

Last Updated: March 2024

2023 Heat Related Deaths Report

**Maricopa County
Department of Public Health
Division of Epidemiology and Informatics**

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Acknowledgments

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

- 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)
- City of Phoenix Heat Relief Network
- Arizona Faith Network Heat Relief Centers

For all **media inquiries**, please contact phpio@maricopa.gov

To receive additional data, please submit a data request form through the Maricopa County Public Health website [here](#). A staff member from the Climate and Health Epidemiology team will contact you to discuss your request.

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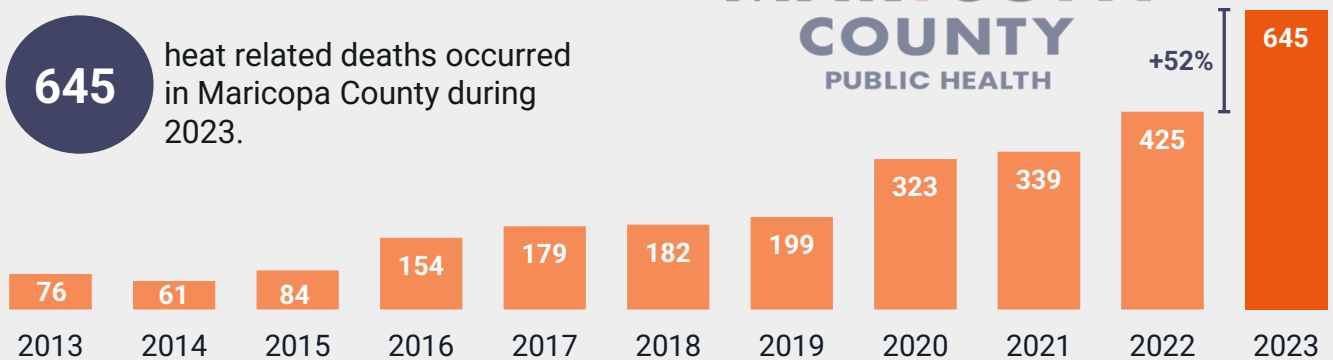
Primary Author: Meaghan Batchelor, Climate and Health Epidemiologist II

2023 Heat Related Deaths

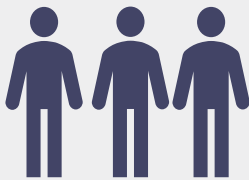


645

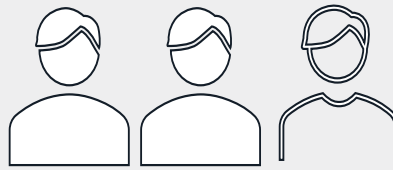
heat related deaths occurred in Maricopa County during 2023.



* 1 death that occurred in September of 2023 is pending a cause of death



More than **3 out of 4** heat related deaths were **male**.

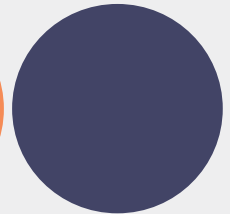


Almost **2 out of 3** heat related deaths were **age 50 years or older**

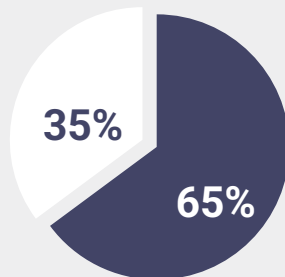
80%

of heat related deaths were among **Maricopa County residents**

3 out of 4 heat related deaths had an injury location **outside**.



Sixty-five percent of heat related deaths **involved substances** in 2023.



Forty-five percent of heat related deaths were among **people experiencing homelessness**.



1 out of 2 heat related deaths had a medical history of **physical/mental health conditions**.



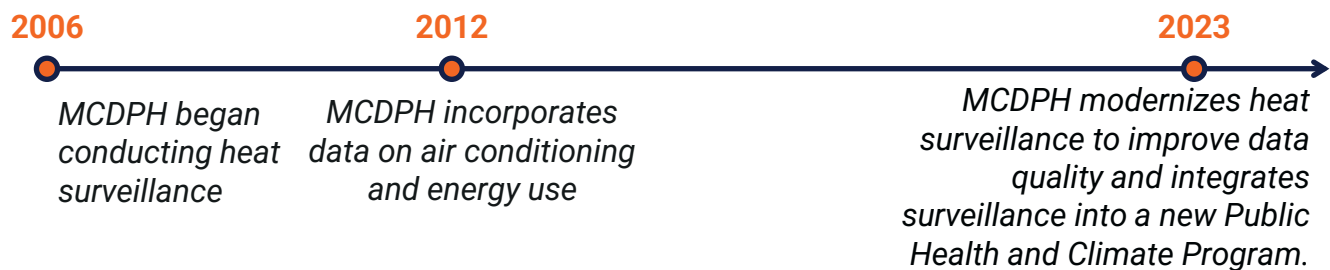
71% of heat related deaths occurred on a day where the Weather Service issued an **excessive heat warning**

Introduction

Mortality from environmental heat is a significant public health problem in Maricopa County, especially because it is largely preventable. Sharing this information helps community stakeholders to design interventions to prevent heat related deaths among vulnerable populations.

TIMELINE OF HEAT SURVEILLANCE IN MARICOPA COUNTY

Maricopa County Department of Public Health (MCDPH) has conducted heat surveillance each year since 2006. The enhanced heat surveillance season usually begins in May and ends in October



HEAT DEATHS CLASSIFICATION

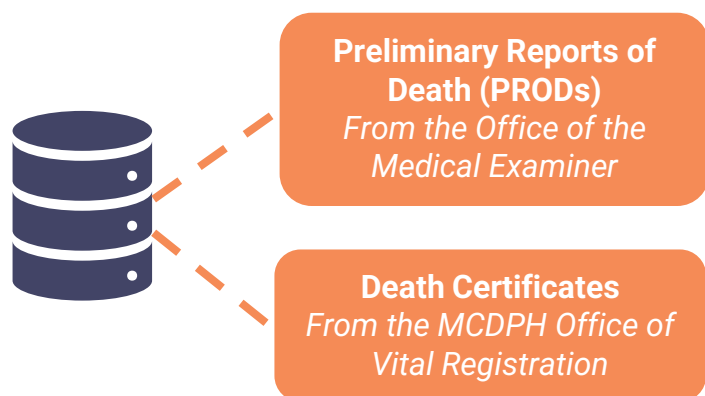
Heat-related deaths are now classified as heat-caused or heat-contributed:

Heat Caused Environmental heat was directly involved in the sequence of events causing deaths.

Heat Contributed Environmental heat contributed to the deaths but was not in the sequence of events causing deaths.

HEAT SURVEILLANCE DATA SOURCES

Maricopa County uses two main sources of data for heat surveillance:



HEAT SURVEILLANCE OBJECTIVES

The main goals of heat surveillance are to identify the demographic characteristics of heat related deaths (e.g., age and gender) and the risk factors for mortality (e.g., homelessness or lack of air conditioning).

For more information on how heat-related deaths are classified, see the definitions in Appendix.

Heat Relief: Community Highlights

The Heat Relief Network, made up of many municipalities, nonprofit organizations, faith-based community, and businesses are hard at work to provide heat relief to Maricopa County and prevent heat related illness and deaths, including the operation of cooling/respice centers and hydration stations. The Arizona Faith Network (AFN) and City of Phoenix have provided data on their heat relief efforts that MCDPH would like to highlight below:

City of Phoenix

The City of Phoenix's 'We're Cool' Outreach Program reached over **8,300 people** (more than double that of 2022) through 1700 staff/volunteer hours. They also had 150+ PHX C.A.R.E.S referrals in 2023.

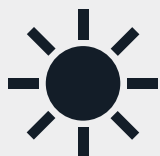
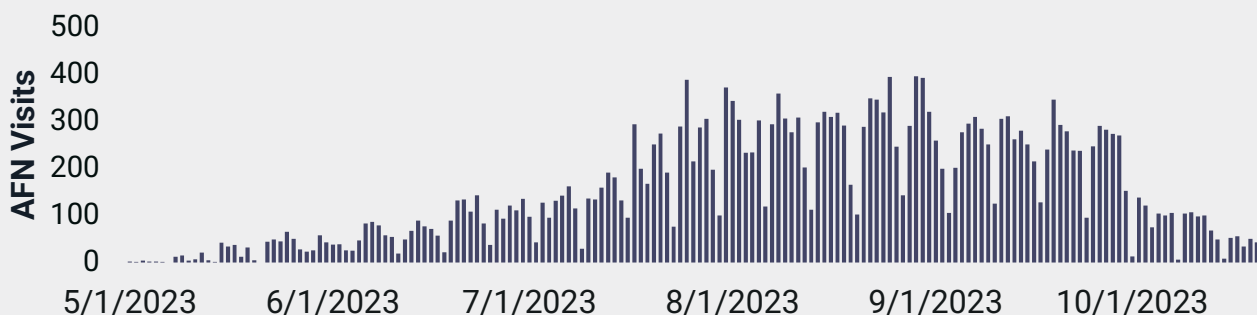


Phoenix's Office of Heat Response and Mitigation (OHRM) Water Distribution Program distributed over **400,000** bottles of water to local non-profits, small businesses, and faith-based organizations to provide heat relief.

The City of Phoenix's efforts allowed **28,392** people to receive heat relief supplies and an additional **16,069** received wraparound, case management and respice from the American Rescue Plan Act (ARPA) Heat Relief Grant.

Arizona Faith Network

During the summer of 2023, The AFN provided heat relief at least **25,972 times** across their thirteen sites.



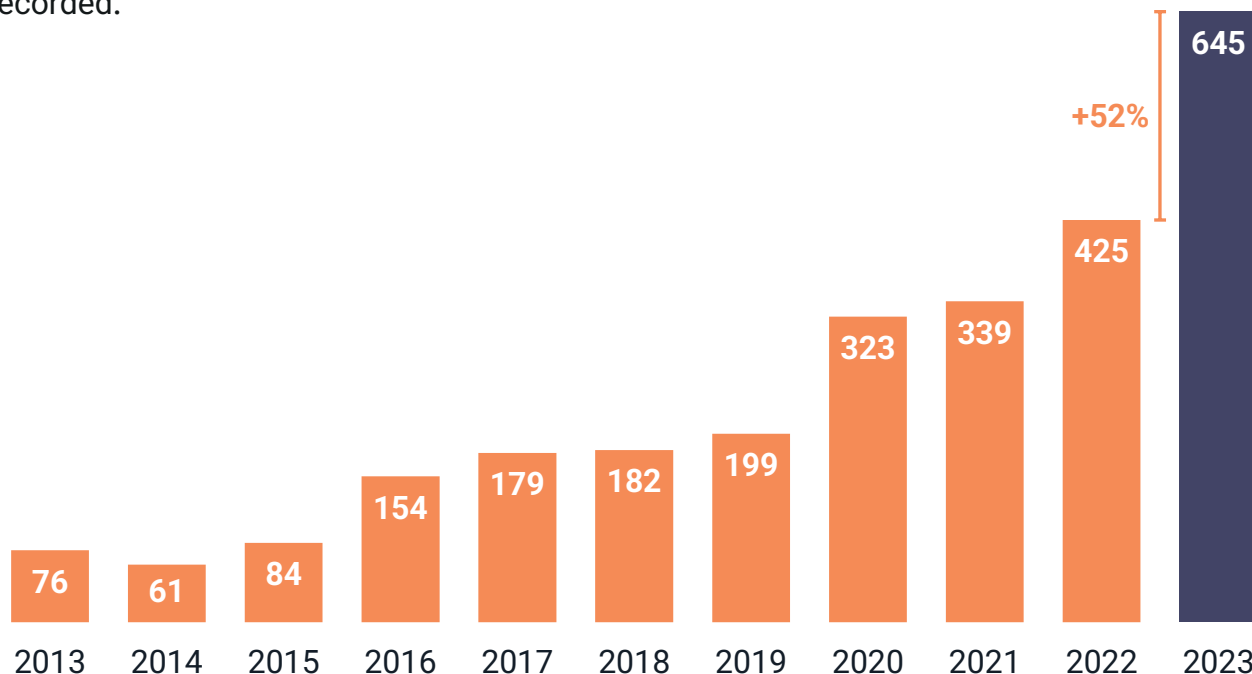
80% of heat relief visits captured by the AFN were among people who identified as **experiencing homelessness** and **28%** were **experiencing symptoms of heat related illness** upon check in to the heat relief site.

In an effort to identify barriers, awareness, and utilization of heat relief centers in Maricopa County, MCDPH also conducted an evaluation of cooling centers during the summer of 2023. To learn more about the results from that evaluation, [click here](#).

Heat Related Deaths Over Time

Deaths by Year

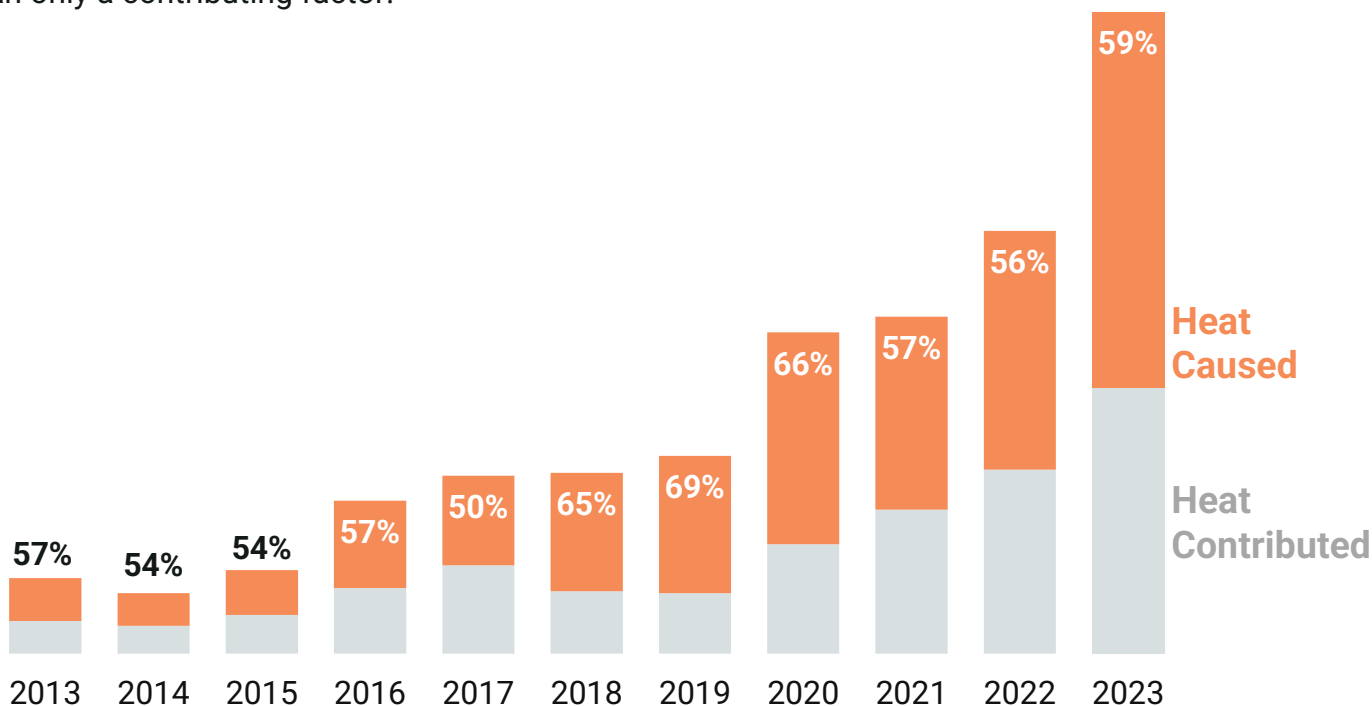
Maricopa County identified a total of **645** heat related deaths occurring in 2023. This represents a 52 percent increase from last year and the most heat related deaths ever recorded.



* 1 death that occurred in September of 2023 is pending a cause of death

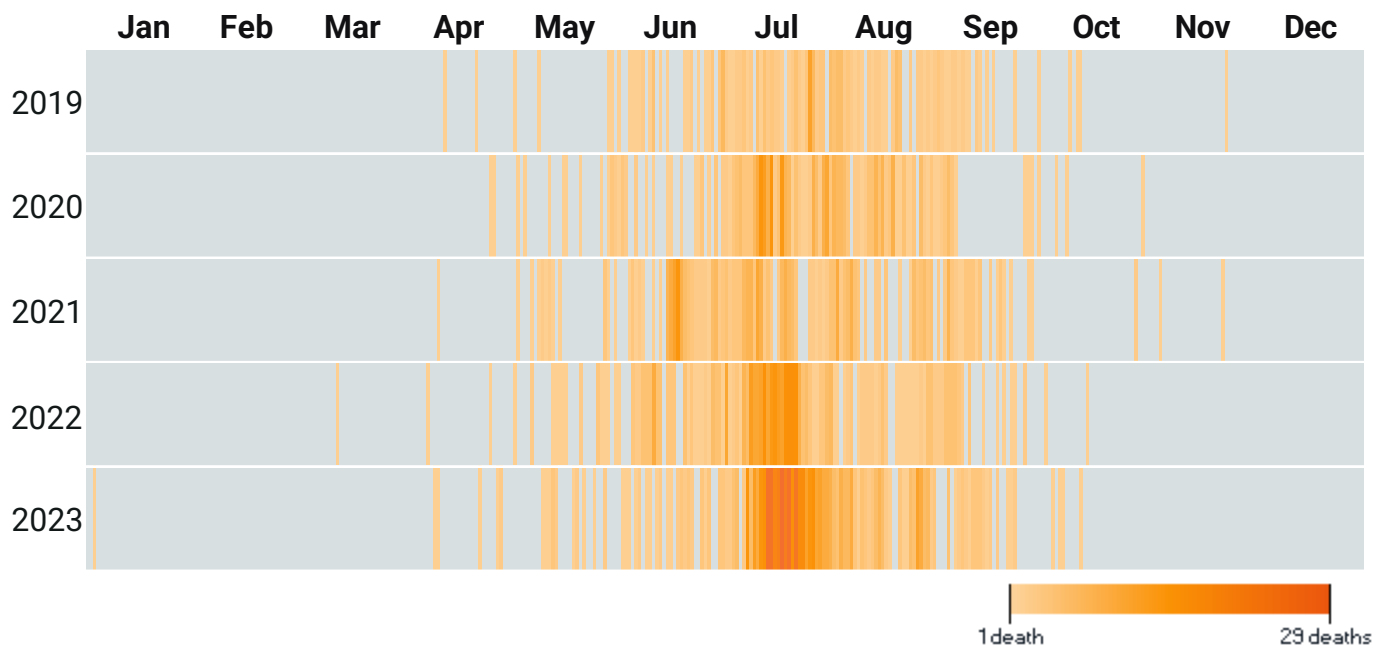
In 2023, fifty-nine percent of all heat related deaths were heat caused.

Over the last ten years in Maricopa County, most heat related deaths were heat caused. This means environmental heat was directly involved in the cause of death in these cases, rather than only a contributing factor.

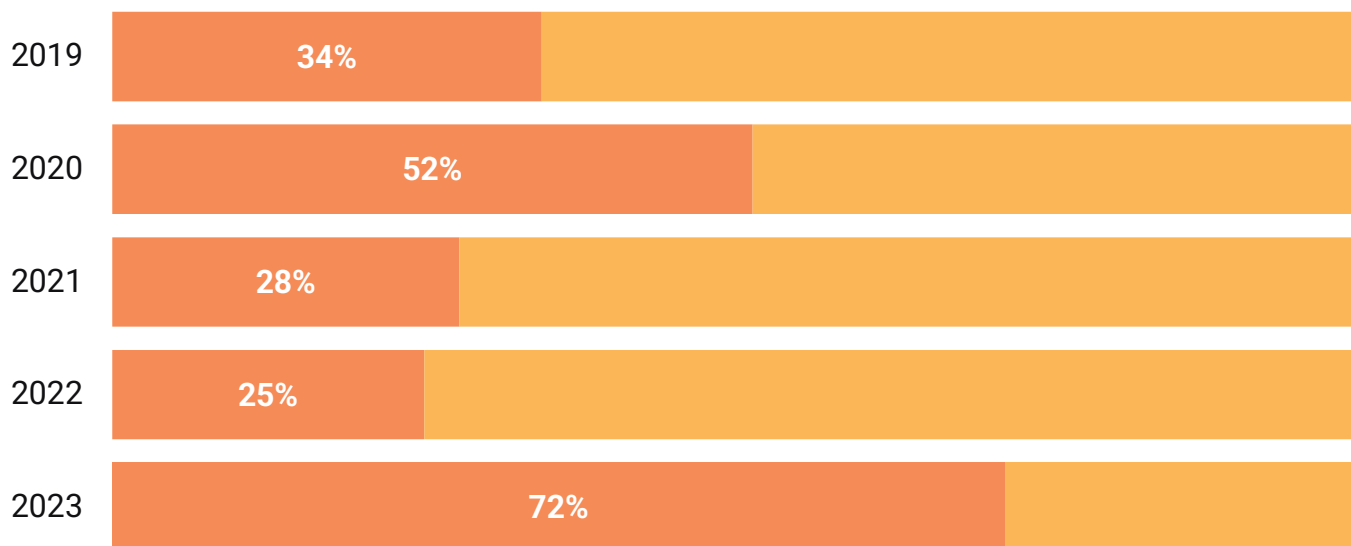


Heat Related Deaths Over Time

In 2023, an average of 13 heat related deaths per day occurred during the month of July. Sixty-four percent of all heat related deaths occurred during July, nearly 10% higher than any previous year.



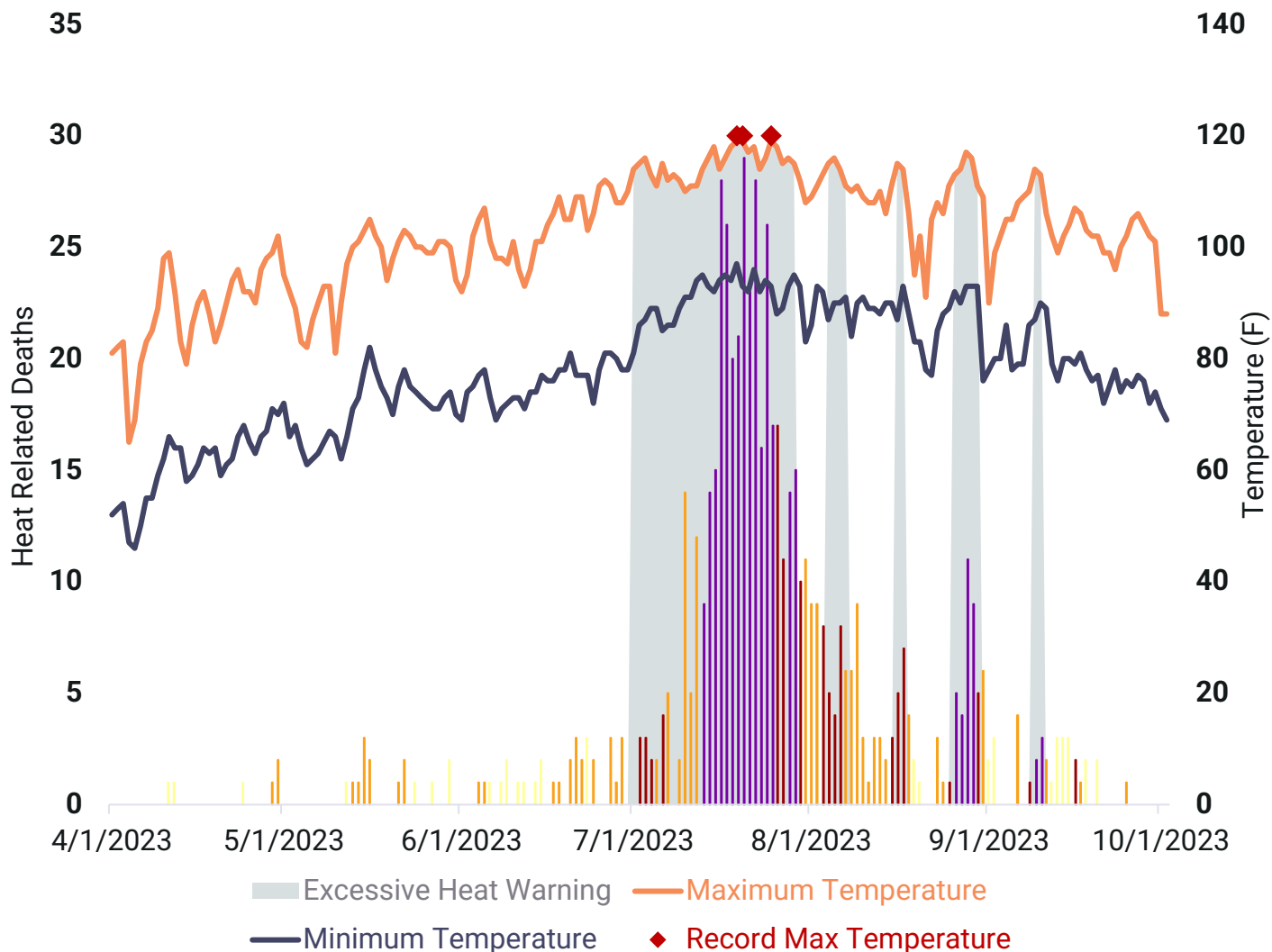
In 2023, 71% of heat related deaths occurred on days with an **excessive heat warning**. The National Weather Service (NWS) issued five excessive heat warnings for a total of 42 days in 2023. From July 1 – July 29, a warning was issued every single day. Over the past 5 years, an average of 32% of deaths occurred on days with an excessive heat warning.



2023 Heat Related Deaths

Extreme Heat

Daily temperatures were not below 91 degrees from July 10th – July 25th. **During these two weeks, 303 deaths occurred.** A new top 5 record-breaking hottest temperatures of 119 occurred on July 19th, 20th, and 25th in Maricopa County.



Over **half** of all heat related deaths in 2023 occurred on days where heat risk was calculated as **extreme**. There were 21 days in 2023 where the NWS calculated an extreme heat risk.

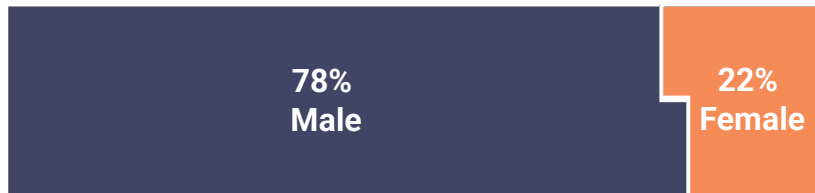
For more information: National Weather Service <https://www.weather.gov/psr/heat>

None	Minor	Moderate	Major	Extreme
No risk.	Risk to those extremely sensitive to heat.	Risk to those sensitive to heat.	Risk to most people.	Risk to everyone.
7%	24%	15%	52%	



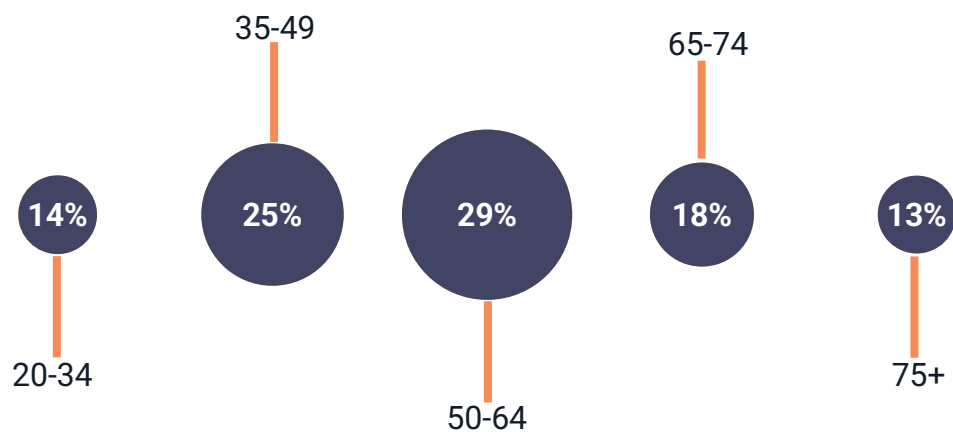
Demographic Overview

Sex, Age, Race, and Ethnicity



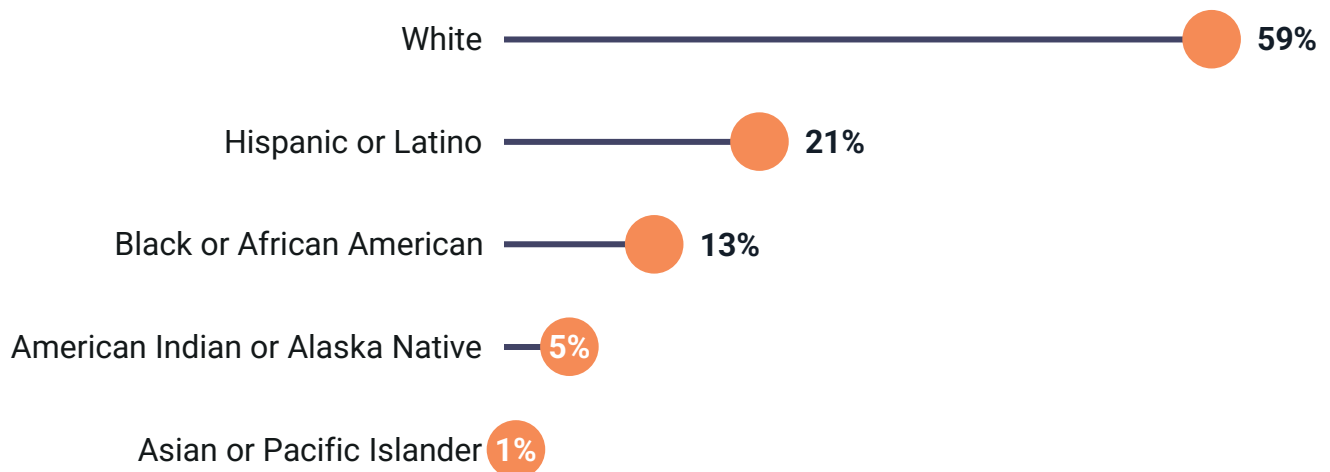
More than 3 out of 4 heat related deaths were among males in 2023.

Nearly two-thirds of all heat related deaths occurred among individuals aged 50 or older.



Nearly 60% of heat related deaths occurred among non-Hispanic White individuals.

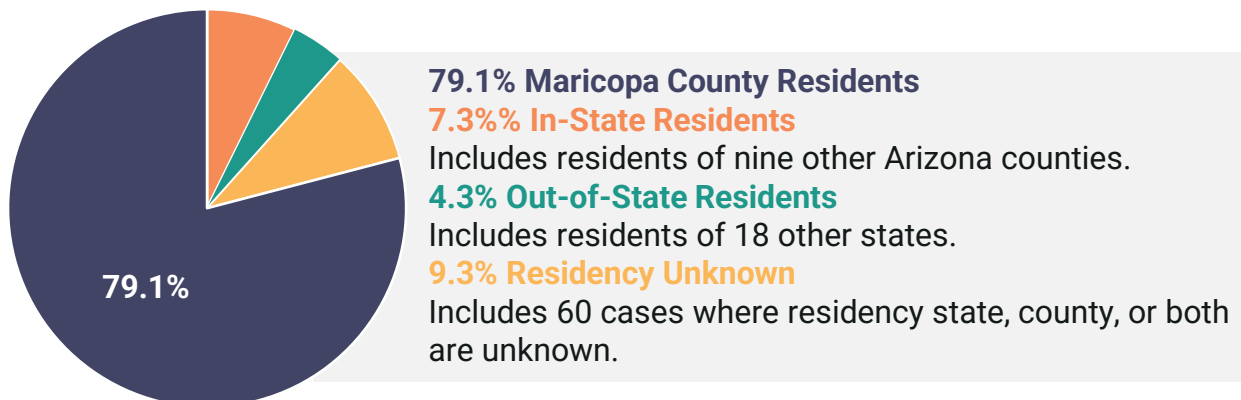
Compared to the proportion in which they make up Maricopa County's total population, African Americans (6.8%) and American Indians (2.9%) are overrepresented among heat deaths. Population rates found at: <https://www.census.gov/quickfacts/fact/table/maricopacountyarizona/PST045222>



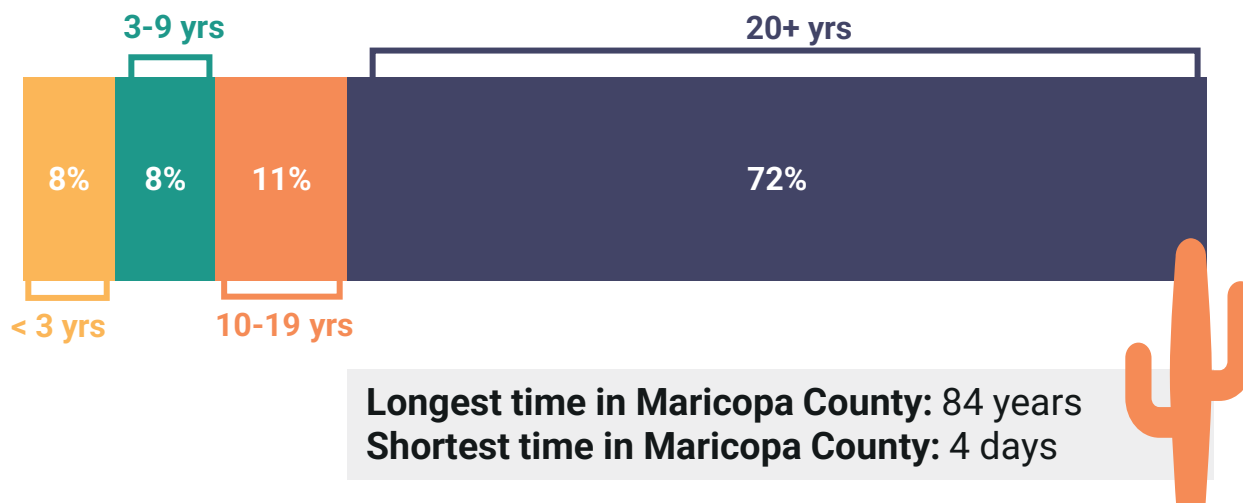
2023 Heat Related Deaths

Residency

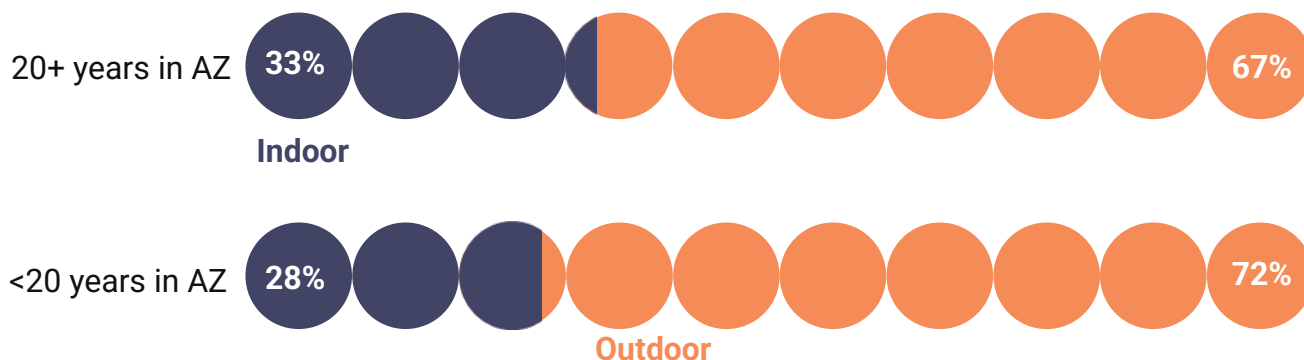
Local residents account for the majority of heat related deaths in Maricopa County.



Among Maricopa County residents for whom length of residency is known, nearly three-fourths had lived in Arizona for **twenty years or more**. The longest residency was 84 years in 2023. **Excludes 216 cases where time spent in AZ is unknown.*



Residents who lived in Arizona twenty years or more had a 5% higher proportion of deaths with an **indoor injury location** compared to those who lived in AZ less than twenty years.



Circumstances of Death

Location of Injury

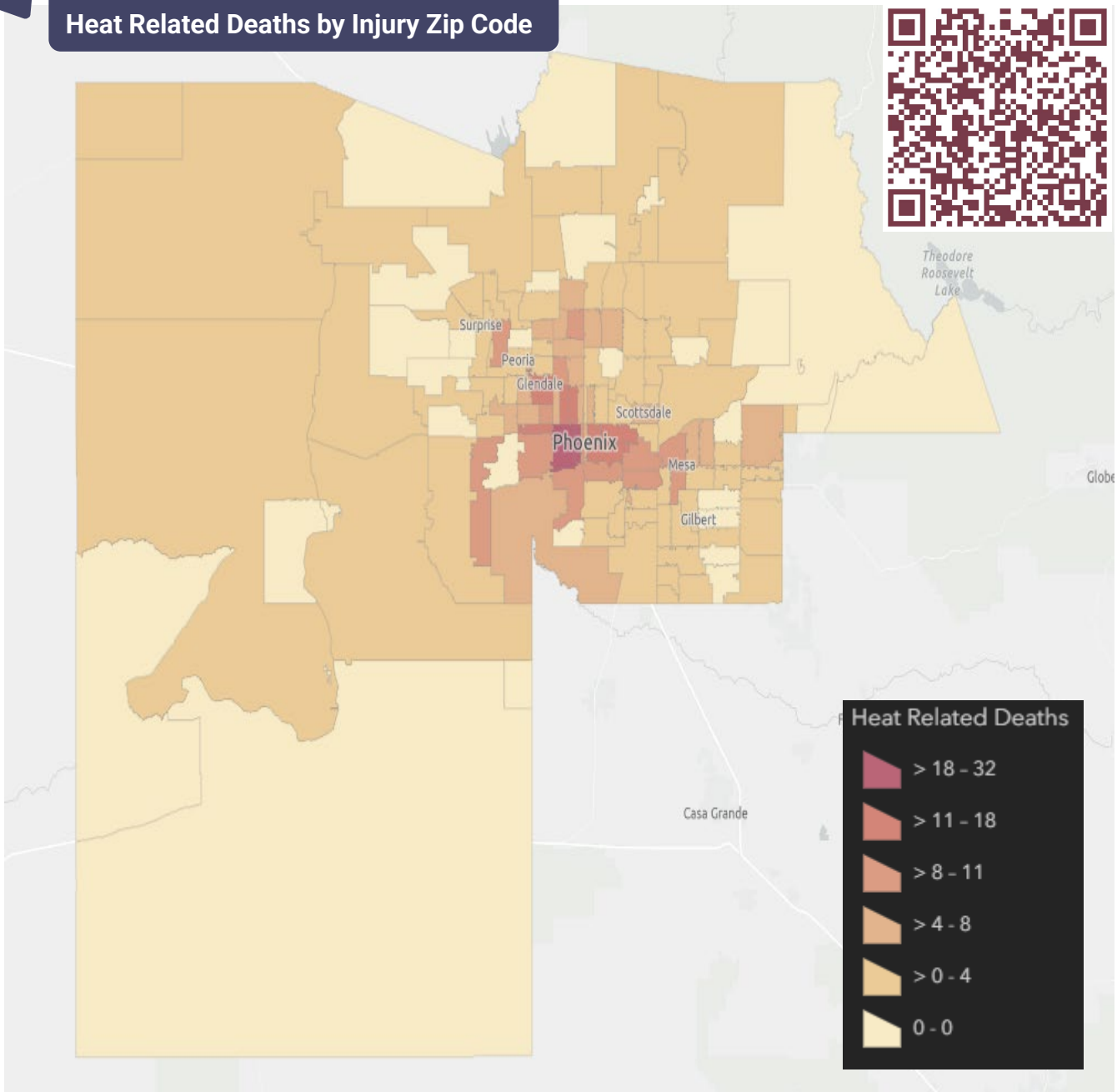
Heat Related Deaths by City of Injury

Phoenix	Mesa	Glendale	Scottsdale	Tempe	Avondale	Chandler
340	51	35	25	24	15	14
Sun City	Laveen	Peoria	Buckeye	Guadalupe	Apache	Youngtown
11	9	9	6	6	5	5

**Cities with less than 5 deaths have been excluded*

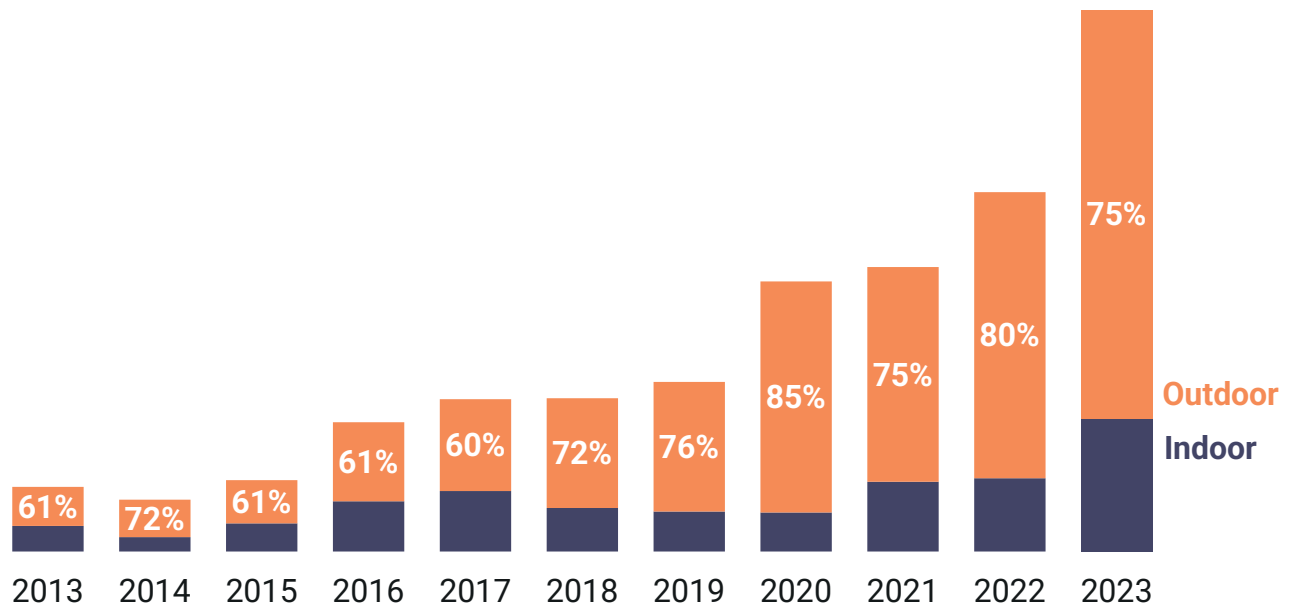
To view an interactive map of 2023 heat related deaths in Maricopa County, click **the QR code** on the map or scan it with your smartphone camera.

Heat Related Deaths by Injury Zip Code

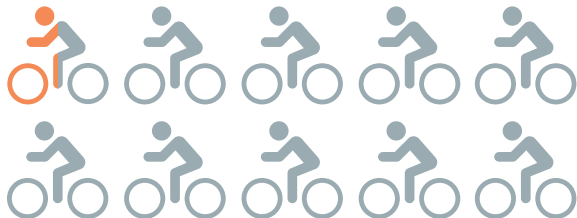


Place of Injury

Deaths in **outdoor settings** have driven the increase in total number of heat related deaths in recent years. In 2023, 75% of heat related deaths occurred outdoors.



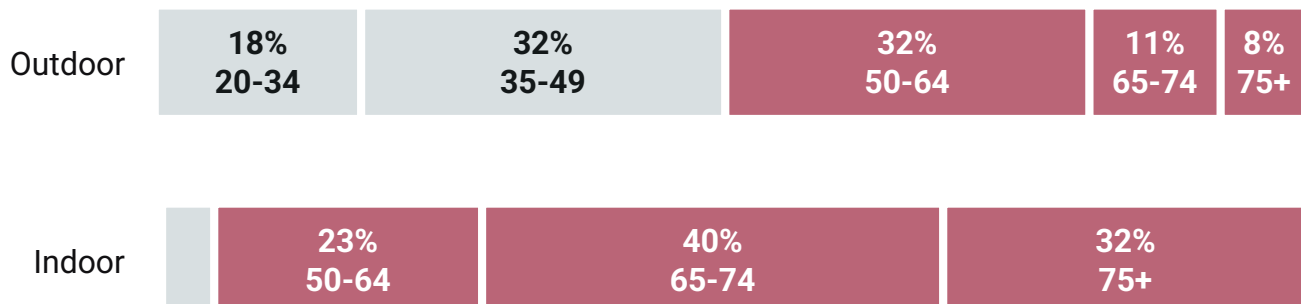
In 2023, **six percent** of all heat related deaths that occurred outdoors involved some type of physical or **recreational activity** (walking, running, bicycling, etc.)



Seventy five percent of all indoor heat related deaths were discovered during a **welfare check** (when a neighbor, family member, or EMS is called to check on someone).

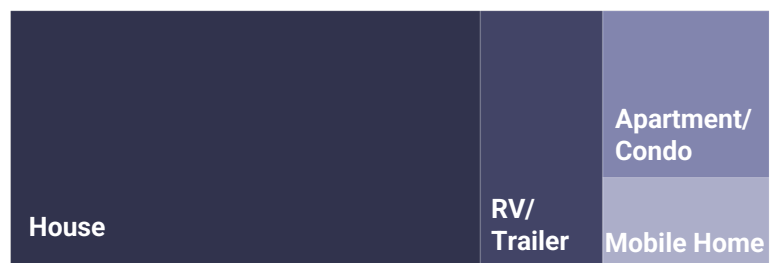
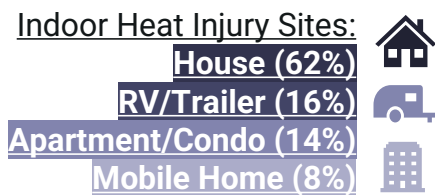
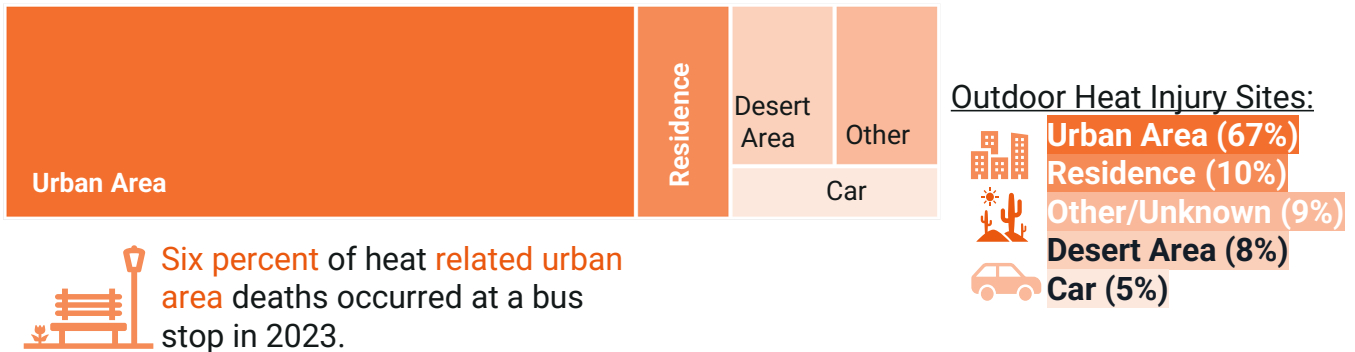


In 2023, 95% of all indoor heat related deaths occurred among individuals aged 50 years or older, 50% of outdoor heat related deaths were among those younger than age 49.



Place of Injury Details

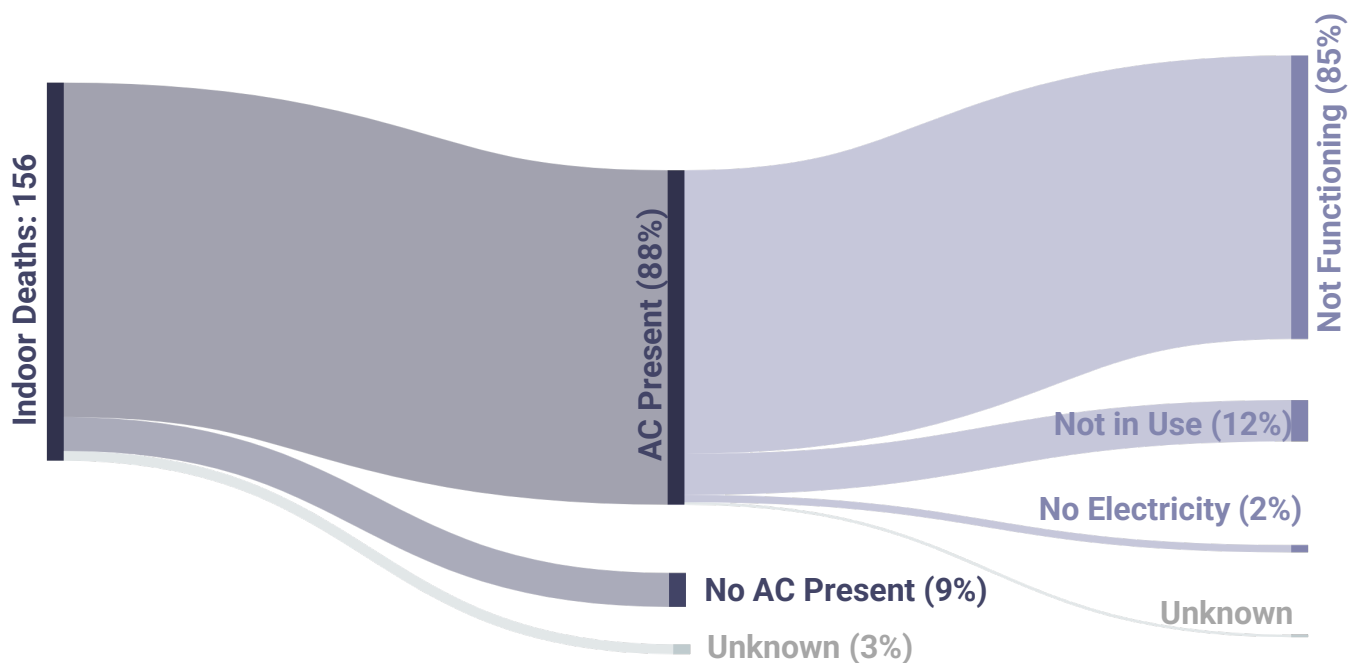
Most (67%) outdoor heat related deaths occurred in an urban area in 2023.



The average ambient air temperature among indoor deaths was 102 degrees (F).

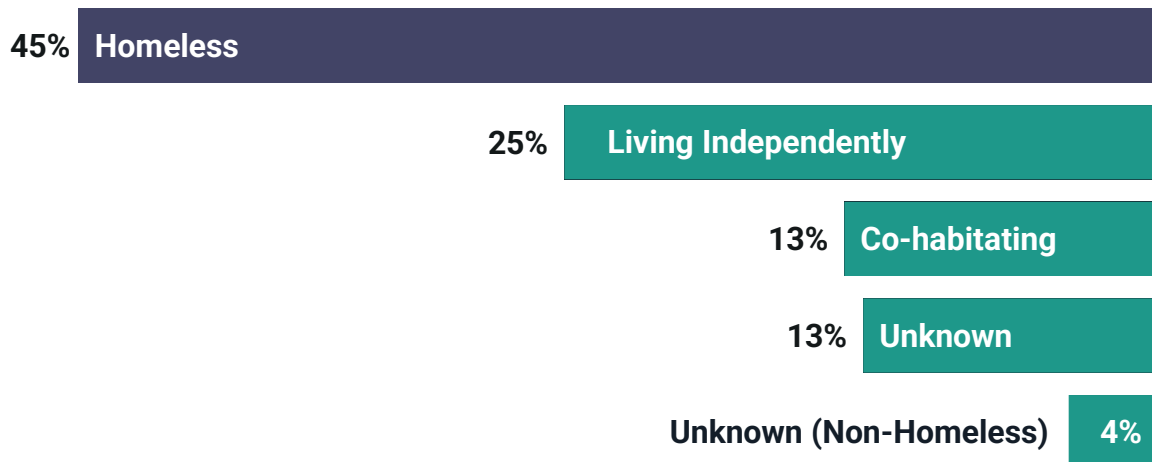


All indoor heat related deaths in 2023 occurred in uncooled environments. In most indoor death cases, an air conditioning (AC) unit was present on-site. Among indoor deaths where an AC unit was present, the unit was non-functioning in 85% of cases.

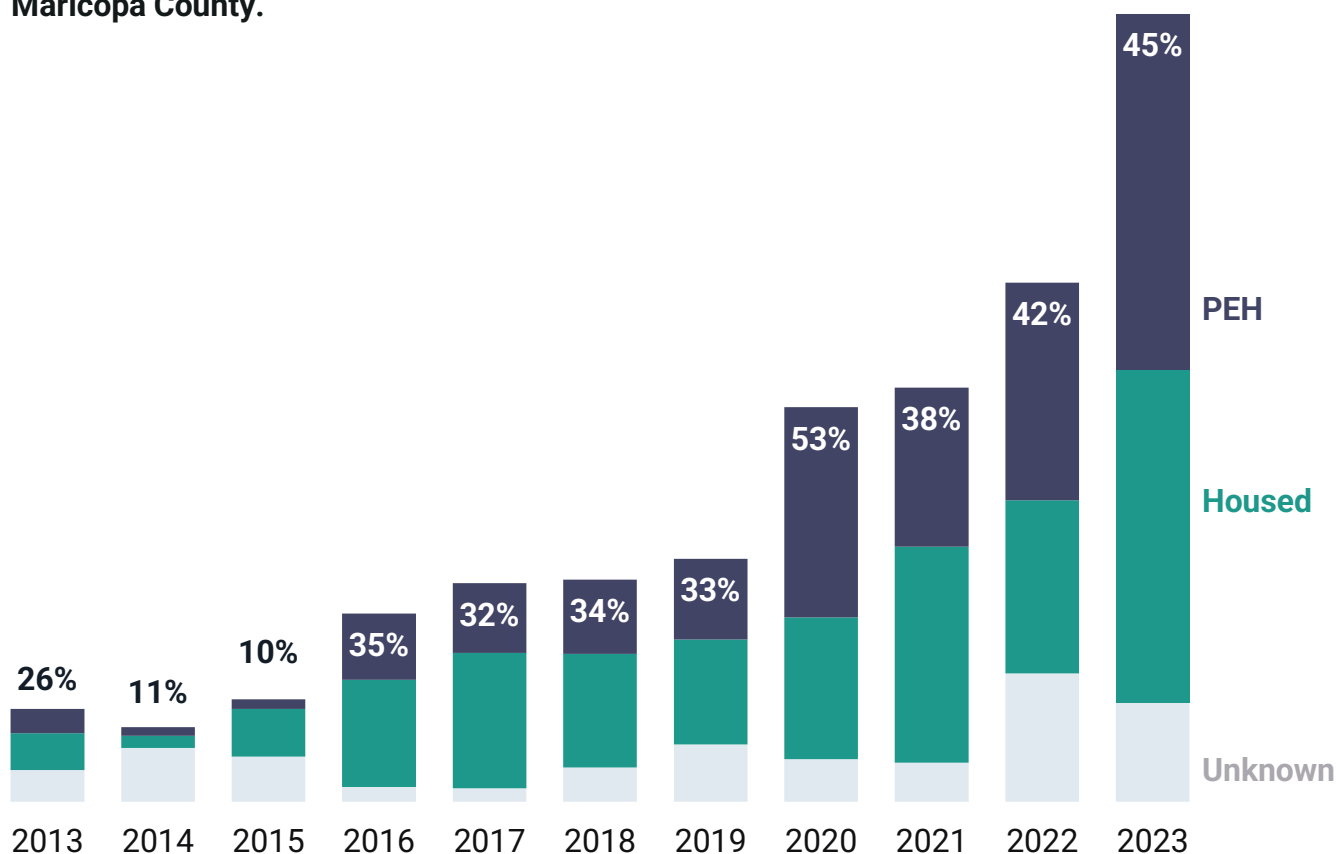


Living Situation

Individuals experiencing homelessness make up the largest proportion of heat related deaths in 2023. One out of four heat related deaths were also among people who were living independently.



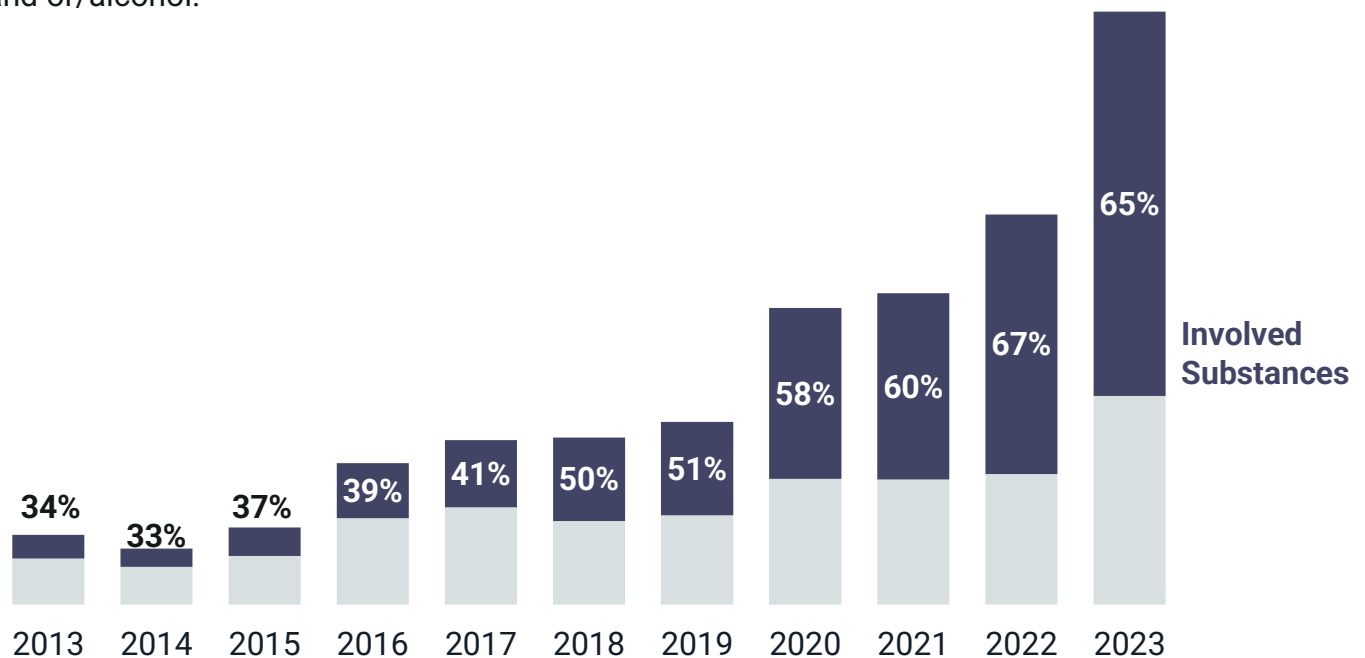
Among deaths where the living situation is known, people experiencing homelessness (PEH) have accounted for an increasingly large share of all heat related deaths in Maricopa County.



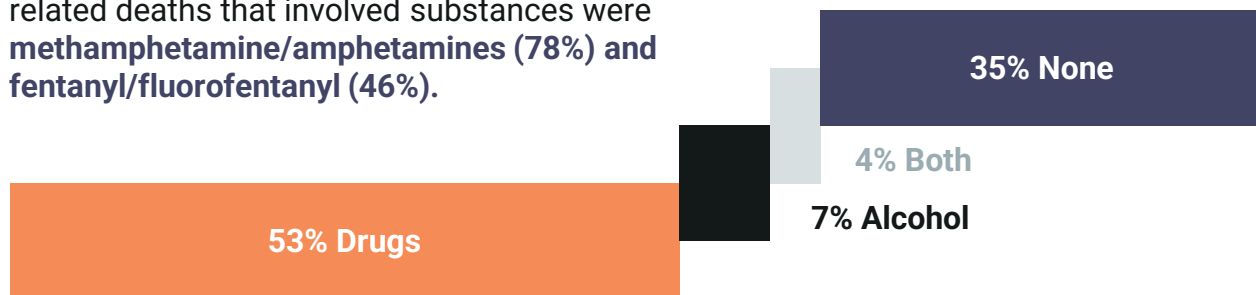
Note: in previous years, this graph only included cases where living situation was known. As of 2023, heat related deaths with unknown living situations will be included in this percentage.

Substance Use

Maricopa County identified 419 deaths involving substance use, representing nearly two-thirds of heat related deaths recorded in 2023. Substance use includes the use of drugs and or/alcohol.



The most common substance involved in the cause of death among heat related cases was **drugs only (53%)**. In 2023, the primary substances involved in heat related deaths that involved substances were **methamphetamine/amphetamines (78%)** and **fentanyl/fluorofentanyl (46%)**.



Substance use was a **primary cause of death** in 72% of heat related deaths involving substance use. When substance use was involved in heat related deaths, substances were more likely to be identified as a cause of death than **merely a factor related to death**.

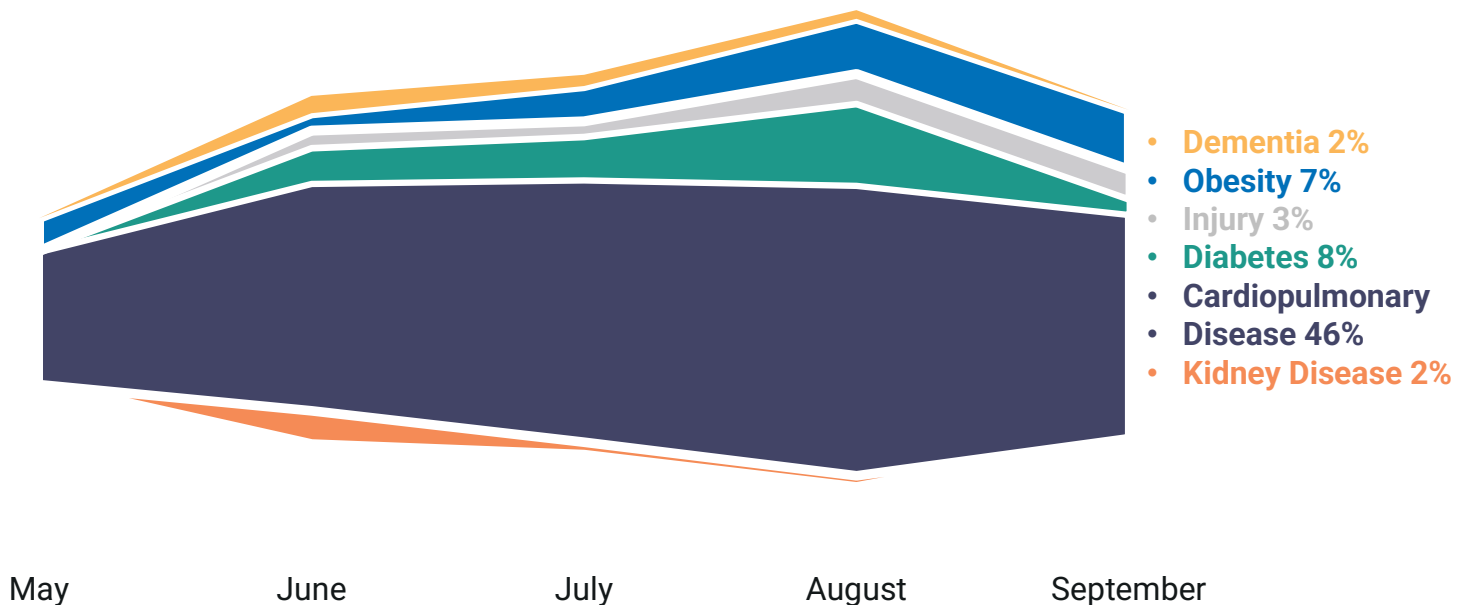


Risk Factors

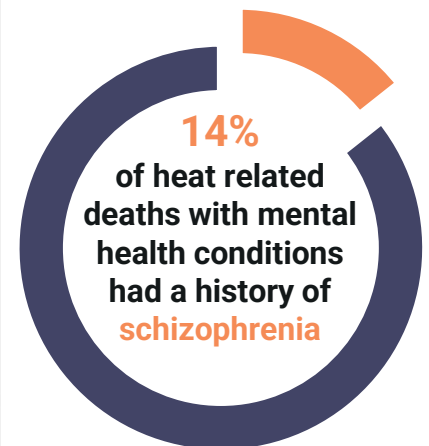
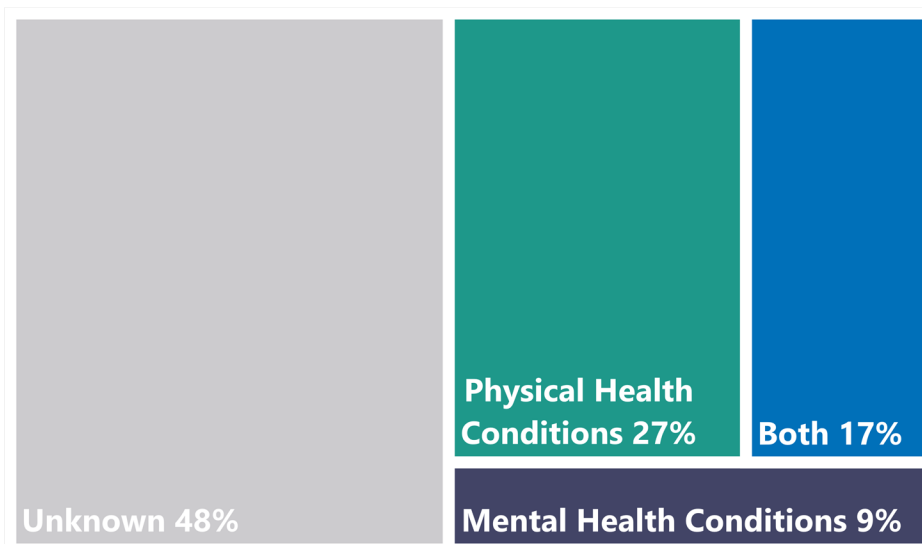


Five percent of heat related deaths in 2023 had experienced a previous heat injury or heat related illness symptoms prior to their death.

Certain health conditions may put individuals at increased risk of heat related illness. In 2023, cardiopulmonary disease also contributed to the cause of death in 46% of heat related deaths. Obesity, Diabetes, Kidney Disease, and injuries or falls were also prevalent.



In 2023, at least 1 out of 4 heat related deaths had a medical history of mental illness. Nearly 45% of heat related deaths had a history of some type of **physical health condition**.



Heat Relief in Maricopa County: Next Steps

2024

MCDPH continues to prioritize improving data quality and modernizing their heat morbidity and mortality surveillance system.

- A public facing dashboard is planned to replace MCDPH's weekly heat report during the summer of 2024 to provide more interactive and comprehensive data regarding heat related deaths and illness.

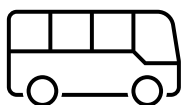


MCDPH hired a Heat Relief Program Coordinator to plan, organize, and coordinate heat relief efforts within the Heat Relief Network.

MCDPH and Maricopa County are expanding the County's heat relief activities, including strengthening the heat relief network to address barriers captured by the 2023 Maricopa County Cooling Center Evaluation, such as:



- Expanding access to heat relief by increasing the number of heat relief locations and lengthening heat relief center hours of operation to ensure availability of heat relief in all regions of Maricopa County 7 days per week during high heat hours from 9 am to 7 pm.



- Funding heat relief locations that meet basic needs by ensuring availability of air-conditioned space, hydration, and food to allow people to recover from heat exposure.



- Supporting the establishment and staffing of a hotline serving residents of Maricopa County with connection to services for those adversely affected by heat by triaging calls, answering questions, providing connection to services, and providing transportation to and from cooling or respite center locations as needed.



- Supporting enhancement of Heat Relief Network advertisement and visibility by providing multilingual signage and increased outreach.
- Supporting training and education for heat relief center staff and volunteers.
- Providing naloxone and naloxone training for heat relief center operators.
- Working to identify sustainable funding sources for future heat-relief activities.



Appendix

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

Key Phrases:

Heat exposure • Environ • Exhaustion • Sun • Heat Stress • Heat Stroke • Hyperthermia

ICD-10 Codes:

X30: Exposure to excessive natural heat

T67.X: Effects of heat and light

P810: Environmental hyperthermia of newborn

Once data are received, analysis of the information is required to identify only those deaths related to or caused by 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 related deaths are categorized based on the classification criteria listed below:

Heat Caused 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 I¹ 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 Contributed 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 II² 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 contributed deaths are combined and referred to as “heat related 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 counts, demographics, residency, drug/alcohol use, comorbidities, and years lived in Arizona are directly retrieved from death certificate data. Place of death location, indoor/outdoor occurrence, air conditioning use, medical history, injury details, and homelessness are retrieved based on explicit notations made in the death certificate and/or OME notes. For the purposes of this report, reasons for not having a cooled environment at the time of death in indoor cases where an A/C unit was present were grouped into three categories: nonfunctioning, functioning but turned off, and no electricity. “Non-functioning” is defined as an A/C unit that was not operating properly, was broken, or could not be turned on despite the presence of electricity. Cases categorized as having a “functioning but turned off” A/C unit indicates that the unit worked properly but the A/C was turned off for some reason at the time of the OME scene inspection. In cases where the unit could not be turned on due to a lack of electricity, regardless of whether it was functioning or nonfunctioning, were counted in the “no electricity” category.

Homelessness is defined as having an address on the death certificate that matches a homeless shelter, government agency, business, or 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. The medical examiner learns if someone is homeless by speaking to next of kin, law enforcement, and reviewing medical records. 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: www.heataz.org.

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.

To receive additional data, please submit a data request form through the Maricopa County Public Health website [here](#). A staff member from the Climate and Health team will contact you to discuss your request.

*For all **media inquiries**, please contact phpio@maricopa.gov*

Heat Related Deaths by Year											
	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Total Deaths	76	61	84	154	179	182	199	323	339	425	645
Heat Caused	43	33	45	88	90	119	138	213	194	240	378
Heat Contributed	33	28	39	66	89	63	61	110	145	185	267
During EHW*	18	10	12	31	49	45	69	167	95	107	457
Heat Related Deaths by Injury Location											
Indoor	30	17	33	59	71	51	47	46	82	86	156
Outdoor	46	44	51	93	108	129	152	271	252	336	480
Unknown	0	0	0	2	0	2	0	6	5	3	6
Heat Related Deaths by Living Situation											
IEH**	20	7	8	54	57	61	66	172	130	178	291
Housed***	30	10	39	88	111	93	86	116	177	142	273
Unknown	26	44	37	12	11	28	47	35	32	105	51
Substance Use Involvement among Heat Related Deaths											
Involved substances	26	20	31	60	73	91	102	186	203	283	419
Drugs Only	12	14	20	32	56	61	77	158	156	229	346
Alcohol Only	12	6	9	23	16	23	19	19	34	40	47
Drugs and Alcohol	2	0	2	5	1	7	6	9	13	14	26
None	50	41	53	94	106	91	97	137	136	142	226
Heat Related Deaths by Residence of Maricopa County											
Resident	67	56	65	141	171	138	165	273	267	329	510
Not Resident	4	4	11	8	8	16	24	41	44	55	75
Unknown	5	1	8	5	0	28	10	9	28	41	60

*Excessive Heat Warning: See dates at: <https://www.weather.gov/psr/heat>

Individual experiencing homelessness *Living Independently or Co-habiting

2023 Heat Related Deaths by National Weather Service Heat Risk Category					
Description			Heat Risk	Days	Deaths
No risk			None	133	1
Risk to those extremely sensitive to heat			Minor	123	46
Risk to those sensitive to heat			Moderate	67	162
Risk to most people			Major	21	99
Risk to everyone			Extreme	21	337
2023 Heat Related Deaths by Place of Injury					
Outdoor Heat Related Deaths		480	156	Indoor Heat Related Deaths	
Recreational Activity		31	0	Recreational Activity	
Welfare Check		22	118	Welfare Check	
Place of Injury	Urban Area	321	96	House	Place of Injury
	Residence	48	26	RV/Trailer	
	Other/Unknown	45	22	Apartment/Condo	
	Desert Area	40	12	Mobile Home	
	Car	26			



Heat Related Deaths 2023 Demographics		Deaths	Female	Male
		645	140	502
Age group				
5-19		*		
20-34		88	13	75
35-49		159	28	131
50-64		189	26	163
65-74		116	33	83
75+		87	40	47
Education				
8th grade or less		49	7	42
Some High School		92	14	78
High School Diploma or GED		228	46	182
Some College		82	31	51
Associates		33	6	27
Bachelors		36	15	21
Masters or higher		17	7	10
Race/Ethnicity				
Hispanic/Latino		138	24	114
Black/African American		81	10	71
American Indian/Alaska Native		35	5	30
Asian or Pacific Islander		6	*	
White Non-Hispanic		383	98	285
Residency				
Maricopa County Residents		510	124	386
In-State Residents		48	6	42
Out-of-State Residents		28	*	
Residency Unknown		60	6	51
Length of Residency in Arizona: Maricopa County Residents				
< 3 years		32	6	26
3-9 years		35	11	24
10-19 years		46	15	31
20+ years		299	75	224

2023 Heat Related Deaths: Substance Use & Homelessness			
	IEH	Housed Individuals	Total
Drug Caused	193	109	302
Drug Contributed	65	52	117
Substance Use	258	161	419
No Substance Use	33	193	226
Meth/Ampethamines	217	108	325
Fentanyl/Fluorofentanyl	131	60	191

2023 Heat Related Deaths: Comorbidities/Medical History			
Medical History	Deaths		Cause of Death Comorbidities
Physical Health Conditions	175	294	Cardiopulmonary Disease
Mental Health Conditions	54	53	Kidney Disease
Both	109	44	Obesity
Unknown	304	22	Injury/Fall
Previous Heat Illness	31	13	Dementia



2023 Maricopa County Resident Heat Related Death Rates			
	Deaths	Population	Rate per 100,000
Total	510	4,430,871	11.5
Sex			
Male	386	2,208,150	17.5
Female	124	2,222,721	5.6
Age Group			
5-19	*		
20-34	65	944,937	6.9
35-49	107	862,354	12.4
50-64	147	788,711	18.6
65-74	104	399,436	26.0
75+	84	293,334	28.6
Race/Ethnicity			
American Indian or Alaska Native	15	60,562	24.8
Asian or Pacific Islander	5	193,077	2.6
Black or African American	55	239,826	22.9
Hispanic or Latino	116	1,402,753	8.3
White Non-Hispanic	319	2,359,261	13.5

*Groups with < 5 deaths have been excluded

2023 Maricopa County Resident Heat Related Death Rates (Age and Sex)						
Age Group	Deaths		Population		Rate per 100,000	
	Male	Female	Male	Female	Male	Female
20-34	55	10	484,375	460,562	11.4	2.2
35-49	85	22	436,558	425,796	19.5	5.2
50-64	125	22	389,745	398,966	32.1	5.5
65-74	72	32	185,471	213,965	38.8	15.0
75+	46	38	127,448	165,886	36.1	22.9

Population numbers found at: <https://data.census.gov/table/ACSST5Y2022.S0101?g=050XX00US04013>
<https://data.census.gov/table/ACSDP5Y2022.DP05?g=050XX00US04013&tid=ACSDP1Y2022.DP05>



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