SURVEILLANCE BRIEF

Wisconsin Environmental Public Health Tracking Program FEBRUARY 2020

EXTREME COLD IN WISCONSIN: TRENDS, SURVEILLANCE, AND PREVENTION

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SUMMARY - Wisconsin is known for cold and snowy winters, often with below-zero wind chills. In January and February of 2019, Wisconsin experienced a frigid blast of arctic air with dangerously low temperatures.

Exposure to cold temperatures can cause hypothermia, frostbite, and other health problems. As the temperature drops, we see an increase in cold-related illness in emergency departments.

Wisconsin Department of Health Services staff are using a tool called ESSENCE to monitor the impact of these cold-related emergency department visits in real time.

Communities and individuals can help prevent cold-related illness and death with preparation and diligence.

COLD-RELATED ILLNESS TRENDS IN WISCONSIN

Climate Change and Winter Weather

Climatologists at the Wisconsin Initiative on Climate Change Impacts are projecting Wisconsin winters will warm by 4° to 11°F by mid-century.[1] While future winters will be warmer on average, Wisconsin may see more intense blasts of cold air in the short-term.[2] In Wisconsin, it is common for freezing temperatures to start as early as October and last through April.

Cold-Related Health Effects

Exposure to cold temperatures can cause a variety of health problems, including abnormally low body temperature (hypothermia), injuries to extremities from freezing of soft tissues (frostbite), and red, tender areas of swelling on the skin (chilblains). Together, public health professionals call these symptoms "cold-related illness."[3]

During 2010–2018, there were 2,497 cold-related inpatient hospitalizations and 7,797 emergency department visits. Peaks in hospitalizations and emergency department visits often coincide with lower average temperatures (Figure 1). During 2010–2018, there were 428 cold-related deaths in Wisconsin during the winter months—October 1 through April 30. Figure 2 displays yearly counts of cold-related deaths during 2010–2018. Wisconsin averages about 50 cold-related deaths each year.

Risk Factors

Those most at risk for cold-related illness include:

- Older adults
- Babies sleeping alone in cold bedrooms
- People who are outside for long periods (e.g., the homeless, hunters)
- People using alcohol or drugs
- People living with chronic medical conditions
- People living with mental illness
- People taking medications that affect how the body regulates temperature

Epidemiologists at our agency reviewed Wisconsin cases of cold-related deaths.[4] These three abbreviated case reports from the January–April 2014 season illustrate examples of cold-related deaths in Wisconsin:

Case 1. In January 2014, a 25-year-old man was found frozen to death one block from his home. He was previously healthy and had no known medical conditions. At the estimated time of his death, the temperature outside was -8°F. Investigators learned that he was dropped off at the wrong home after leaving a tavern. His blood alcohol level was nearly three times the legal limit.

Case 2. In February 2014, a 59-year-old woman was found in her driveway 72 hours after last contact. She lived alone and had multiple chronic conditions, including type 2 diabetes, chronic obstructive pulmonary disease, and spinal stenosis. At the estimated time of her death, the temperature outside was 6°F. The investigation concluded that she likely fell and sustained minor injuries. Although she was wearing suitable clothing for the weather, she was unable to stand because of impaired mobility.

Case 3. In March 2014, a 63-year-old man was found in a snow-covered field. He had a history of advanced Parkinson's disease and lived alone. Family members reported that he was unable to care for himself completely, and neighbors noted he had a tendency to wander outdoors. He had last spoken with his family 36 hours before discovery of his body. At the time he was found, the temperature outside was 35°F. He was wearing only jeans, a short-sleeve shirt, shoes, and gloves.

FIGURE 1. Emergency department visits for cold-related illness tend to go up when average temperatures are colder.

Wisconsin Cold-Related Emergency Department Visits and Average Temperatures (°F) by Season*, 2010–2018

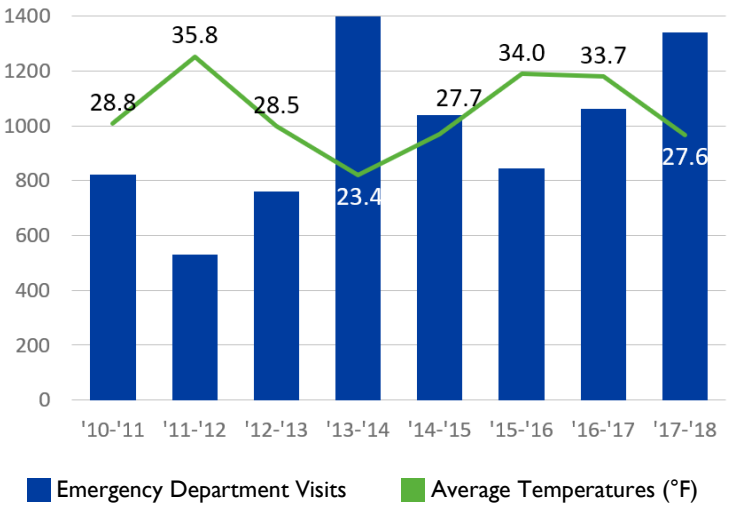
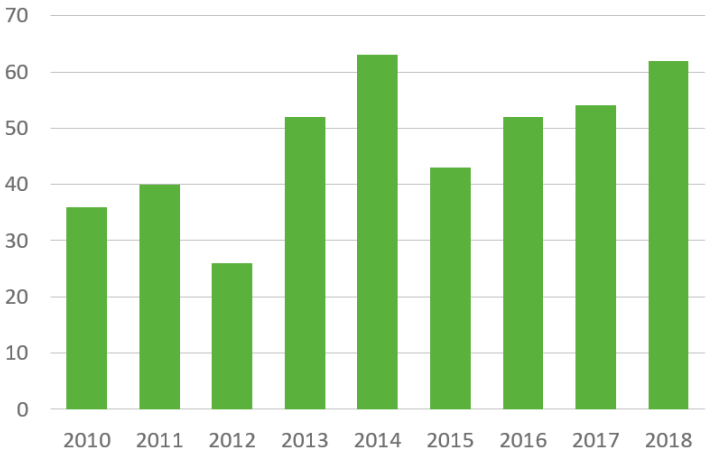


FIGURE 2. Wisconsin averages about 50 cold-related deaths each year.

Wisconsin Cold-Related Deaths, 2010–2018*



Data from May 1 through September 30 are excluded.

REAL-TIME SURVEILLANCE

The ESSENCE System

Epidemiologists in our agency evaluate cold-related emergency department visits and deaths (see Figures 1 and 2), but data are delayed by several months before they become available. This time lag makes these data unhelpful for monitoring the health impacts of cold weather as it is happening.

To assess the health impacts of extreme cold in near-real time, we rely on a rapid surveillance system called ESSENCE (Electronic Surveillance System for the Early Notification of Community-Based Epidemics).

ESSENCE is a web-based syndromic surveillance system that collects, processes, and examines data from several clinical data sources. These data sources include chief complaints (what a patient states as the reason for seeking medical care), discharge diagnoses, and triage notes from hospital staff. Users can query, analyze, and visualize data by time and geography. Currently 86% of Wisconsin emergency departments are part of the ESSENCE system.

Queries can be tailored to specific events, such as a flooding event or a cold snap. These queries help public health staff better predict the number and types of emergency department visits that health care systems might experience during natural disasters, which can lead to better preparation to respond to these situations.

The Polar Vortex

During January 29 through January 31, 2019, Wisconsin experienced a polar vortex bringing arctic cold air down into the Midwestern portion of the United States. Wisconsin set record low temperatures in Madison and Milwaukee and had wind chills as low as -55°F in Waukesha.

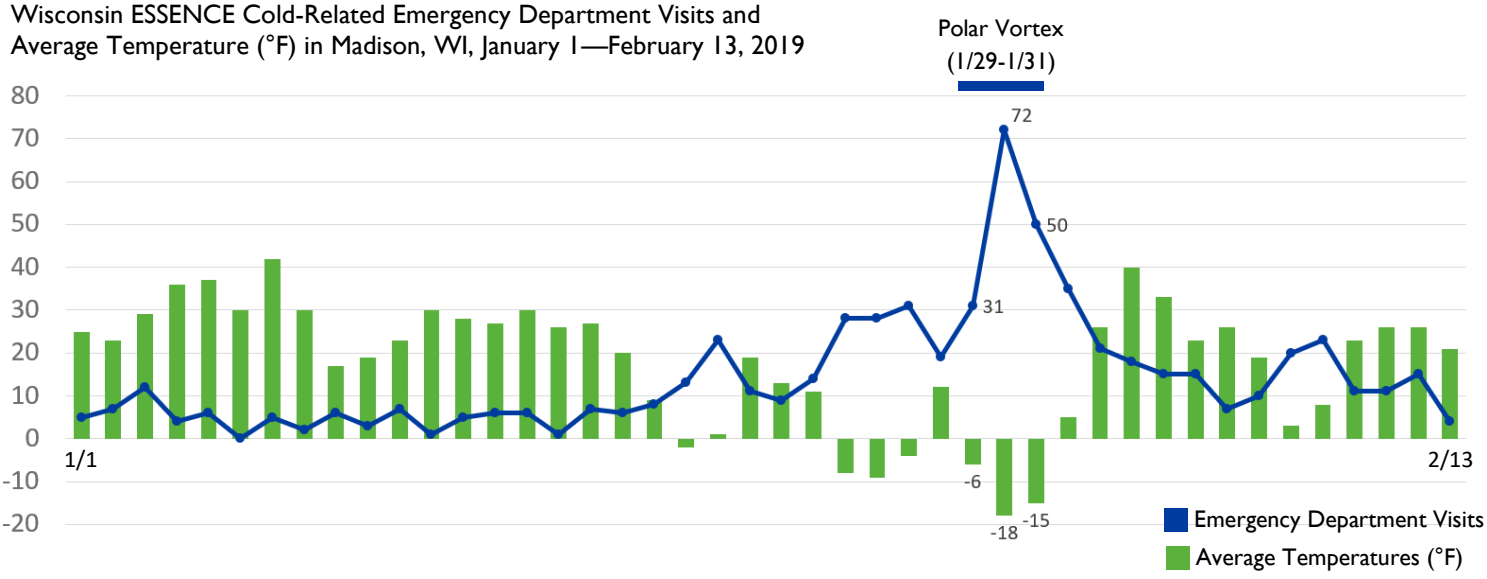
The cold temperatures combined with the sub-zero wind chills resulted in widespread power outages. Governmental agencies were forced to close, leading to a disruption of public services. Eleven people died as a result of the polar vortex. This number is likely an underestimate since it includes only those cases in which cold was listed as an underlying or contributing cause of death on the death certificate.

During January 29–31, our staff used a cold-related illness query developed by the Kansas Department of Health and Environment. The query revealed 157 health events related to cold weather exposure or illness in Wisconsin.

Figure 3 illustrates cold-related emergency department visits for the state over the average daily temperatures for Madison, Wisconsin during the 2019 polar vortex. There was a marked increase in cold-related emergency department visits identified through ESSENCE as the average temperature dropped across the state.

During the Polar Vortex, the query revealed 71% of the cold-related illnesses were in males and 29% were in females. Of the individuals presenting to the emergency department

FIGURE 3. Cold-related emergency department visits from ESSENCE increased during the 2019 Polar Vortex



during the extreme cold period, 75% were between the ages 18 and 64 years.

Our staff will continue to use ESSENCE to detect outbreaks and patterns of injury in near real-time. Staff are also surveilling the effects of extreme heat, flooding, and other natural disasters as they occur. These data can enhance our public health messaging when it matters most.

PREVENTING COLD-RELATED ILLNESS

In the Community

Create an extreme cold preparedness plan. These plans outline roles and responsibilities for community partners during periods of extreme cold.

Identify warming centers. Ensure there are community spaces for people to stay safe from the cold. Promote them widely ahead of cold weather.

Curb excessive drinking. Alcohol is implicated in many cold-related deaths. There are policies and best practices for creating a positive alcohol environment. These policies are good public health practice, no matter the season.

As an Individual

Stay inside. When possible, stay indoors. If you have to venture out, dress in loose-fitting layers. Wear a hat, mittens, and snow boots. Use a scarf to cover your mouth and face.

Stock a home emergency kit. Your home kit should include items such as food and water, cell phone and charger, flashlight and batteries, first aid kit, important medications, a weather radio, and a change of clothes. Ready Wisconsin has more items and tips.

Winterize your car. Just as you have a home emergency kit, you need one for your car too. Pack items such as blankets, snacks and water, a shovel, jumper cables, and sand. Ready Wisconsin has more items and tips. Keep your gas tank at least half-full.

Check on your friends, family, and neighbors. As illustrated in the case studies (page 2), it's critical to check on loved ones and neighbors during extreme cold.

Limit outdoor time for pets. Extreme cold is dangerous for animals too.

Know the signs and symptoms of hypothermia. Warning signs include shivering, exhaustion, confusion, and slurred speech. Symptoms can look similar to intoxication. Call 911 if someone is exposed to cold temperatures and you see these symptoms.

CONCLUSIONS

Wisconsin has experienced extremely cold days in recent polar vortex events. While future winters will be warmer on average, Wisconsin may see more intense blasts of cold air in the short-term. Using the ESSENCE surveillance system, public health professionals can monitor the impact of the cold and adapt messaging in near real-time. With preparation and diligence, communities and individuals can prevent injuries and death from extreme cold.

ACKNOWLEDGEMENTS

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ABOUT TRACKING

The Wisconsin Environmental Public Health Tracking Program is your source for environmental public health data on Wisconsin communities.

DATA DETAILS

The average temperature data used for Figure 1 came from the National Oceanic and Atmospheric Administration (NOAA) National Centers for Environmental Information, Climate at a Glance: Statewide Time Series.

Cold-related emergency department visit and hospitalization illnesses included those with an ICD-9 code of 991, E901.0, E901.8, E901.9, or E988.3 or an ICD-10 code of X31, T68, T69, T33, or T34 in any of the diagnostic fields. Cases due to excessive cold of man-made origin (ICD-9 code E901.1 or ICD-10 code W93) were excluded. ICD-9 codes were used for ED/ hospitalization data through September 2015; starting on October 1, 2015, ICD-10 codes were used. The cold illness season includes only cases that occurred from October 1 to April 30.

Cold-related fatalities included those with an ICD-10 code of X31 (exposure to excessive natural cold) and/ or T68 (hypothermia) as an underlying or contributing cause of death. Fatalities due to excessive cold of man-made origin (W93) were excluded. Counts include fatalities of Wisconsin residents only. Fatalities exclude Wisconsin residents who died out-of-state. Fatalities include only cases that occurred from October 1 to April 30; fatalities from the summer months of May-September were excluded.

REFERENCES

[1]Wisconsin Initiative on Climate Change Impacts. Wisconsin's changing climate: Impacts and adaptation, 2011.

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[3]National Institute for Occupational Safety and Health. Cold Stress—Cold Related Illness. 2018.

[4]MMWR. Hypothermia-related deaths – Wisconsin, 2014, and United States, 2003-2013.