

Hyperthermia

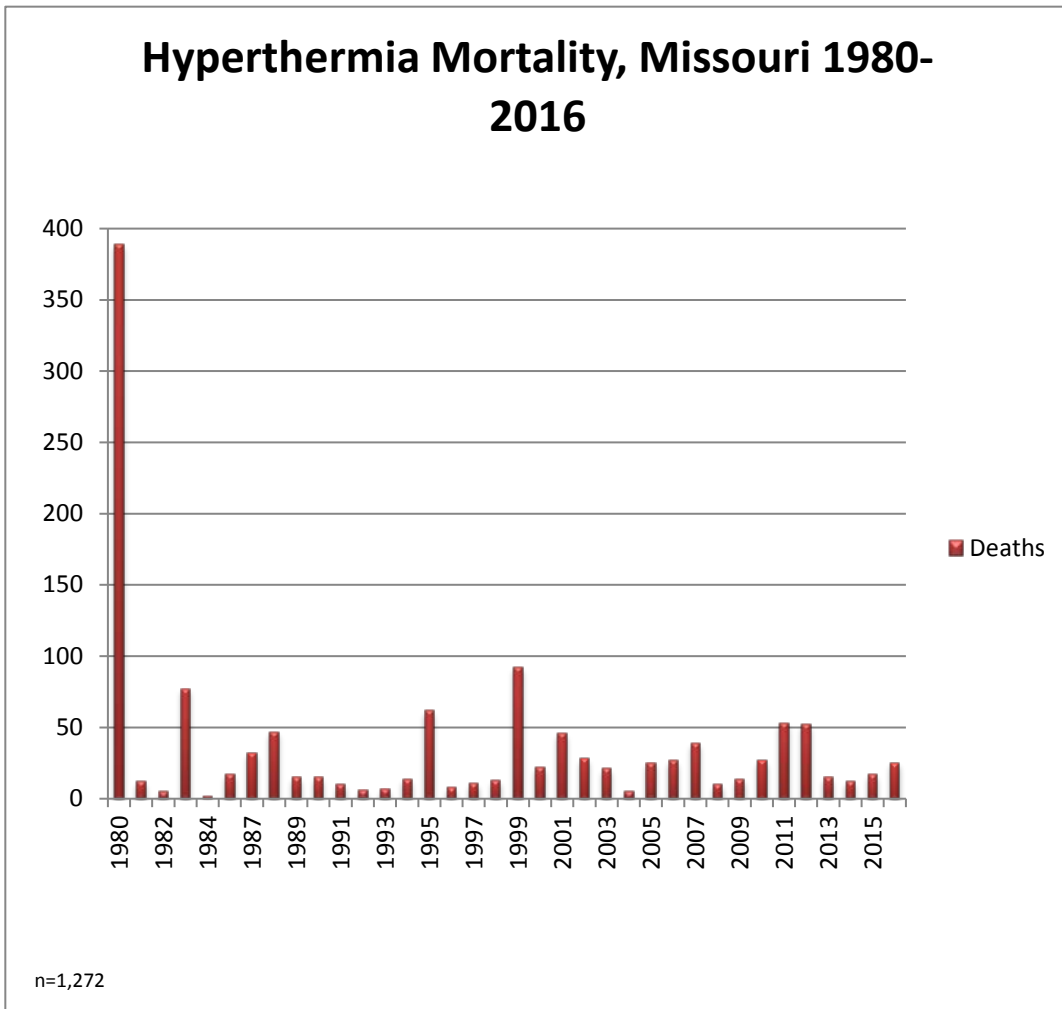
Each year many Missourians suffer from heat-related illnesses, with some cases resulting in death. During prolonged periods of high temperatures, using air conditioning—either at home or by seeking shelter in a local cooling center—is the best preventive measure.

The Missouri Department of Health and Senior Services' (DHSS) Bureau of Environmental Epidemiology (BEE) monitors high temperatures and humidity across the state in an effort to help prevent heat-related illness and death. Very young children, senior citizens, and the chronically ill are more vulnerable to the effects of high temperatures. They perspire less and are more likely to have health problems requiring medications that can impair the body's response to heat. Many prescription medications make individuals more sensitive to the heat. Some of these medications include heart drugs, some anti-Parkinsonian agents, antihistamines, over-the-counter sleeping pills, antidepressants, anti-psychotics, and major tranquilizers.

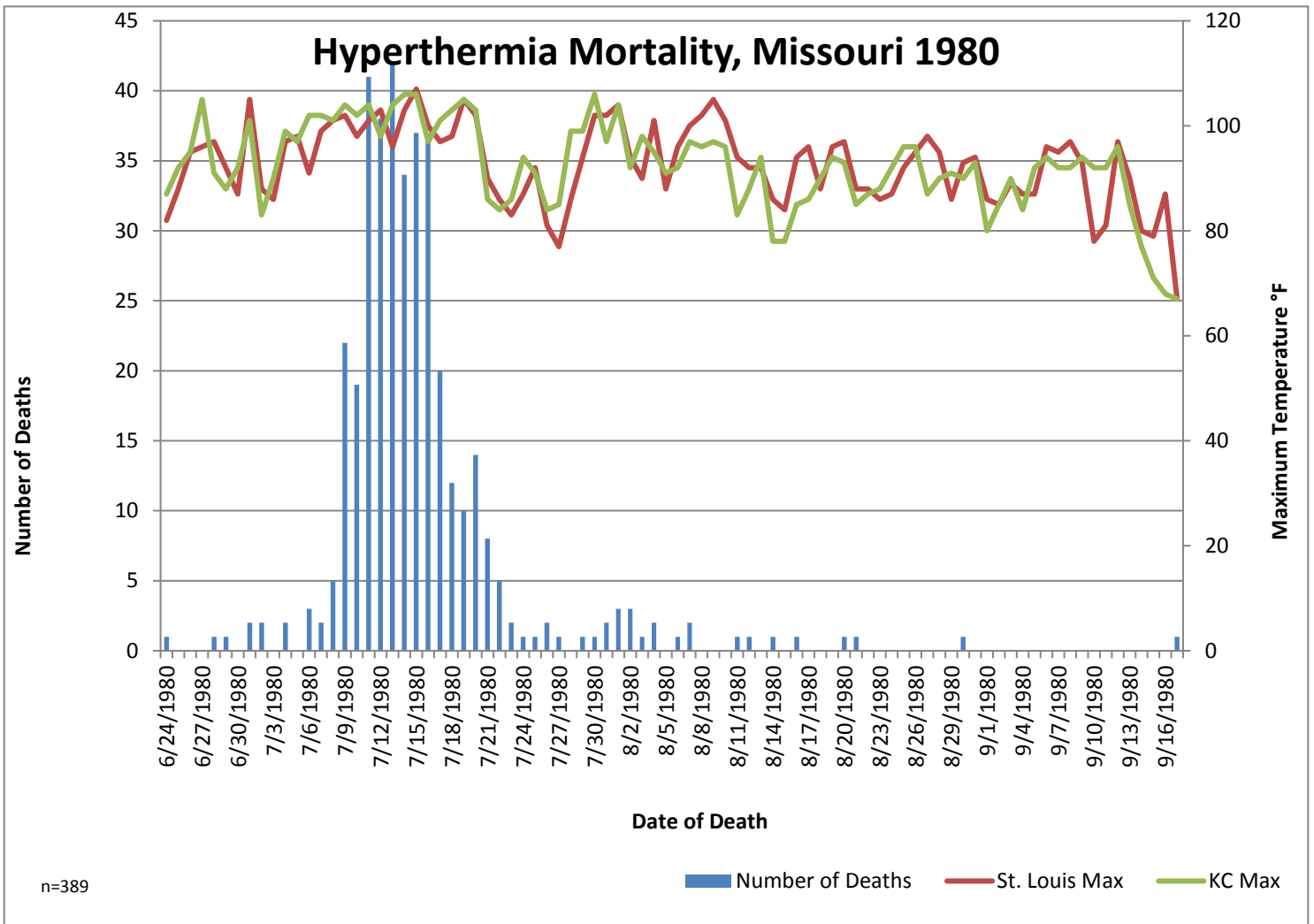
The former Missouri Division of Health initiated statewide hyperthermia death surveillance in 1980 in response to a heat wave that resulted in an unprecedented 389 deaths due to Missouri's extreme temperatures during July of that summer. Under the Missouri Code of State Regulations, [19 CSR 20.20-020](#), health care providers have been required to [report cases](#) of hyperthermia to DHSS since 1993. The department conducts on-going statewide surveillance for hot weather-related illnesses and deaths.

The BEE hyperthermia surveillance program defines hyperthermia as a physician-diagnosed case of weather-related heat exhaustion, heat stroke, or a death certificate that includes hot weather exposure as the underlying cause or a contributing cause. Cases are reported by hospital emergency departments, urgent care centers, and other health care providers. Information on deaths is received from the DHSS Bureau of Vital Statistics ([BVS](#)), medical examiners, and coroners. The number of deaths reported in this report differs from information published by BVS, as this report includes deaths that list hot weather exposure as either an underlying or contributing cause. Data published by BVS and BEE are not directly comparable due to differences in case ascertainment and classification.

From 1980 through 2016, there have been 4,377 cases of hyperthermia reported, including 1,272 deaths caused by Missouri's hot weather and high humidity.

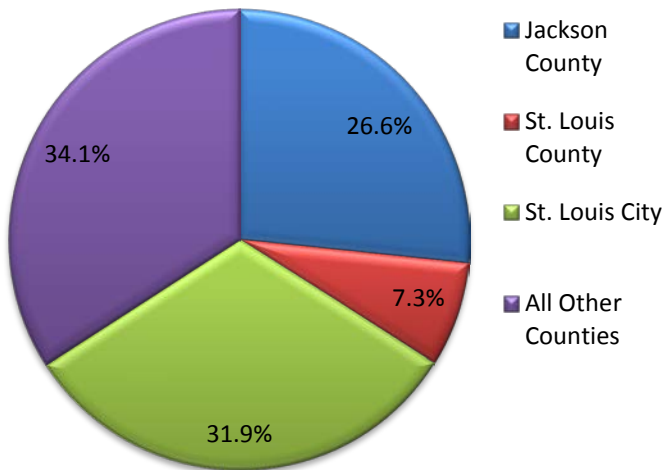


The 1980 Midwest heat wave resulted in a total of 389 heat-related deaths in Missouri. The majority of the deaths, over 87%, occurred during a two-week period, July 8 through 21, when 339 people died. That summer included 17 days of temperatures over 100 degrees Fahrenheit (°F) in the St. Louis area and a high temperature of 107°F on July 21. In the Kansas City area there were also 17 days with high temperatures over 100°F. Six of those very hot days were consecutive from July 6 through July 11 (Source: National Oceanic and Atmospheric Administration [NOAA] Online Weather Data).



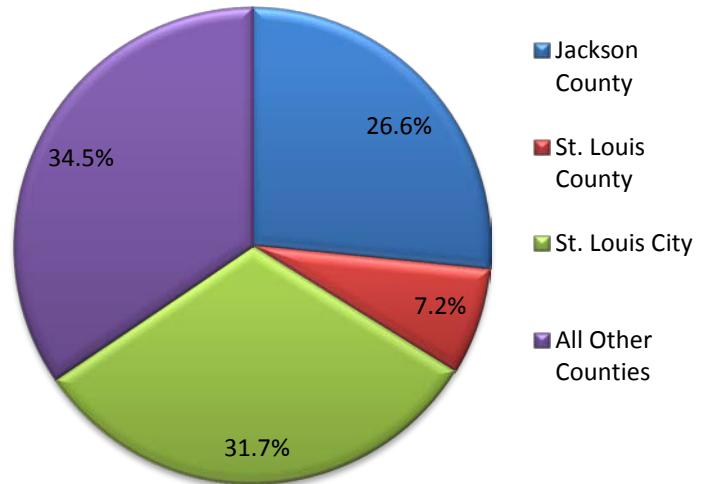
In Missouri, the greatest numbers of heat-related deaths have occurred in the urban, more densely populated areas of St. Louis City, St Louis County, and Jackson County (Kansas City). Of the 1,254 Missouri residents who died from hot weather as an underlying or contributing cause from 1980 through 2016, there were 826 (65.9%) deaths in these metropolitan areas. Deaths in the less populated counties accounted for 428 (34.1%) of the deaths. Non-Missouri residents who succumb to heat while visiting our state are also considered cases, accounting for 18 deaths.

Hyperthermia Mortality by County of Residence, Missouri 1980-2016



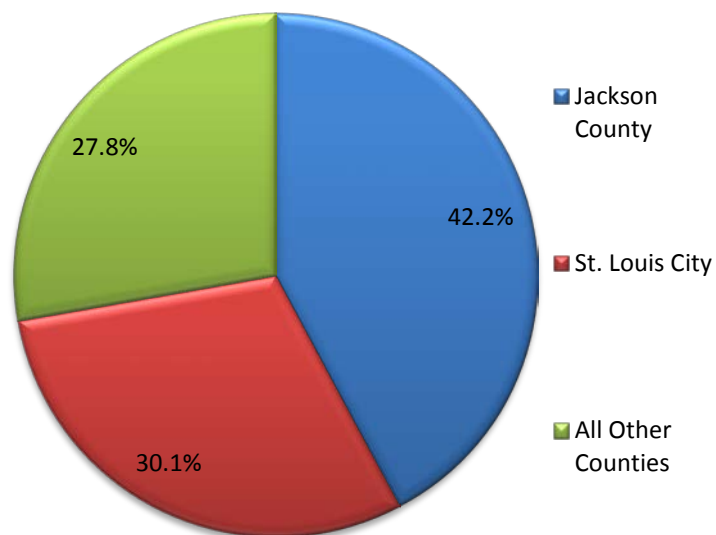
n=1,254 – does not include 18 deaths of non-Missouri residents

Hyperthermia Mortality by County of Death, Missouri 1980-2016



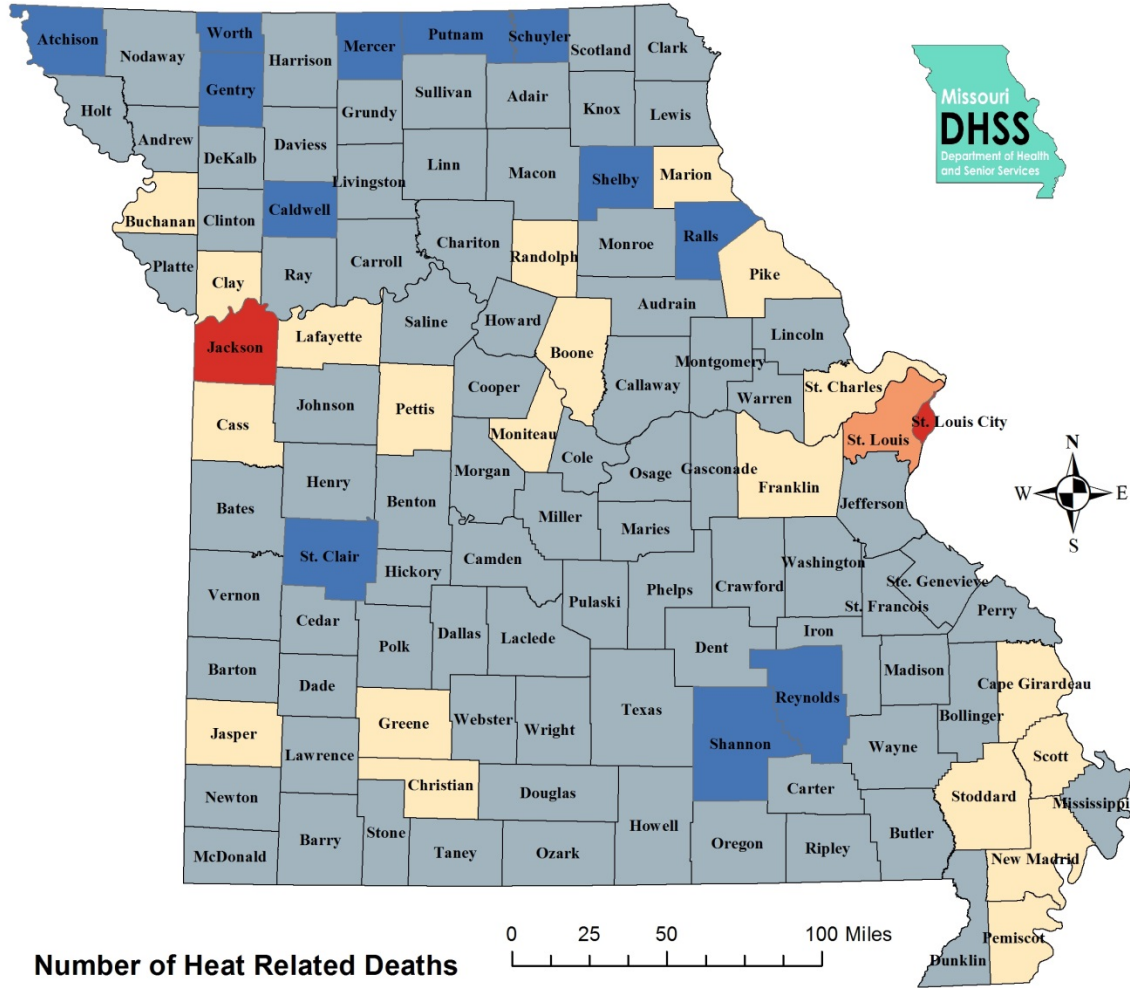
n=1,272 - includes 18 deaths of non-Missouri residents

Hyperthermia Mortality by County of Residence, Missouri 1980

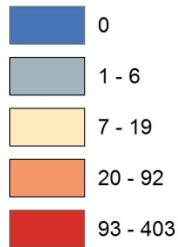


n=389

Number of Heat Related Deaths in Missouri by County** for 1980 - 2016^



Number of Heat Related Deaths



0 25 50 100 Miles

** County of death may differ from county of residence

^ Data for 2016 is preliminary and subject to change

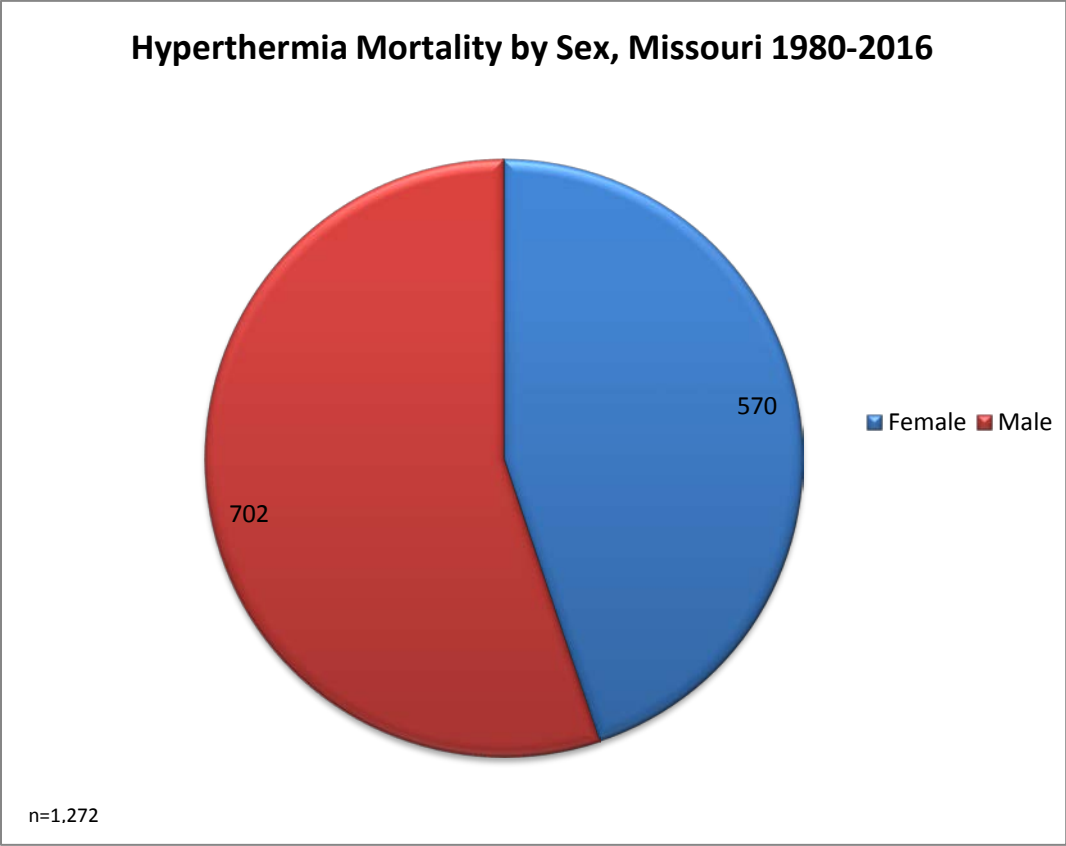
Total number of deaths from 1980 to 2016 was 1,272

Includes 18 non-Missouri residents who died in Missouri

Source: Bureau of Environmental Epidemiology

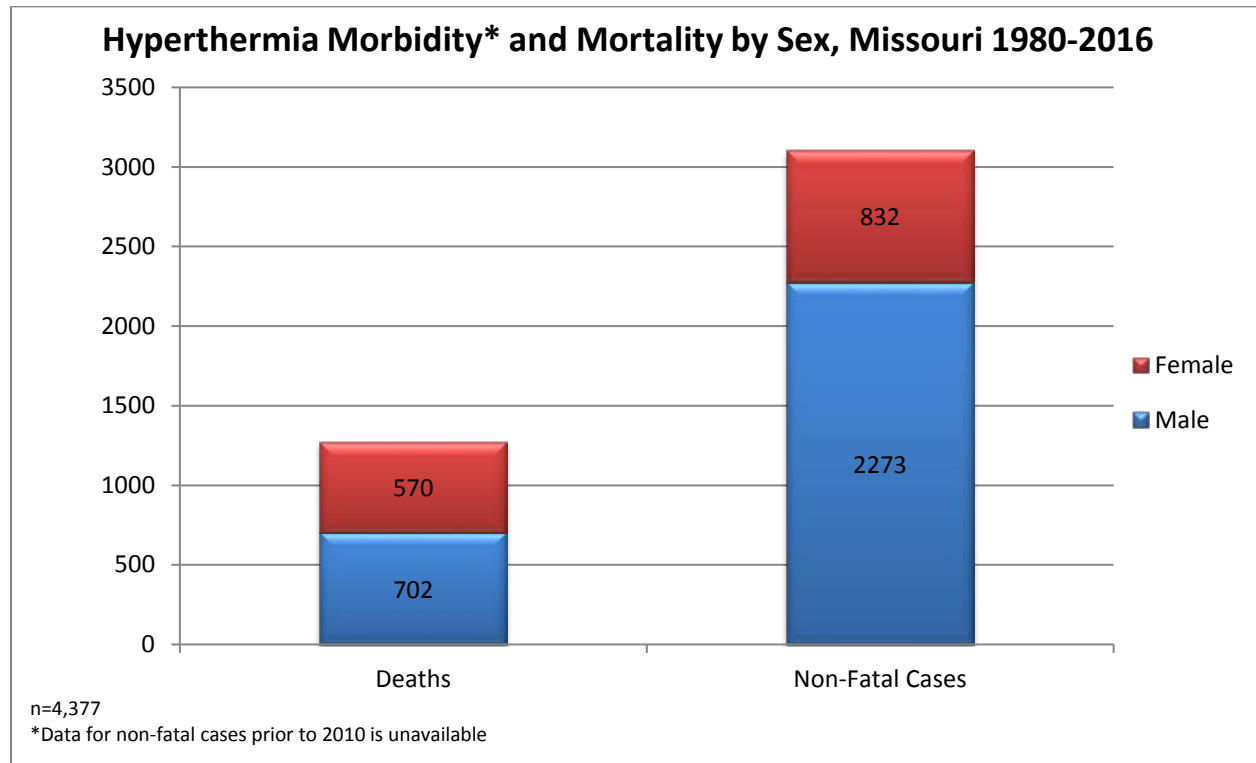
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In the same thirty-six-year period of 1980 through 2016, there were more heat-related deaths in men (702, 55.2%) than in women (570, 44.8%).

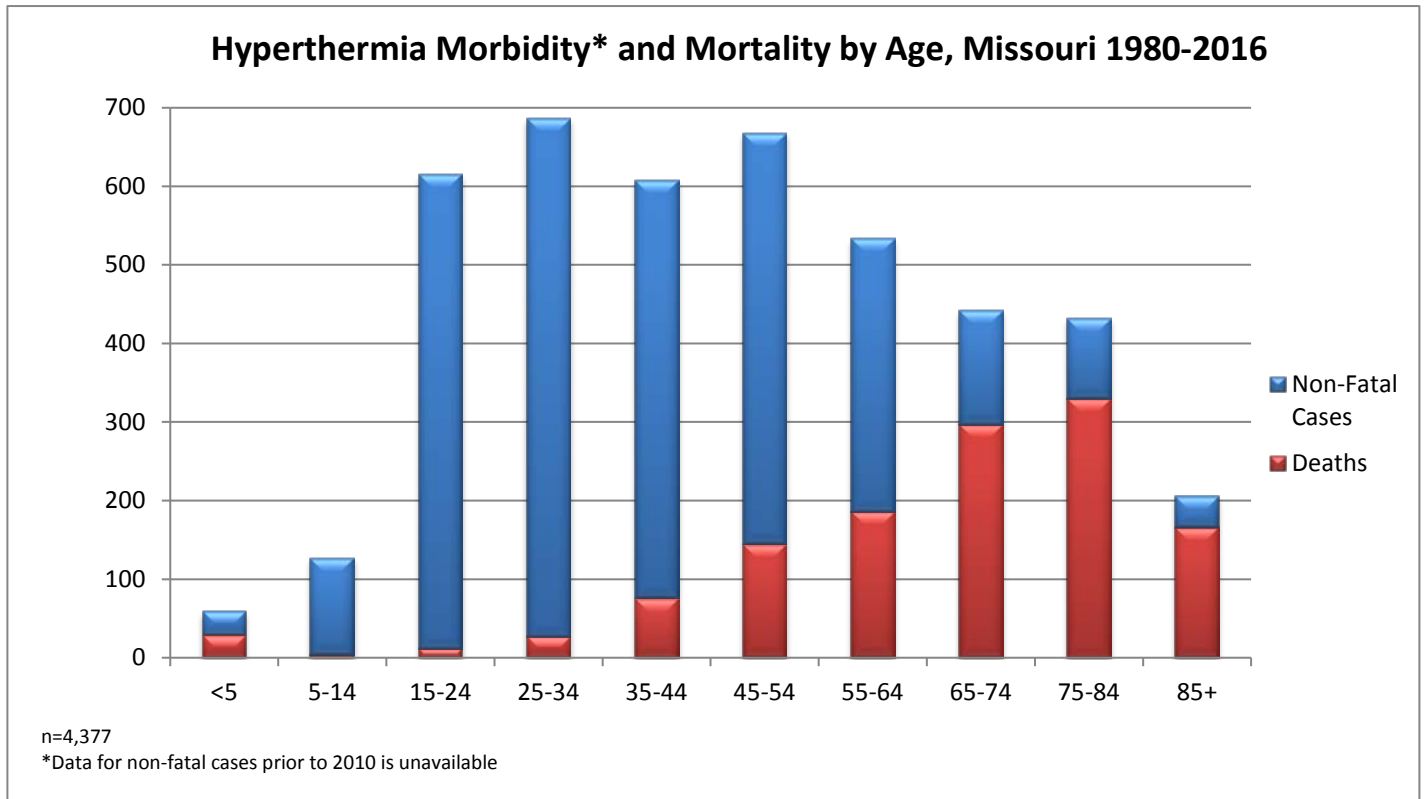


In 1980, however, the opposite was seen. In that summer heat wave, there were 179 male deaths (46%) and 210 (54%) deaths in females.

A more significant difference is shown in the number of non-fatal cases of hyperthermia. Males are clearly the most frequent victims of non-fatal heat-related illness. Non-fatal cases are very underreported. Data reported from 2010 through 2016 show 73.2% of the non-fatal cases were men.



People ages 15 through 64 years are much more likely than senior citizens to become ill with a non-fatal heat-related illness. Although non-fatal cases are very underreported and data prior to 2010 is unavailable, from 2010 through 2016 there have been 2,665 illnesses reported in people ages 15 through 64 years, which is 85.8% of the total of 3,105 reported.



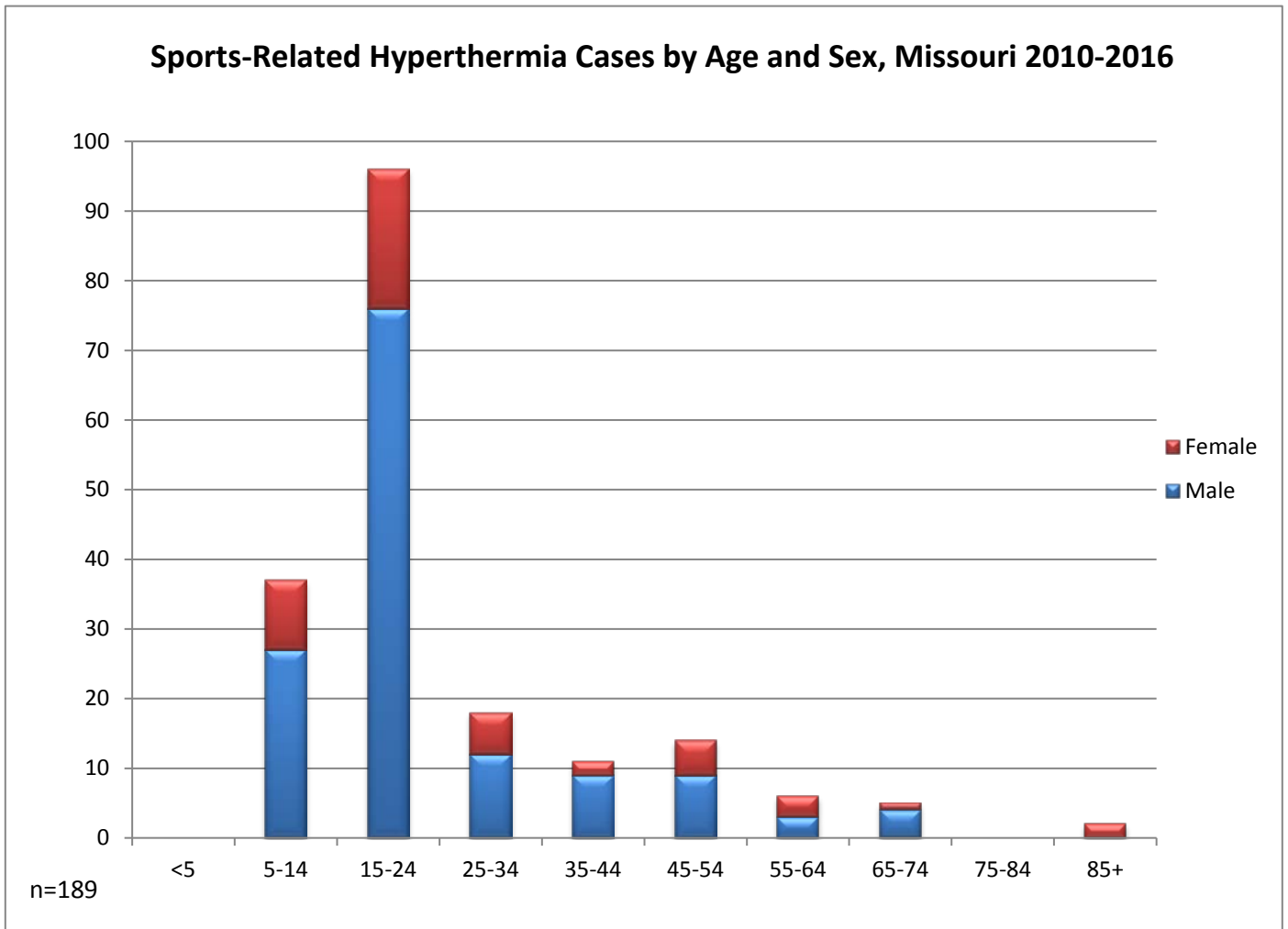
Death is much more likely in the <5 years age group as well as in those who are age 65 and older.

Heat-related illnesses and deaths in the younger population often have contributing causes such as physical activity (sports or work), complicating medical conditions, or substance abuse.

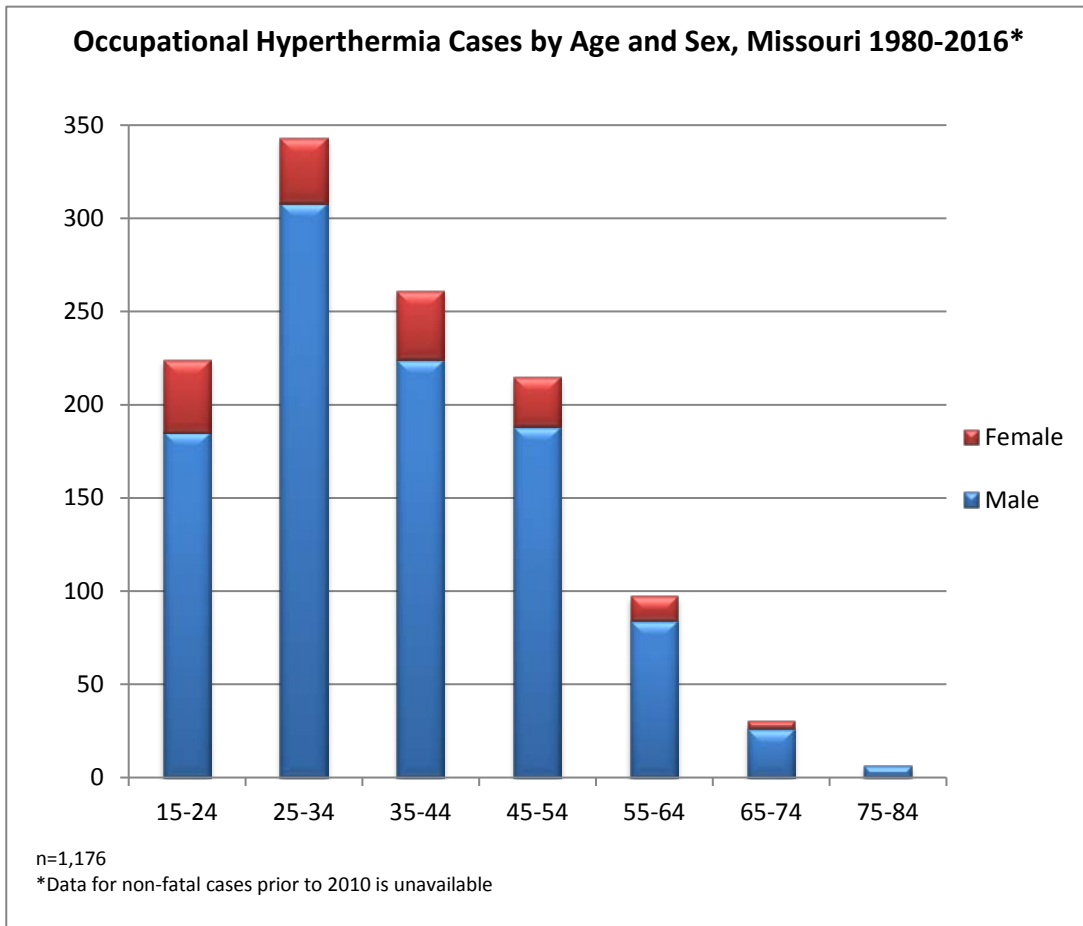
There have been 189 heat-related illnesses reported, including four deaths, of people participating in or watching sporting events.

- A 31-year-old woman died in 2016 after having played five games of softball in the July heat.
- A 52-year-old man was admitted to the hospital and died of a heart condition exacerbated by hot weather after watching an all-terrain vehicle competition at the end of July 2011. The high outdoor temperature on that day was 99°F. During the prior week, high temperatures ranged between the upper 90s to 102°F and overnight low temperatures did not drop below 75°F.

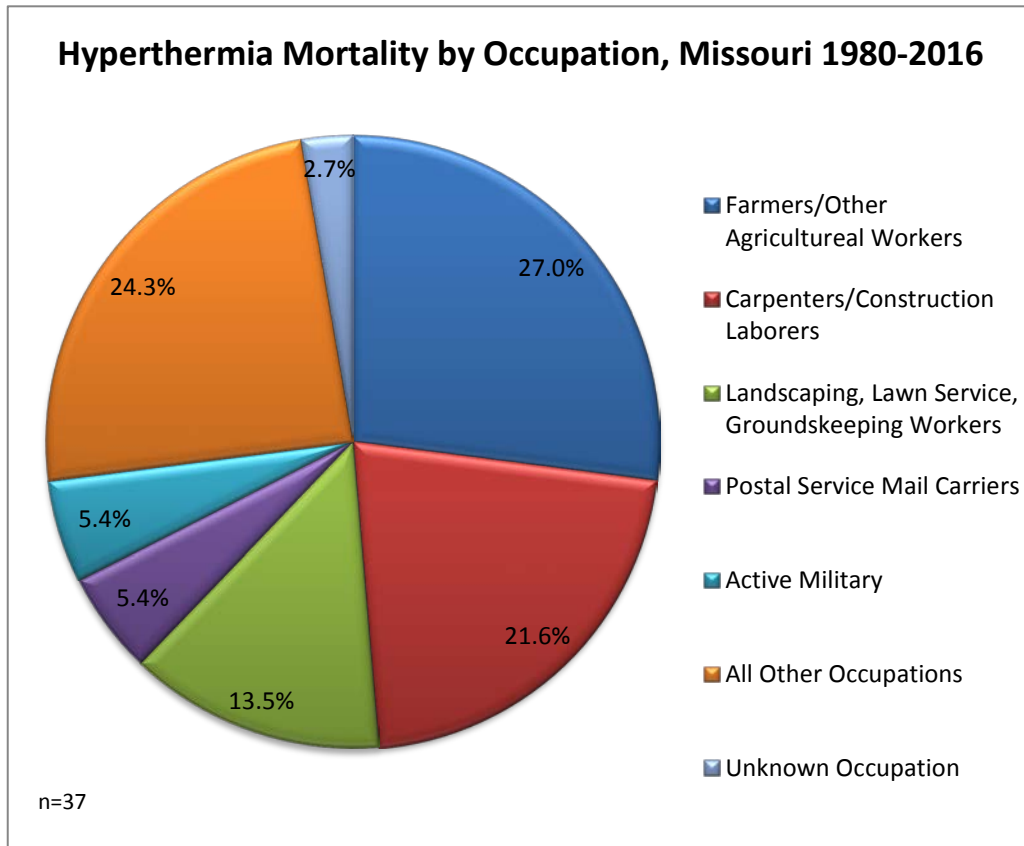
- In July 2001, the final 90 minutes of a two-day extreme obstacle race were cancelled after two men, ages 29 and 31, suffered seizures and collapsed while competing. High humidity pushed the heat index in the area above 100°F. Temperatures of the men were 106°F and 109°F. Both men were admitted to the hospital and later died. Neither of the two was known to have any prior health conditions.



People who work in extreme heat are at risk for heat-related illness. Stress from exposure to hot weather can cause heat exhaustion, heat stroke, and even death. Workers at risk of heat stress include outdoor workers such as farmers, construction workers, landscapers, factory workers, and others who do not have air conditioning available. Those at even greater risk include those workers who are age 65 years and older, are overweight, have heart disease or high blood pressure, or who take medications that make them more susceptible to heat-related illness. Of the 4,377 hyperthermia fatal and non-fatal cases reported from 1980 through 2016, 1,176 (26.9%) included work as a contributing cause. Males comprised 86.8% of these occupational cases.



There have been 37 occupational heat deaths reported from 1980-2016. Ten (27.0%) of these were farmers or other agricultural workers; eight (21.6%) were carpenters, five (13.5%) were landscaping workers, two (5.4%) were postal mail carriers, and two (5.4%) were active military. Other occupations with one death each were fire fighter, real estate agent, logger, brick mason, roofer, meat processor, welder, truck driver, and freight mover. The occupation was unknown for one work-related hyperthermia death in 1980.



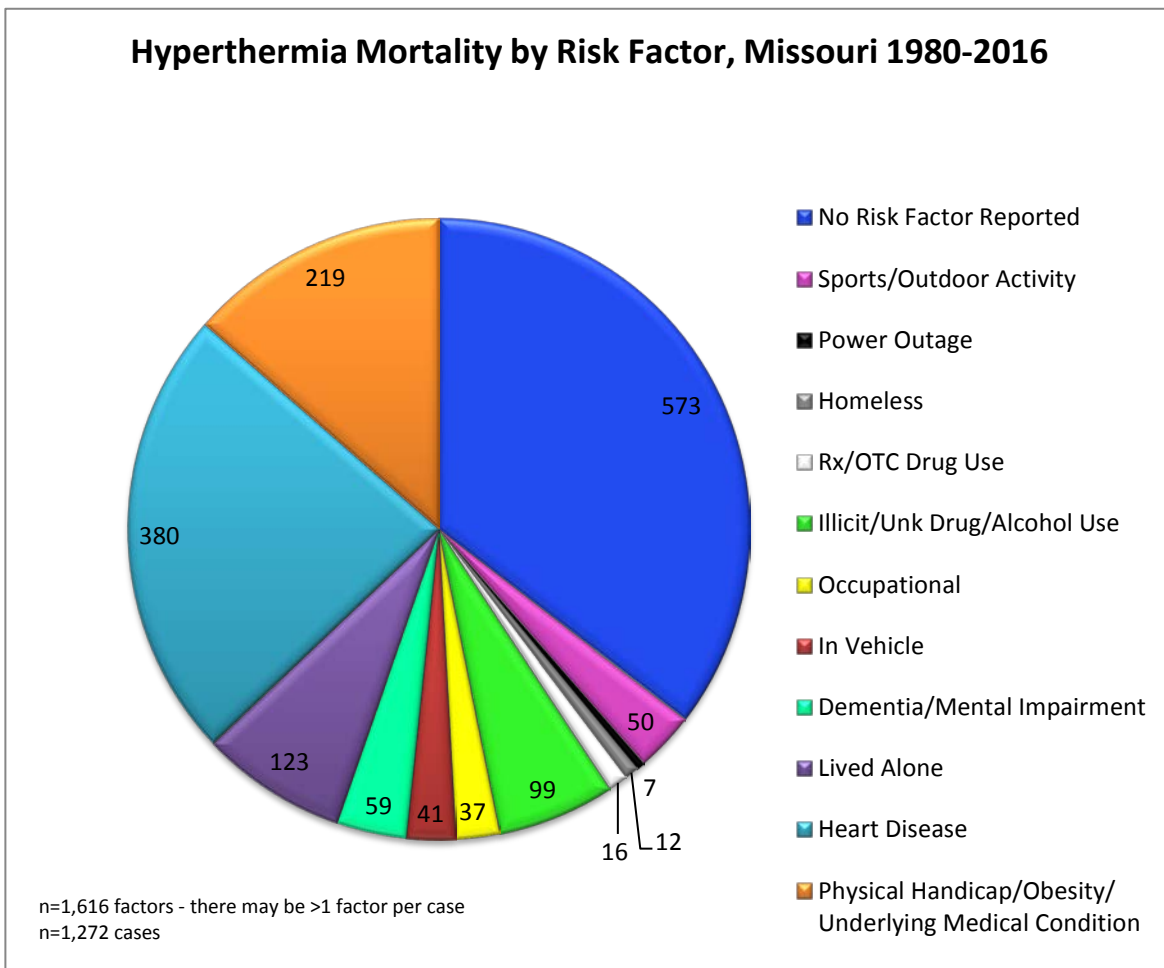
Hyperthermia deaths in young children often involve a motor vehicle—a child left in or climbing into a parked vehicle during hot weather. From 1980-2016, there were 29 heat-related deaths (2.3% of 1,272 total deaths) of children less than five years of age. Seventeen (58.6%) of those childhood deaths involved a vehicle.

- A ten-month-old girl died of hyperthermia in a parked car in 2016. The infant's mother was also found deceased in the vehicle due to an opioid overdose.
- In June 2010, two-year-old twin girls were found by their mother in an unlocked, parked car. Emergency personnel responded and tried to resuscitate the children but they were pronounced dead at the scene. The outdoor temperatures in the area were in the upper 80s °F to low 90s °F but the temperature inside the vehicle was over 130°F.
- A one-year-old girl was found unconscious with her two-year-old brother and their cousin in an unlocked abandoned car that was parked outside their home. All three children were taken to the hospital where the siblings both died that day. The cousin, also a two-year-old boy, died two days later. The outdoor temperature on that day in August 2001 was in the mid 80s.
- In July 1998 at 4:47 p.m., a four-year-old girl was found in a locked car in front of a child care center. She had disappeared from the center at approximately 10:00 a.m. Cardiopulmonary resuscitation was administered on the scene, but rigor mortis already had occurred. Death was attributed to hyperthermia. The temperature inside the car at the time of her death was unknown; however, the estimated heat index in the area that day was 93°F. The child's body temperature was documented as 109.5°F.

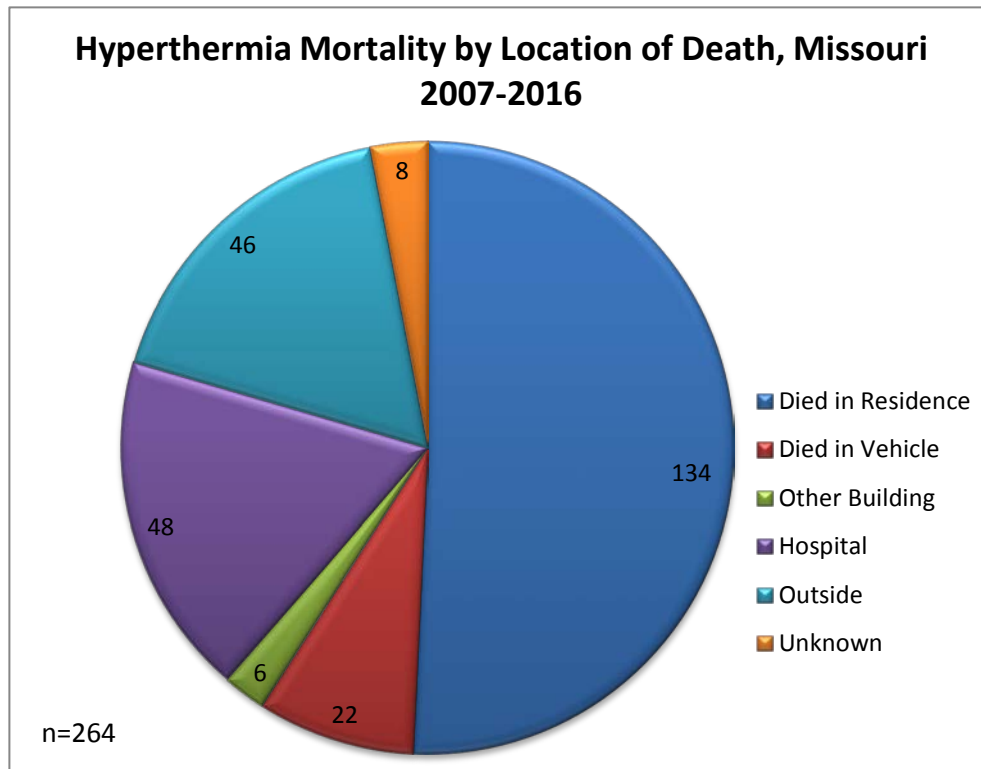
The victims of fatal hot weather exposure who are over the age of 65 years are much more likely to live alone and have other complicating medical conditions. Also, lack of air conditioning or refusal to use it for fear of higher utility expenses contributes to the number of deaths in the senior population. Of the 1,272 hyperthermia deaths from 1980 through 2016, over half (793, 62.3%) have been of people age 65 years and older, compared to 450 (35.4%) hyperthermia deaths occurring in the 5-year-old through 64-year-old age group.

In the 1980 heat wave, an even higher proportion of deaths were people age 65 years and older, with a total of 279 (71.7%) of the 389 total deaths that summer. There were no deaths in the 5-14 or 15-24 year age groups reported for 1980.

In addition to medical conditions such as heart disease, athletics, occupation, substance abuse, and age, there are many risk factors and contributing causes for hyperthermia. These include living alone, mental impairment, being in a vehicle, medication use, homelessness, and power outages. People with one or more of these factors are even more at risk for heat-related illness and death.

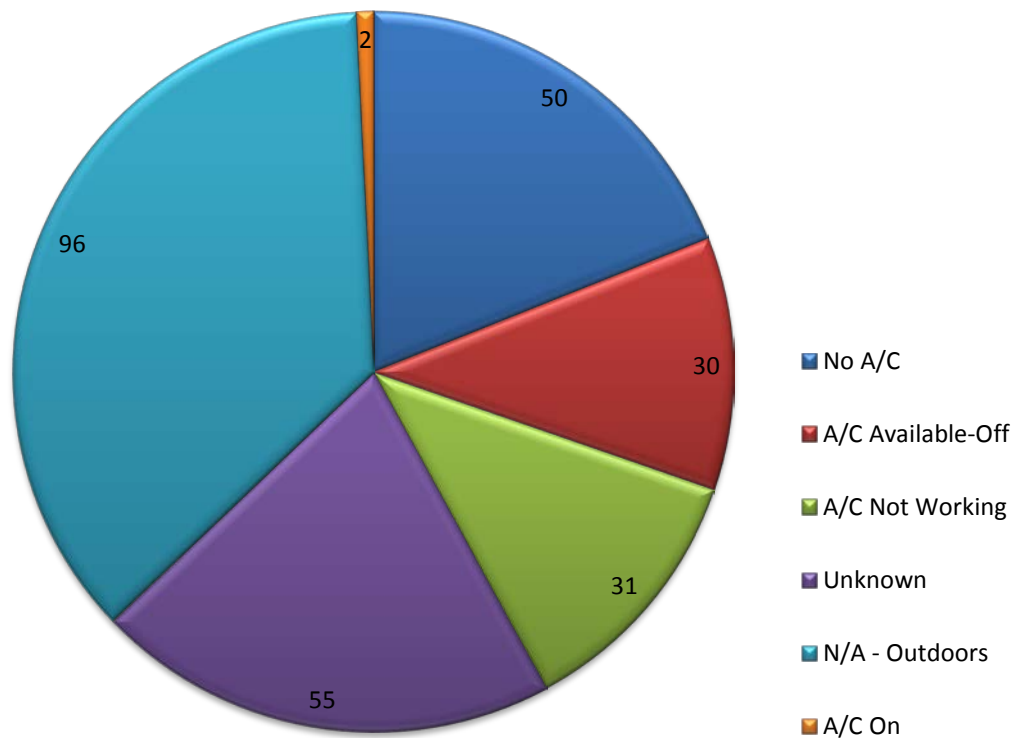


The most common location where people become ill and die from hot weather is in their own home. Over half (50.8%) of the 264 hyperthermia deaths from 2007 through 2016 were of people who were found deceased inside their residence. People who died outside comprised 17.4% (46) of deaths. Automobiles were the location in 8.3% (22) of deaths. Other structures such as storage or abandoned buildings were much less common, being the location of only 6 (2.3%) deaths. There were 48 people (18.2%) who were transported to a hospital and died either in the emergency department or as an inpatient due to exposure to hot weather.



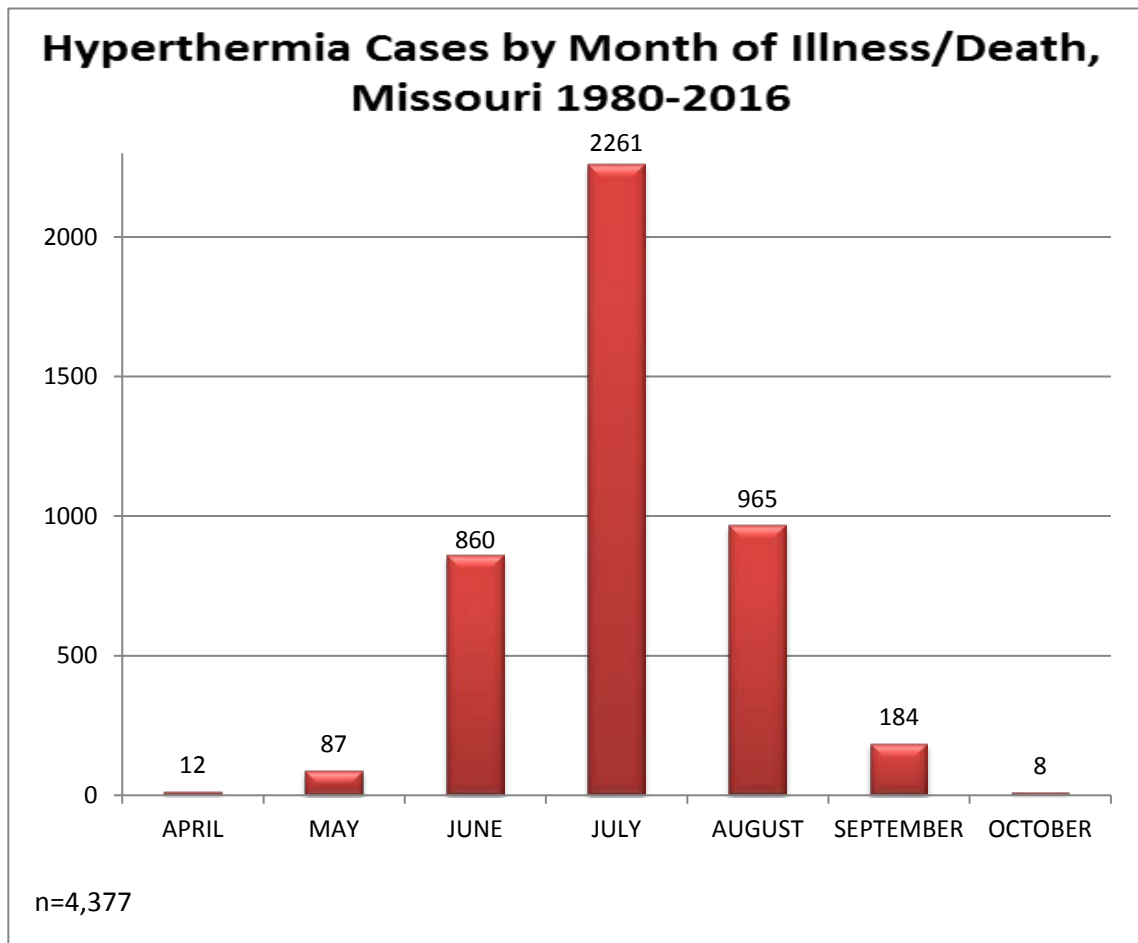
Air conditioning is the number one protective factor against heat-related illness and death. If a home is not air conditioned, people can reduce their risk for heat-related illness by spending time in public facilities that are air conditioned. Electric fans may be useful to increase comfort and to draw cool air into a home at night, but should not be relied on as the primary cooling device during a heat wave. During extreme heat, a fan will deliver overheated air to the skin rather than cooling the body, thus making the situation even worse. The Bureau of Environmental Epidemiology provides an interactive [cooling centers map](#) to assist the public in locating an air-conditioned place to go during hot weather. Young children, senior citizens, and the chronically ill are especially susceptible to the effects of high temperatures. From 2007 through 2016, of the 264 fatal hyperthermia cases, 50 people (18.9%) died in homes with no air conditioning, 31 (11.7%) died in homes where the air conditioning malfunctioned, and 30 people (11.4%) died in homes that had air conditioning available, but it was not in use.

Hyperthermia Mortality by Air Conditioning Status, Missouri 2007-2016



n=264

Missouri's highest temperatures generally occur in June, July, and August each summer. Thus, the majority of hot-weather-related cases also occur during these months. Of the 1,272 deaths reported from 1980 through 2016 and the 3,105 non-fatal heat-related illnesses from 2010 through 2016, 860 (19.6%) were during the month of June; 2,261 (51.7%) were in July; and 965 (22%) were in August.



Missouri's variable Midwest weather can cause illness and even deaths in spring and autumn as well.

- Four women ages 66, 70, 85, and 88 years of age died within two days when the air conditioning system of a skilled nursing facility either failed or had not been turned on. The daytime high temperatures had been between 82°F and 91°F for only a few days in early April 2001, but the room temperature on the top floor of the three-story brick facility was reported to be between 95°F and 98°F.

Even in September when night-time temperatures typically cool off, there have been 29 deaths, 13 of which were in people with a known heart or cardiovascular condition.

During heat waves, varying public and private emergency response plans are implemented across the state. These responses include opening [cooling centers](#), distributing ice and water, and people checking door-to-door for persons in danger from the heat. Without these local response actions, public health officials believe mortality from hot weather would be much greater.

Note: Percentages have been rounded and may not total 100%