CLIMATE CHANGE AND YOUR HEALTH

SUMMARY

Heat in the Heartland

60 Years of Warming in the Midwest

The summer of 2011 was a scorcher. All but eight states reported above-average summer temperatures, and four states broke records for extreme heat. Such sticky, steamy, uncomfortable weather is poised to become even more common as our climate warms. But hot, humid days are not just uncomfortable. Extreme heat kills. Heat is actually the biggest weather-related killer in the United States, claiming, on average, more lives each year than floods, lightning, tornadoes, and hurricanes combined. From 1999 to 2003, exposure to excessive heat killed an estimated 3,442 U.S. residents.

High temperatures can lead to dehydration, heat exhaustion, and deadly heatstroke. Very hot weather can also aggravate existing medical conditions, such as diabetes, respiratory disease, kidney disease, and heart disease. Urban residents, the elderly, children, agricultural workers, and people with impaired health and limited mobility are particularly susceptible to heat-related illness and death. Air pollutants such as ozone and particulate matter may also work in concert with heat, exacerbating its health effects.

Dangerous heat is not just a future concern. Through original research, we found that hot summer weather and heat waves have indeed become more common, on average, in the nation's heartland over the last six decades. In other words, many baby boomers living in the Midwest have already faced these changes during their lifetimes.

Some 65 million Americans call the Midwest home, and some of our nation's most populous and vibrant cities thrive in the eight states in the region. The Midwest also boasts one of the largest bodies of freshwater in the world, and is intersected by two major rivers. To represent this vast and varied region, we selected five major metropolitan areas and five nearby smaller cities. Some of these cities are landlocked, while some sit on the Great Lakes; some are in the northern tier of states while others are more southerly; some are on the region's easterly edge, while one was once considered a gateway to the West. Our analysis includes these 10 cities: Chicago and Peoria, IL; Cincinnati and Toledo, OH; Detroit, MI; Lexington, KY; Minneapolis and Rochester, MN; and St. Louis and Columbia, MO.

Our research focuses on weather systems called air masses: vast bodies of air that define the weather around us. We explored whether the number of days with dangerously hot summer air masses, which are linked to human health risks, as well as cool, dry summer air masses has changed over the last 60 years. We also examined how average daytime and nighttime temperatures and humidity levels within these weather systems have changed over time. We did so because high temperature, lack of cooling relief at night, and high humidity all contribute to heat-related illness.

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Dangerously hot summer days are becoming more common, and summer nights hotter and more humid, across the Midwest, on average. These trends pose growing risks to public health and well-being, especially to certain groups such as urban residents, the elderly, children, and outdoor workers.

Key findings of our research include:

- **Dangerously hot summer days are becoming more common across the Midwest. This trend poses growing risks for public health and well-being.**
- **The characteristics of this dangerous weather are also changing. Hot air masses have become hotter and more humid during nighttime hours, for example. In some cities, nighttime summer temperatures within some types of air masses rose as much as 4° to 5°F over six decades.**
- **The number of hot, humid days has increased, on average, across the Midwest since the 1940s and 1950s, while hot, dry days have become hotter.**
- **Heat waves lasting three days or longer have also become more common over the last six decades. The number of dangerous three-day heat waves each year has doubled in St. Louis, for example—from an average of three each year in the 1940s to an average of seven today.**
- **Relief from heat is harder to find. All the cities we studied now have fewer cool, dry days in the summer.**
- **While urban heat island effects play a role in higher air temperatures in large midwestern cities, smaller cities recorded similar increases in the number of hot summer days. This suggests that higher summer temperatures are not due solely to such effects.**

City-by-City Results

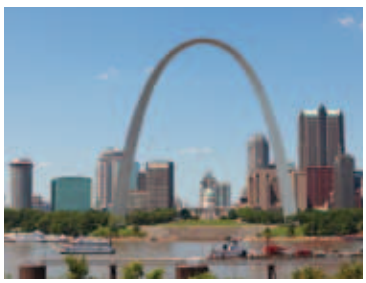
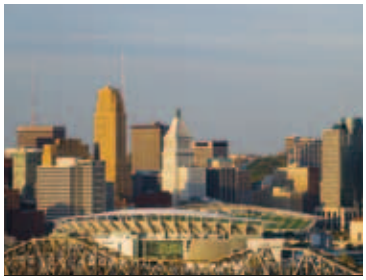
In this chart we identified statistically significant values at *p<0.05 and ^p<0.10. Note that for some cities, proper statistical tests could not be performed on dry tropical air masses because the frequencies were too low.

DAILY SUMMER WEATHER TRENDS

Very hot, humid days and hot, dry days are both dangerous to human health, while cool, dry days bring relief from the summer heat and humidity.

NIGHTTIME SUMMER

High nighttime temperatures bring no relief from the heat, heat-related

		Very Hot, Humid Days	Hot, Dry Days	Cool, Dry Days	Temperature and Humidity Changes in Very Hot, Humid Nights	
					Temperature	Dew Point
Chicago, IL 1948–2011 (63 years)		Increased 62% 2.5 Days	Increased 79% 1.5 Days	Decreased* 44% 7+ Days	Increased^ 1.7°F	Increased 0.8°F
Detroit, MI 1959–2011 (52 years)		Increased^ 172% 3.5 Days	Increased^ 338% 3 Days	Decreased* 70% 10.5 Days	Increased* 2.1°F	Increased* 2.5°F
Minneapolis, MN 1945–2011 (66 years)		Increased 55% 1.5 Days	Increased 45% 3 Days	Decreased^ 32% 4.5 Days	Increased^ 1.6°F	Increased* 2.2°F
St. Louis, MO 1946–2011 (65 years)		Increased* 200% 10 Days	No Change	Decreased* 43% 4 Days	Increased* 2.1°F	Increased 0.6°F
Cincinnati, OH 1948–2011 (63 years)		Increased^ 208% 2 Days	Decreased 45% 2 Days	Decreased 26% 2 Days	Increased 0.2°F	Decreased 0.7°F

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+ 45–99% +100–199% +≥ 200% Decrease in Cool Days
– 45–99%

+ < 1°F + 1°–2.9°F
– < 1°F – 1°–2.9°F

WEATHER TRENDS

and high relative humidity putting people at risk for illness and death.

THREE-DAY HEAT WAVE TRENDS

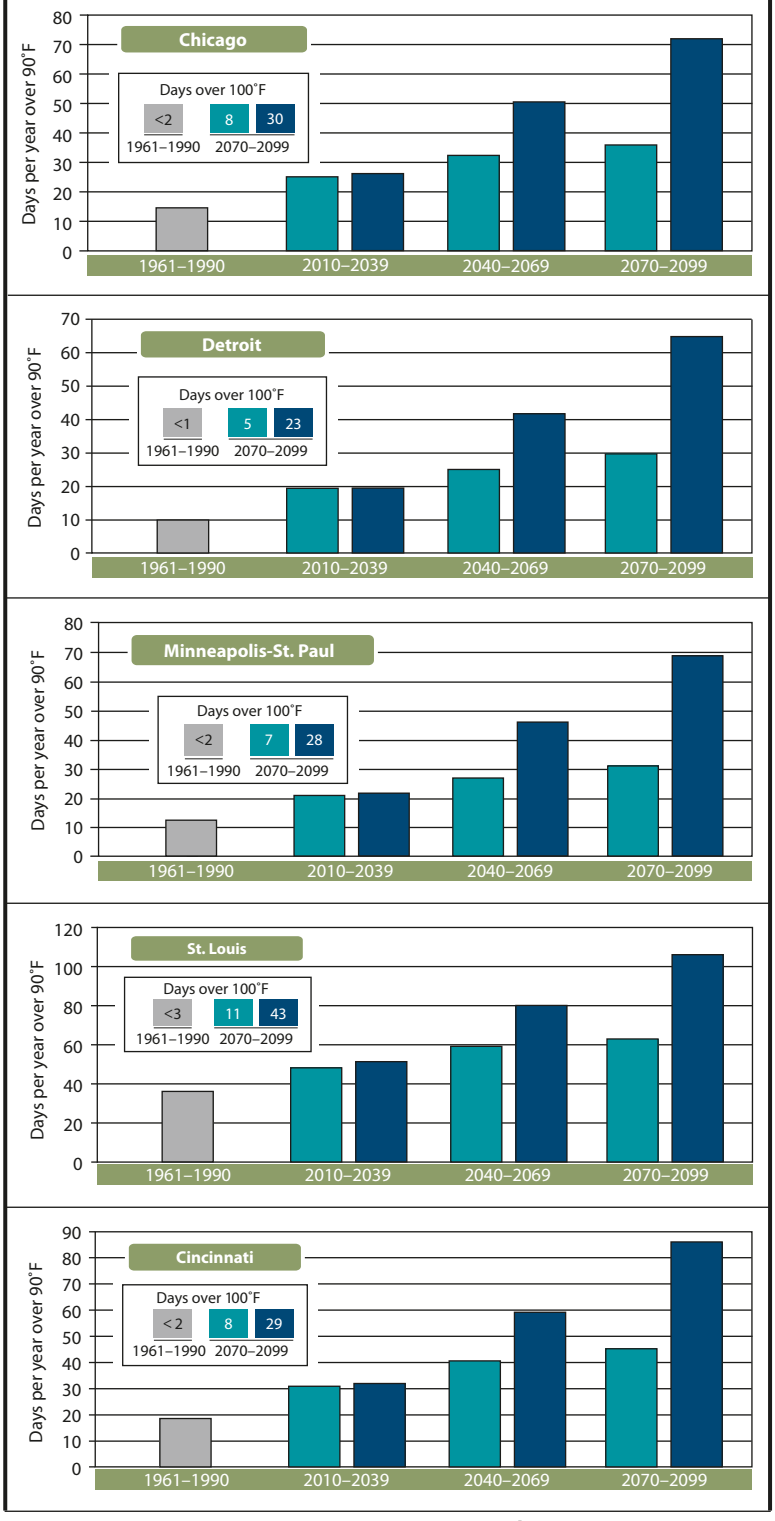
Three consecutive days of high heat and humidity can increase heat-related illness and death.

Temperature and Humidity Changes in Hot, Dry Nights		Average Increase in Heat Waves Harmful to Human Health
Temperature	**Dew Point**	
Increased 2.6°F	**Increased 2.8°F**	**Increased 1 per year**
Increased* 4.3°F	**Increased 1°F**	**Increased 2 per year**
Decreased 0.8°F	**Decreased 1.4°F**	**Increased 1 per year**
Increased* 4.4°F	**Increased* 7.7°F**	**Increased* 4 per year**
Increased 0.6°F	**Decreased 1.1°F**	**No Change**
■ + > 3°F		■ ≥ 1

WHAT THE FUTURE MIGHT LOOK LIKE

Assuming current carbon emissions trends continue (equivalent to the higher-emissions scenario), the Midwest will likely face scorching summer days with temperatures that soar above 90°F—and even 100°F—late in this century. If carbon emissions are significantly curtailed (lower-emissions scenario), far fewer summer days will be extremely hot.

The data for this section were compiled from other sources. This report's original research does not include projections of potential future climate changes.



Source: UCS 2009a-e.

Implications of Our Findings

We aimed not only to understand how summer weather has changed in cities in the Midwest, but also to shed light on the importance of city-level efforts to minimize the health risks of future climate change. Our findings suggest several consequences for public health, as well as implications for local preparedness and efforts to reduce the effects of a changing climate.

Health

The weather types that have become more common, on average, in cities in the Midwest—very hot, humid air masses and hot, dry air masses—are associated with heat-related illness and death. Very hot, humid air masses increase the risk of hyperthermia—elevated body temperature—while hot, dry air masses raise the risk of dehydration.

Heat waves, which are also becoming more common on average, further affect human health. Rising overnight temperatures are also problematic, because a lack of nighttime relief could increase the risk of heat-related complications.

Preparation and Mitigation

We cannot ignore the potential consequences of climate change, including the risk of deadly heat waves, and we must invest in preventive measures to protect public health and save lives during extreme heat events. The cities we studied are already taking some steps to minimize the health effects of dangerous hot weather. However, many other cities in the region are woefully unprepared.

We must also take aggressive action to reduce heat-trapping emissions from the burning of fossil fuels. If we do not, temperatures will likely continue to rise, and we will have to cope with the effects of extreme heat on our daily lives, our health, and our economy for decades to come.

Conclusion

We need strategies to both build climate-resilient communities and reduce the global warming emissions that are driving climate change. Our health and well-being—and those of our children—depend on it.

Building resilience in the face of extreme heat requires commitment and collaboration. For example, planners can reduce the urban heat island effect by expanding green spaces such as parks and rooftop gardens (left). Officials can also develop heat-response plans, which can include educating and checking on residents and setting up cooling centers, such as at Detroit's Farwell Recreation Center (center, during a 2010 heat wave). Residents can also take proactive steps, such as drinking plenty of water, spending at least a few hours a day in air conditioning, and avoiding strenuous activity.

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The report and technical appendix are available online (in PDF format) at *www.ucsusa.org/heatintheheartland.*

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