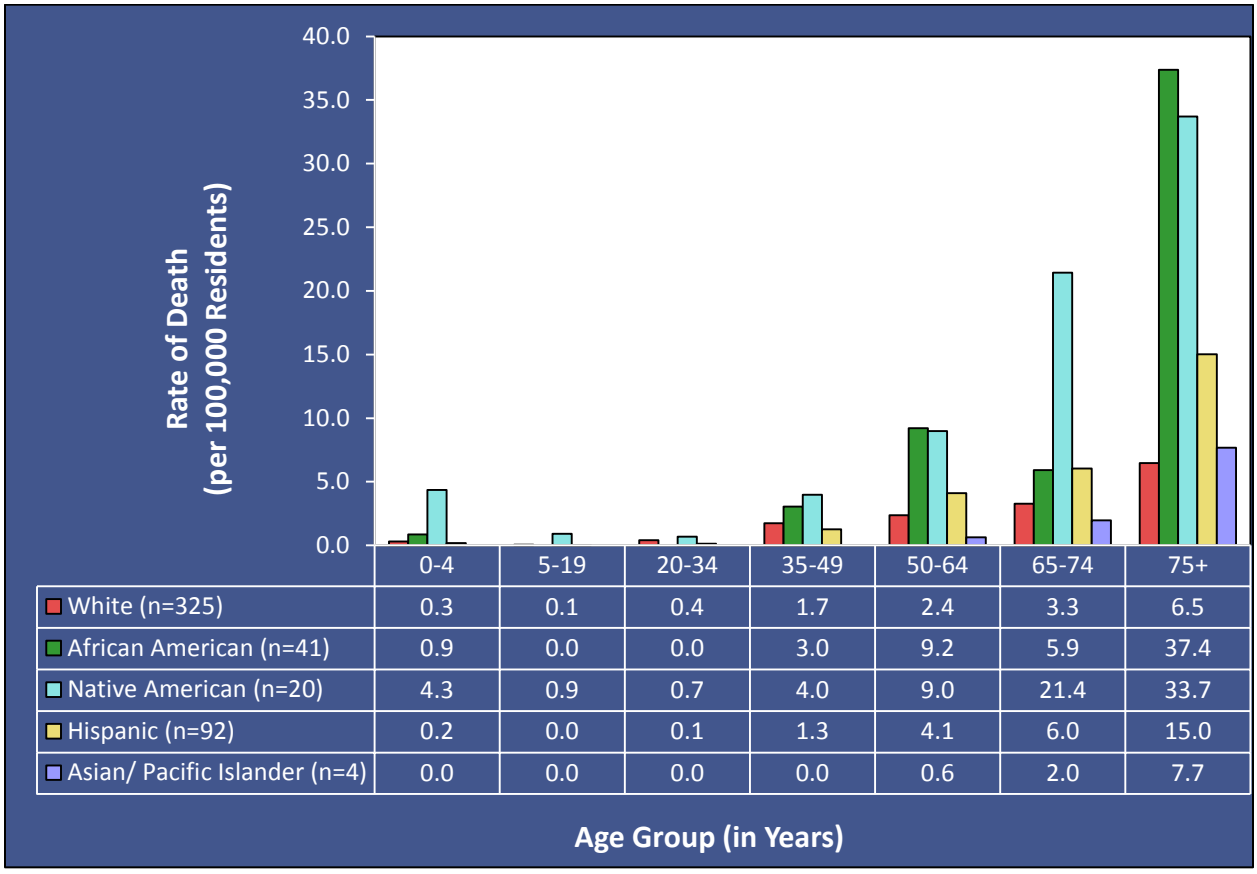


* Based on Census population estimates for Maricopa County. Excludes 141 cases that were not Maricopa County residents and 9 additional cases with unknown/ multiple races.

Heat-Associated Death Rates by Race and Age

- The highest death rate of any age and race/ethnicity group is seen in African Americans aged 75+ years, at 37.4 per 100,000 residents.
- Native Americans aged 65-74 years and 75+ years also have high rates of heat-associated death.

Graph 11. Heat-Associated Crude Death Rate per 100,000 Maricopa County Residents by Race/Ethnicity and Age Group (n=482)*, Maricopa County, 2006-2013



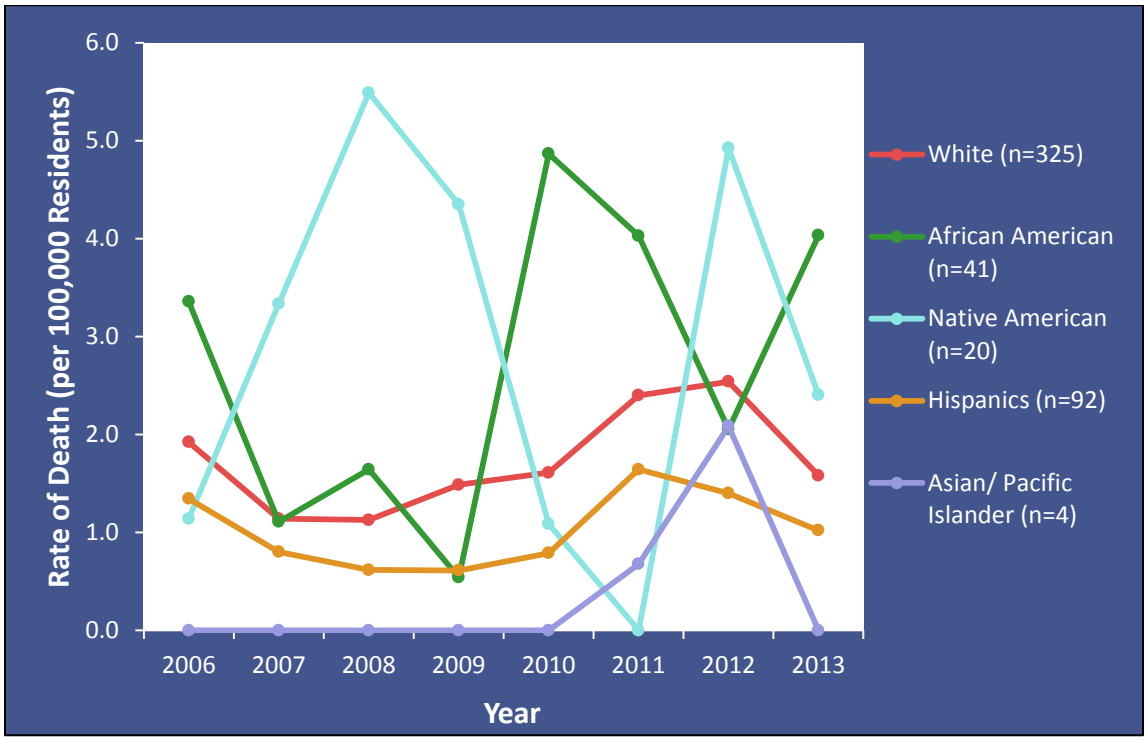
	0-4	5-19	20-34	35-49	50-64	65-74	75+
White (n=325)	0.3	0.1	0.4	1.7	2.4	3.3	6.5
African American (n=41)	0.9	0.0	0.0	3.0	9.2	5.9	37.4
Native American (n=20)	4.3	0.9	0.7	4.0	9.0	21.4	33.7
Hispanic (n=92)	0.2	0.0	0.1	1.3	4.1	6.0	15.0
Asian/ Pacific Islander (n=4)	0.0	0.0	0.0	0.0	0.6	2.0	7.7

* Based on Census population estimates for Maricopa County. Excludes 141 cases that were not Maricopa County residents and nine additional cases with unknown/multiple races.

Heat-Associated Death Rates by Race and Year

• Although the heat-associated death rates by race fluctuated between 2006 and 2013, Native Americans and African Americans generally had the highest rates of death compared to other groups.

Graph 12. Heat-Associated Crude Death Rate per 100,000 Maricopa County Residents by Race and Year (n=482)*, Maricopa County, 2006-2013

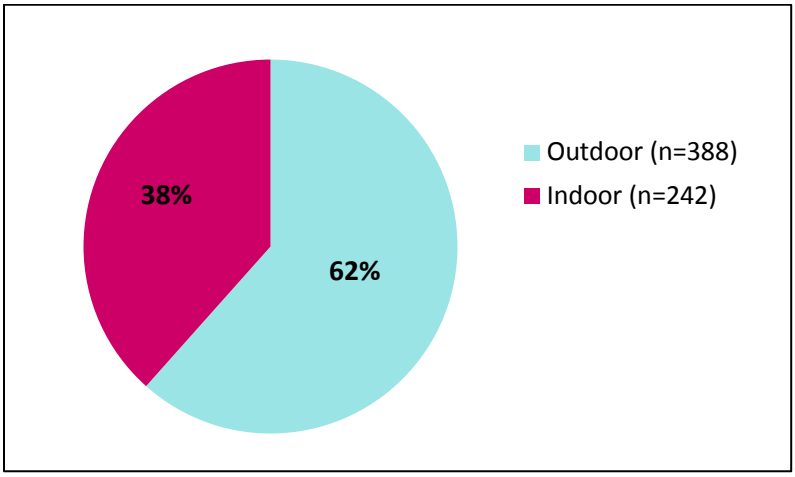


* Based on Census population estimates for Maricopa County. Excludes 141 cases that were not Maricopa County residents and nine additional cases with unknown/multiple races.

Heat-Associated Deaths by Place of Injury

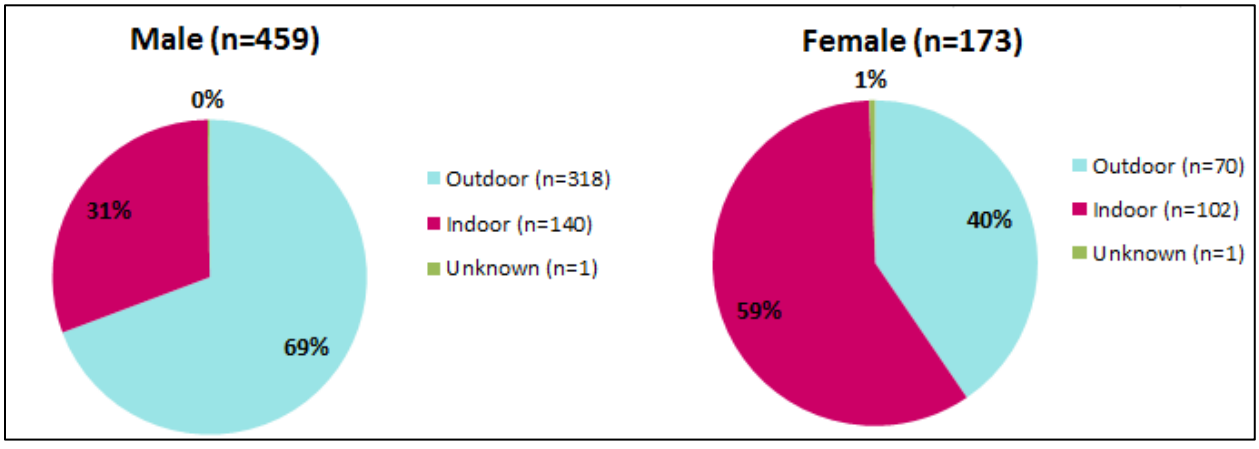
- In general, most heat injuries occurred outdoors.
- The majority of males were injured outdoors (69%). In contrast, the majority of females were injured indoors (59%).
- See Appendix, Table I for more information on place of injury.

Graph 13. Outdoor Heat-Associated Deaths by Place of Injury (n=630)*, Maricopa County, 2006-2013



*Two cases excluded due to unknown place of injury occurrence

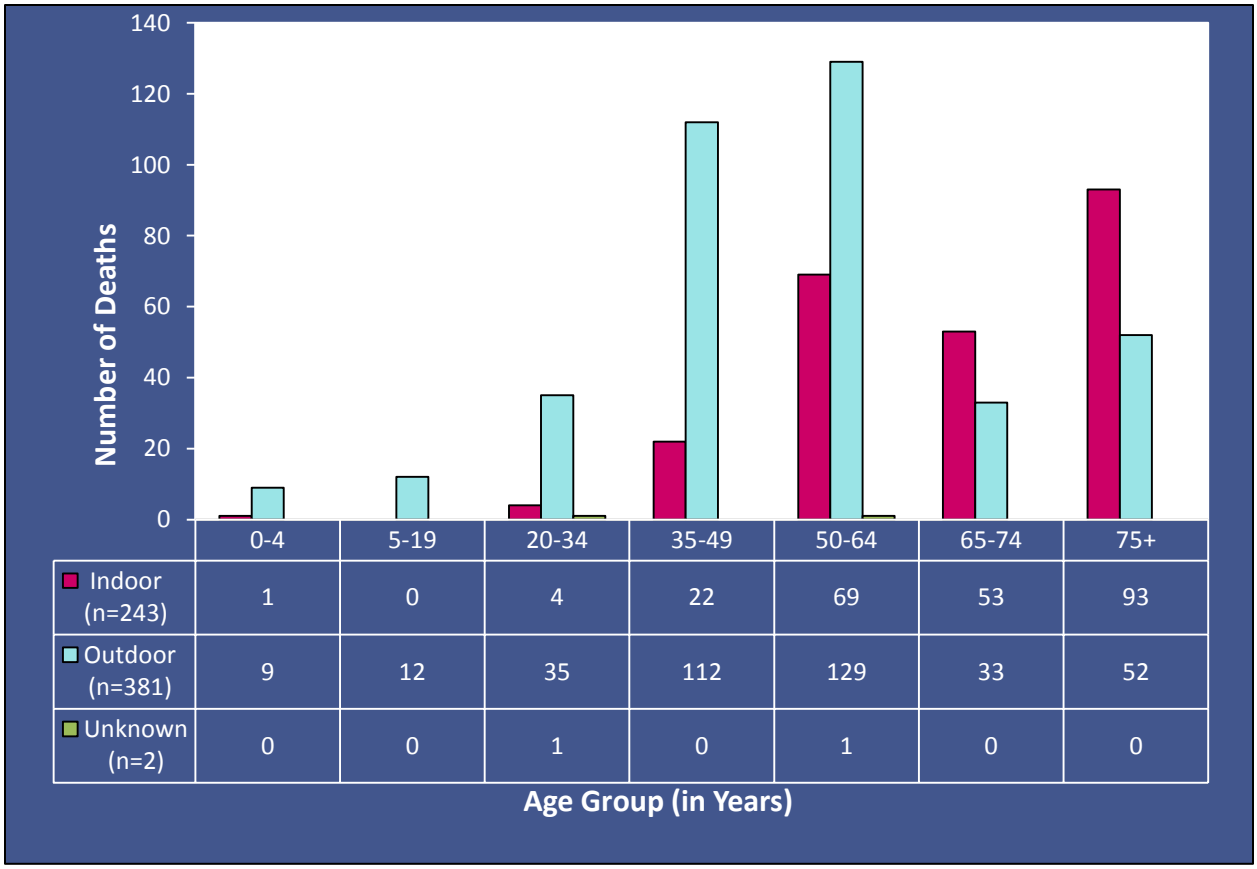
Graph 14. Heat-Associated Deaths by Gender and Place of Injury, Maricopa County, 2006-2013



Heat-Associated Death Rates by Place of Injury and Age

- Individuals 64 years old or younger were more likely to be injured outdoors.
- In contrast, individuals 65 years old or older were more likely to be injured indoors.

Graph 15. Heat-Associated Deaths by Age Group and Place of Injury (n=626)*, Maricopa County, 2006-2013



	0-4	5-19	20-34	35-49	50-64	65-74	75+
Indoor (n=243)	1	0	4	22	69	53	93
Outdoor (n=381)	9	12	35	112	129	33	52
Unknown (n=2)	0	0	1	0	1	0	0

*6 cases excluded due to unknown age

Heat-Associated Death Rates by Place of Injury and Year

Graph 16. Heat-Associated Deaths by Year and Place of Injury (n=630)*, Maricopa County, 2006-2013

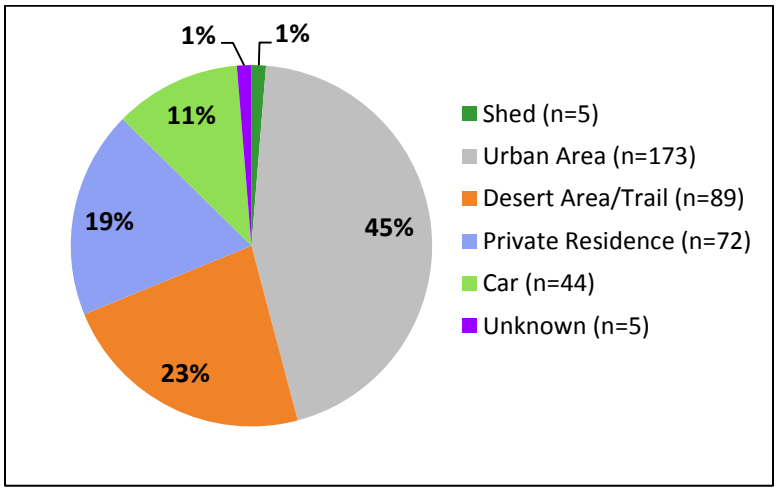
• For every year except for 2011, a higher proportion of decedents were injured outdoors as opposed to indoors.

*Excludes 2 cases with unknown place of injury

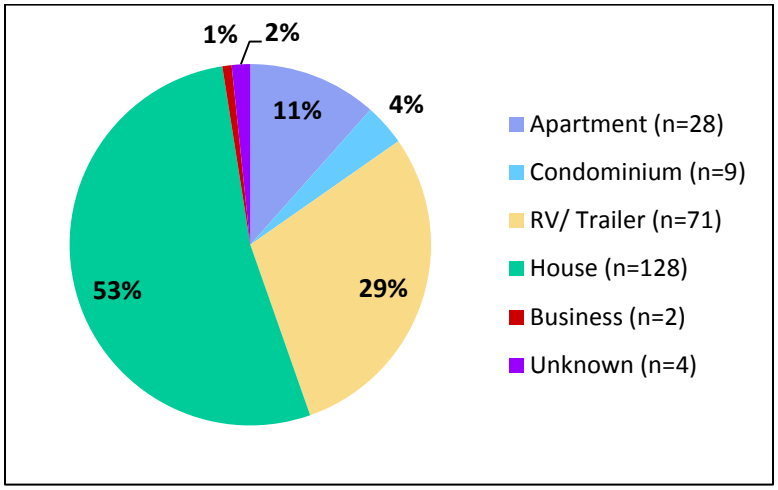
Specific Place of Injury for Indoor and Outdoor Deaths

- Most outdoor deaths were injured in an urban area (45%, n=173).
- Forty-four decedents were injured in a car. See Appendix, Table J for more information on injuries that occurred in a car.
- Most indoor deaths were injured in a house (53%, n=128).

Graph 17. Outdoor Heat-Associated Deaths by Place of Injury (n=388)



Graph 18. Indoor Heat-Associated Deaths by Place of Injury (n=242)



Air Conditioning Use for Indoor Deaths

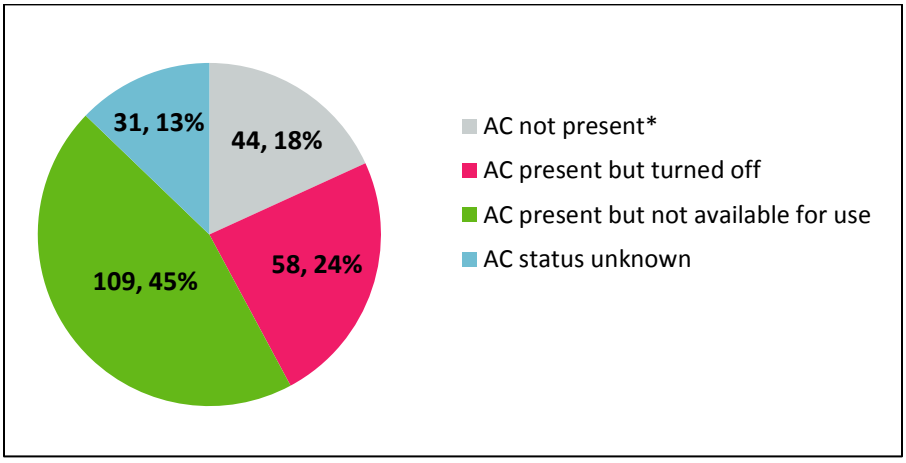
- The air conditioning (AC) status was unknown for 13% of indoor deaths.
- Eighty-seven percent of indoor deaths were injured in an indoor environment not cooled by AC:

  -Eighteen percent did not have AC physically present when they were injured. .

  -Twenty-four percent had AC present but it was turned off for unknown reasons.

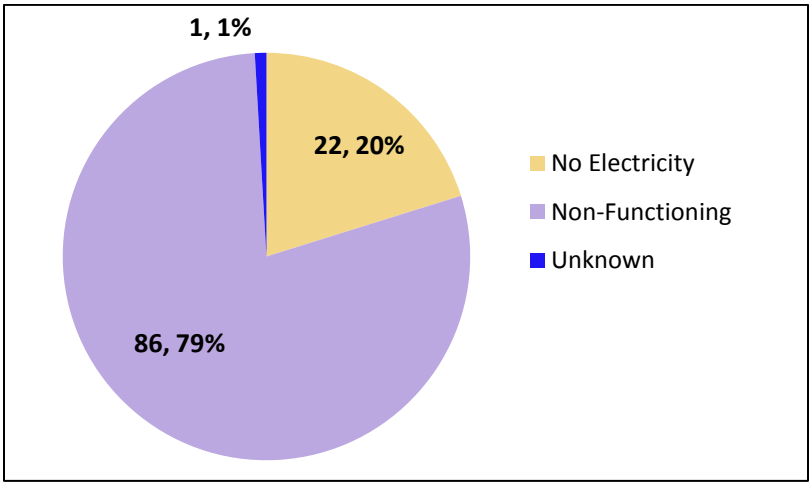
  -Forty-five percent of indoor deaths had AC present but were unable to use it. The most common reason why AC was not available for use was that it was non-functioning (graph 17).

Graph 19. Indoor Heat-Associated Deaths by Use of Air Conditioning Maricopa County, 2006-2013*



*6 of the cases that did not have AC present had a swamp cooler.

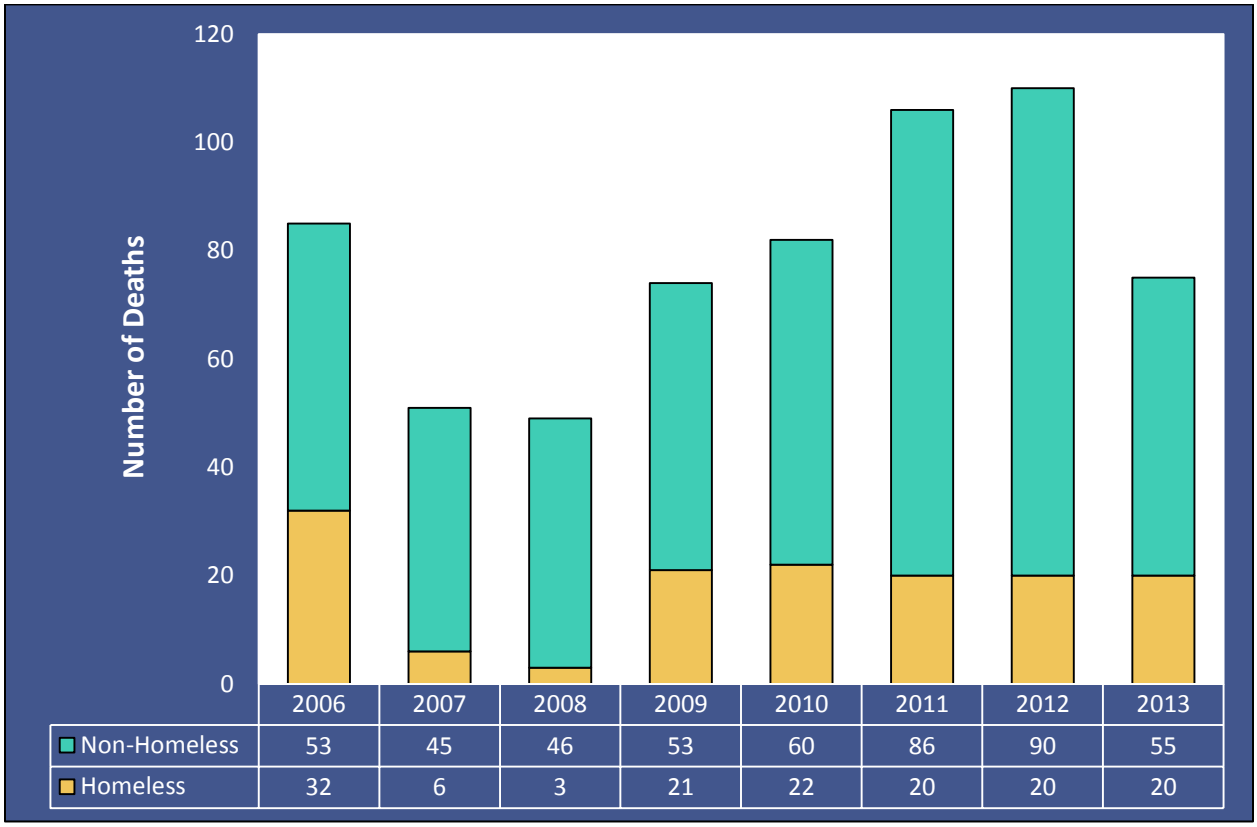
Graph 20. Reasons why AC was not available for use (n=109), Maricopa County, 2006-2013



Homelessness among Heat-Associated Deaths

- From 2006-2013, there were a total of 144 cases (23%) who were homeless.
- The highest number of deaths among the homeless was reported in 2006 with 32 heat-associated deaths (38% of the 2006 total).
- See Appendix, Table K for more information on homelessness.

Graph 21. Homeless Heat-Associated Deaths by Year (n=632), Maricopa County, 2006-2013

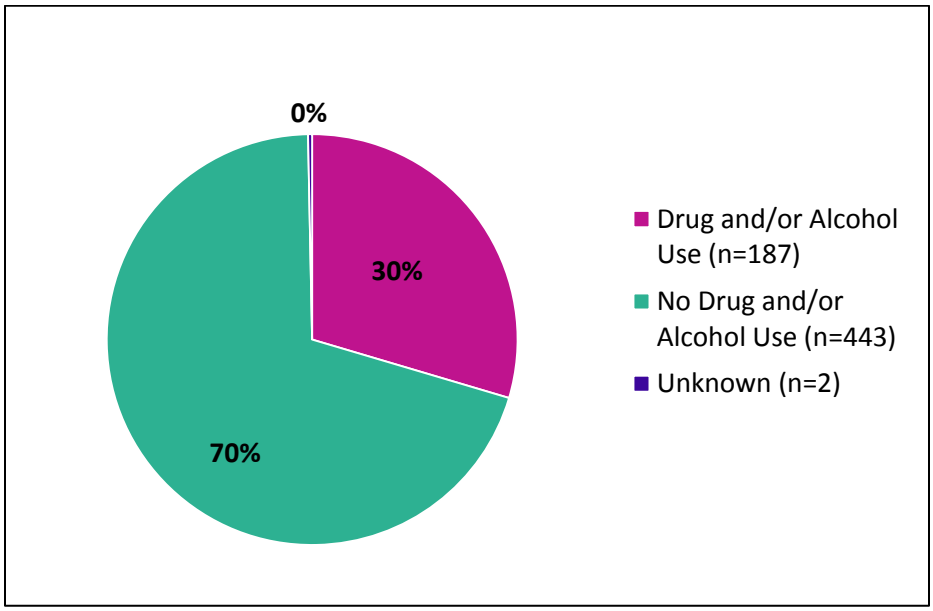


	2006	2007	2008	2009	2010	2011	2012	2013
Non-Homeless	53	45	46	53	60	86	90	55
Homeless	32	6	3	21	22	20	20	20

Substance Use among Heat-Associated Deaths

• There were a total of 187 cases (30%) where drug and/or alcohol use was mentioned on the death certificate.

Graph 22. Drug and Alcohol Use, as Mentioned on the Death Certificate for Heat-Associated Death (n=632), Maricopa County, 2006-2013



V. Conclusions

•There were 632 confirmed heat-associated deaths between 2006 and 2013. The highest number of deaths occurred in 2012 and the fewest number of deaths occurred in 2008.

•The majority of heat-associated deaths were classfied as heat-caused.

•Most deaths occurred between the months of June and August.

•Between 2006 and 2013, 43 excessive heat warnings were issued in Maricopa County—29% if all heat-associated deaths occurred during the days when an warning was issued.

•The majority of cases were Maricopa County residents. In addition, the vast majority of cases had lived in Arizona for at least 3 years.

•There were many more deaths among males than among females.

•Among Maricopa County residents, the rate of heat-associated deaths was highest for males, those 75 and older, and Native Americans. African Americans 75 or older had the highest rate of death of any combined race and age group.

•The majority of cases were injured outdoors. Most outdoor deaths were injured in urban area and most indoor deaths were injured in a house.

•Males were more likely to die outdoors and females were more likely to die indoors. Those who died indoors were generally older than those who died outdoors.

• Eighty-seven percent of indoor deaths were injured in an environment not cooled by air-conditioning.

• Appriximately one in five heat-associated deaths occurred among the homeless.

•Thirty percent of cases had drug or alcohol use mentioned in the death certificate.

VI. Future Plans

Expand heat morbidity surveillance by analyzing hospital discharge data, data from BioSense (a CDC syndromic surveillance system) , and data from the Arizona Prehospital Information and EMS Registry System (AZ-PIERS).

Provide community stakeholders with information related to heat mortality and morbidity that can be used for prevention efforts

Incorporate Geographic Information System (GIS) maps in future heat reports

Analyze the relationship between environmental temperatures and heat-associated mortality and morbidity

To learn more about services provided for cooling and hydration during the summer months, or how you can help, please visit:

http://www.maricopa.gov/publichealth/Programs/Heat/default.aspx

http://www.cir.org/

VII. Appendix

Table A. Heat-Associated Deaths Reported by Investigation Status, Maricopa County, 2006-2013

Year	Total Reported n	Confirmed n (%)	Ruled-Out n(%)	Pending n(%)
2006	104	85 (82%)	19 (18%)	0 (0%)
2007	131	51 (39%)	80 (61%)	0 (0%)
2008	96	49 (51%)	47 (49%)	0 (0%)
2009	114	74 (65%)	40 (35%)	0 (0%)
2010	142	82 (58%)	60 (42%)	0 (0%)
2011	144	106 (74%)	38 (26%)	0 (0%)
2012	173	110 (64%)	63 (36%)	0 (0%)
2013	145	75 (52%)	69 (48%)	1*(0%)
Total	**1,049**	**632 (60%)**	**416 (40%)**	**1 (0%)**

Table B. Characteristics of Heat-Associated Deaths by Year, Maricopa County, 2006-2013

		Year of Death								
		2006	2007	2008	2009	2010	2011	2012	2013	Total
Month of Death	January	0	0	0	0	0	1	0	0	**1**
	February	0	0	0	0	0	0	0	0	**0**
	March	0	0	0	0	0	1	0	1	**2**
	April	0	0	0	1	0	1	0	0	**2**
	May	2	1	0	4	1	2	4	1	**15**
	June	16	11	12	4	18	15	18	16	**110**
	July	62	22	20	42	44	32	33	39	**294**
	August	5	11	12	16	12	39	42	11	**148**
	September	0	5	3	6	6	15	7	7	**49**
	October	0	1	2	1	1	0	3	0	**8**
	Novermber	0	0	0	0	0	0	3	0	**3**
	December	0	0	0	0	0	0	0	0	**0**
	Total	**85**	**51**	**49**	**74**	**82**	**106**	**110**	**75**	**632**
Residence Status	Maricopa	66	42	42	49	61	83	89	59	**491**
	Non-Maricopa	3	3	2	9	13	11	11	5	**57**
	Non-Arizona	9	6	5	14	8	9	9	7	**67**
	Unknown	7	0	0	2	0	3	1	4	**17**
	Total	**85**	**51**	**49**	**74**	**82**	**106**	**110**	**75**	**632**
Gender	Male	65	34	34	55	62	77	71	61	**459**
	Female	20	17	15	19	20	29	39	14	**173**
	Total	**85**	**51**	**49**	**74**	**82**	**106**	**110**	**75**	**632**

Table B (continued)

		Year of Death								
		2006	2007	2008	2009	2010	2011	2012	2013	Total
Age Group	0-4	0	2	2	0	2	0	2	2	**10**
	5-19	1	1	2	2	2	1	1	2	**12**
	20-34	5	3	2	5	7	7	4	7	**40**
	35-49	24	7	7	15	18	22	22	19	**134**
	50-64	29	15	15	20	24	37	36	23	**199**
	65-74	9	9	5	13	7	16	16	11	**86**
	75+	14	14	16	18	21	23	29	10	**145**
	Unknown	3	0	0	1	1	0	0	1	**6**
	Total	**85**	**51**	**49**	**74**	**82**	**106**	**110**	**75**	**632**
Years of Life Spent in Arizona	< 3 years	9	4	8	4	11	11	8	12	**67**
	3-9 years	10	9	5	7	9	9	9	9	**67**
	10-19 years	8	8	7	4	10	13	18	5	**73**
	20 years	35	20	24	27	38	52	61	36	**293**
	Unknown	23	10	5	32	14	21	14	13	**132**
	Total	**85**	**51**	**49**	**74**	**82**	**106**	**110**	**75**	**632**
Race/Ethnicity	White	53	32	32	46	54	68	71	43	**399**
	African American	9	2	3	2	9	10	5	10	**50**
	American Indian	2	4	5	5	1	0	7	2	**26**
	Hispanic	20	12	9	19	14	23	18	17	**132**
	Asian/Pacific Islander	0	0	0	1	0	1	4	0	**6**
	Multiple	0	0	0	0	1	1	0	1	**3**
	Unknown	1	1	0	1	3	3	5	2	**16**
	Total	**85**	**51**	**49**	**74**	**82**	**106**	**110**	**75**	**632**
Place of Injury	Indoor	26	21	17	25	24	54	46	29	**242**
	Outdoor	58	30	32	49	58	52	63	46	**388**
	Unknown	1	0	0	0	0	0	1	0	**2**
	Total	**85**	**51**	**49**	**74**	**82**	**106**	**110**	**75**	**632**
Homelessness	Homeless	32	6	3	21	22	20	20	20	**144**
	Non-Homeless	53	45	46	53	60	86	90	55	**488**
	Total	**85**	**51**	**49**	**74**	**82**	**106**	**110**	**75**	**632**

Table C. Heat- Associated Deaths by Excessive Heat Warnings, Maricopa County, 2006-2013

Year	Events	Consecutive Days	Date	Number of deaths	Total deaths
2006	1	3	6/3-6/5	3	29
2006	2	2	7/14-7/15	6	
2006	3	3	7/21-7/23	20	
2007	1	1	6/21	1	6
2007	2	2	7/4-7/5	3	
2007	3	2	8/12-8/13	2	
2008	1	2	5/19-5/20	0	13
2008	2	8	6/15-6/22	5	
2008	3	3	7/1-7/3	5	
2008	4	2	8/1-8/2	3	
2009	1	4	7/11-7/14	0	26
2009	2	4	7/17-7/20	16	
2009	3	3	7/26-7/28	3	
2009	4	6	8/1-8/6	6	
2009	5	4	8/27-8/30	1	
2010	1	2	6/6-6/7	1	27
2010	2	3	6/30-7/2	3	
2010	3	3	7/8-7/10	2	
2010	4	5	7/13-7/17	11	
2010	5	2	7/19-7/20	8	
2010	6	1	8/5	1	
2010	7	3	8/13-8/15	1	
2010	8	2	8/23-8/24	0	
2011	1	1	6/22	1	31
2011	2	3	6/27-6/29	6	
2011	3	3	7/1-7/3	3	
2011	4	2	8/2-8/3	1	
2011	5	1	8/18	3	
2011	6	11	8/22-9/1	16	
2011	7	1	9/4	1	
2012	1	2	5/21-5/22	1	32
2012	2	2	5/31-6/1	1	
2012	3	1	6/18	0	
2012	4	4	6/27-6/30	4	
2012	5	2	7/9-7/10	4	
2012	6	9	8/6-8/14	22	

Table C (Continued)

2013	1	1	6/2	1	19
2013	2	1	6/7	0	
2013	3	1	6/12	1	
2013	4	6	6/28-7/3	12	
2013	5	1	8/1	1	
2013	6	4	8/16-8/19	3	
2013	7	2	8/20-8/21	1	
Total	43	128		183	183

Table D. Heat-Associated Deaths by Residency Status, Maricopa County, 2006-2013

Residency Status		
Non-Maricopa (n=57)	Non-Arizona (n=67)	
	U.S. Residents (n=43)	Non-U.S. Residents (n=24)
Apache (1)	AK (1)	Austria (1)
Cochise (2)	AR(1)	Canada (1)
Coconino (1)	CA (7)	Honduras (1)
Gila (1)	CO (2)	Guatemala (1)
Mohave (1)	IA (1)	Mexico (19)
Navajo (2)	IL (1)	Scotland (1)
Pima (2)	IN (1)	
Pinal (7)	MN(1)	
La Paz (2)	NC (1)	
Yuma (1)	ND (1)	
Unknown (37)	NM (1)	
	OR (1)	
	PA (1)	
	TX (3)	
	UT (1)	
	WA (1)	
	WV (1)	
	Unknown (17)	
Total (57)	**Total (43)**	**Total (24)**

Table E. Heat- Associated Deaths by Gender and Age Group, Maricopa County, 2006-2013

Age Group	Deaths by Gender		
	Male n (%)	Female n (%)	Total n (%)
0-4	4 (1%)	6 (3%)	10 (2%)
5-19	11 (2%)	1 (1%)	12 (2%)
20-34	37 (8%)	3 (2%)	40 (6%)
35-49	111 (24%)	23 (13%)	134 (21%)
50-64	163 (36%)	36 (21%)	199 (31%)
65-74	58 (13%)	28 (16%)	86 (14%)
75 +	69 (15%)	76 (44%)	145 (23%)
Unknown	6 (1%)	0 (0%)	6 (1%)
All	**459 (73%)**	**173 (27%)**	**632 (100%)**

Table F. Heat-Associated Death Rates per 100,000 Resident* by Gender and Age Group, Maricopa County, 2006-2013

Age Group	Gender Rate per 100,000 (n)		
	Male	Female	Total
0-4	0.3 (4)	0.5 (6)	0.4 (10)
5-19	0.1 (3)	0 (1)	0.1 (4)
20-34	0.5 (18)	0 (1)	0.3 (19)
35-49	2.6 (82)	0.5 (17)	1.6 (99)
50-64	4.8 (115)	1.3 (33)	2.9 (148)
65-74	5.5 (52)	2.2 (24)	3.7 (76)
75+	9.1 (63)	7.4 (72)	8.1 (135)
All Ages	**2.2 (337)**	**1.0 (154)**	**1.6 (491)**

*Based on Census population estimates for Maricopa County. Excludes 141 cases who were not Maricopa County residents.

Table G. Heat-Associated Death Rates per 100,000 Residents* by Race/Ethnicity and Age Group, Maricopa County, 2006-2013

Age Group	Race/ Ethnicity Rate per 100,000 (n)				
	White	African American	Native American	Hispanic	Asian/ Pacific Islander
0-4	0.3 (3)	0.9 (1)	4.3 (2)	0.2 (2)	0.0 (0)
5-19	0.1 (2)	0.0 (0)	0.9 (1)	0.0 (1)	0.0 (0)
20-34	0.4 (14)	0.0 (0)	0.7 (1)	0.1 (3)	0.0 (0)
35-49	1.7 (67)	3.0 (8)	4.0 (4)	1.3 (20)	0.0 (0)
50-64	2.4 (89)	9.2 (16)	9.0 (5)	4.1 (34)	0.6 (1)
65-74	3.3 (54)	5.9 (3)	21.4 (3)	6.0 (13)	2.0 (1)
75+	6.5 (96)	37.4 (13)	33.7 (4)	15.0 (19)	7.7 (2)
All Ages	**1.8 (325)**	**3.1 (41)**	**4.1 (20)**	**1.0 (92)**	**0.4 (4)**

* Based on Census population estimates for Maricopa County. Excludes 141 cases that were not Maricopa County residents and nine additional cases with unknown/multiple races.

Table H. Heat-Associated Death Rates per 100,000 Residents* by Gender and Race/Ethnicity, Maricopa County, 2006-2013

Race/Ethnicity	Gender Rate per 100,000 (n)		
	Male	Female	Total
White	2.5 (221)	1.1 (104)	1.8 (325)
African American	3.9 (28)	0.7 (13)	1.7 (41)
Native American	5.3 (12)	3.2 (8)	4.2 (20)
Hispanic	1.5 (67)	0.6 (25)	1.1 (92)
Asian/Pacific Islander	0.8 (4)	0.0 (0)	0.4 (4)
All Races	**2.2 (337)**	**1.0 (154)**	**1.6 (491)**

*Based on Census population estimates for Maricopa County. Excludes 141 cases that were not Maricopa County residents.

Table I. Heat-Associated Deaths by Indoor or Outdoor Occurrence, Age Group, and Gender, Maricopa County, 2006-2013

Age Group	Indoor			Outdoor		
	Male	Female	Total	Male	Female	Total
0-4	0	1	1	4	5	9
5-19	0	0	0	11	1	12
20-34	4	0	4	32	3	35
35-49	15	7	22	96	16	112
50-64	49	20	69	114	15	129
65-74	35	18	53	23	10	33
75+	37	56	93	32	20	52
Unknown	0	0	0	6	0	6
Total	**140**	**102**	**242**	**318**	**70**	**388**

*Excludes 2 cases for which place of injury was unknown

Table J. Heat-Associated Deaths that Occurred in a Car by Age-Group, Maricopa County, 2006-2013

Age Group	Number of Deaths
0-4	9 (20%)
5-19	1 (2%)
20-34	4 (9%)
35-49	9 (20%)
50-64	16 (36%)
65-74	4 (9%)
75+	1 (2%)
All Ages	**44 (100%)**

Table K. Homeless Heat-Associated Deaths by Age-Group and Gender, Maricopa County, 2006-2013

Age Group	Gender		
	Male	Female	Total
0-4	0 (0%)	0 (0%)	0 (0%)
5-19	4 (3%)	0 (0%)	4 (3%)
20-34	16 (11%)	0 (0%)	16 (11%)
35-49	41 (28%)	2 (1%)	43 (30%)
50-64	65 (45%)	2 (1%)	67 (47%)
65-74	7 (5%)	1 (1%)	8 (6%)
75+	1 (1%)	0 (0%)	1 (1%)
Unknown	5 (3%)	0 (0%)	5 (3%)
All Ages	**139 (97%)**	**5 (3%)**	**144 (100%)**

Table L. Heat-Associated Deaths by Education Category, Maricopa County, 2006-2013

Education Category	n	(%)
8th grade or less	35	6%
9th through 12th grade; no diploma	43	7%
High school graduate or GED completed	134	21%
Some college credit, but no degree	60	9%
Associate degree (e.g.AA,AS)	13	2%
Bachelor's degree (e.g.BA,BS)	20	3%
Master's degree (e.g.MA,MS,MEng,MEd,MSW,MBA	7	1%
Doctorate (e.g.PhD,EdD) or Professional degree (e.g.MD,DDS,DVM,LLB,JD)	0	0%
Not Classifiable	3	0%
Unknown	317	50%
Total	**632**	**100%**