



COLD-RELATED ILLNESS QUERY

Guidance for Implementing Cold-Related Illness
Syndromic Surveillance in Public Health Practice

Council of State and Territorial Epidemiologists (CSTE)

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Guidance for implementing cold-related illness syndromic surveillance in public health
practice**

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Nelson Adekoya, DrPH

Epidemiologist
Centers for Disease Control and Prevention

Hayleigh McCall, MPH

Program Analyst
Council of State and Territorial
Epidemiologists

Carol R. Braun

Epidemiology Specialist
Missouri Department of Health & Senior
Services

Henri Menager, MD, MPH

Senior Epidemiologist
Kansas Department of Health and
Environment

Lori Harris-Franklin

Senior Epidemiology Specialist
Missouri Department of Health & Senior
Services (formerly)

Matthew Roach, MPH

Epidemiology Program Manager
Arizona Department of Health Services

Anna Frick, MPH

Research Analyst
Alaska Department of Health and Social
Services

Meredith Jagger, MS, MPH

Oregon Health Authority (formerly)

Melissa Kretschmer, MA

Environmental Public Health Tracking
Epidemiologist
Arizona Department of Health Services

Kathryn Lane, MA, MPH

Senior Environmental Epidemiologist
New York City Department of Health and
Mental Hygiene

Fatema Mamou, MPH

Epidemiologist
Michigan Department of Health and Human
Services

We also gratefully acknowledge the review and helpful comments of:

Laurel Harduar Morano, PhD

Epidemic Intelligence Service Officer
Centers for Disease Control and Prevention

Amy Ising, MSIS

NC DETECT Program Director
Department of Emergency Medicine
University of North Carolina at Chapel Hill

Rasneet Kumar, MPH

Syndromic Surveillance Epidemiologist
Maricopa County Department of Public Health

Zach Stein, MPH

Epidemiologist, Syndromic Surveillance Coordinator
Kansas Department of Health and Environment (formerly)

Ramona Lall, PhD

City Research Scientist
Bureau of Communicable Disease
NYC Department of Health and Mental Hygiene

Introduction

During the cold season, low temperatures can increase the risk for cold-related illnesses (CRI) related to weather, such as hypothermia and frostbite. In some parts of the country, especially in the northern latitudes and higher elevations, cold weather is a year-round hazard. In warmer climates, CRI can occur when swimming or diving in cold water or when there is wind and rain when temperatures are near 50°F. ¹ In addition, hypothermia can occur among older and health-compromised adults even at relatively warm temperatures.² In a review of weather-related causes of death in the United States from 2006-2010, exposure to excessive natural cold and hypothermia was the leading cause of death (63 percent) when compared to deaths directly attributed to other weather hazards like extreme heat, floods, storms, and lightning.³ Populations more at-risk of developing CRI include older adults, infants, males, black individuals, as well as people who are homeless, use alcohol or substances, have mental health or chronic medical conditions, lack adequate home heat, or participate in outdoor winter recreation.³

Major winter storms are also common environmental hazards that can require a public health response. According to the Federal Emergency Management Agency (FEMA), for example, winter storms, severe ice storms, and snowstorms led to three major disaster declarations by states in 2017.⁴ In addition to cold-related illnesses and deaths, winter storms with snow, wind, and ice can lead to unsafe road conditions for pedestrians and drivers. These conditions can increase the risk of both injuries from motor vehicle crashes as well as motor vehicle mechanical issues that may strand drivers ill-prepared for cold temperature exposure. Icy roads and sidewalks can lead to slips and falls,⁵ which can damage the wrist, arm, hips, and head. Winter storms can also cause power outages that can result in a loss of home heat. During this time, households may rely on space heaters and fire-places, which can increase the risk of carbon monoxide poisoning.⁶

Many studies have demonstrated an increased risk of cardiovascular events following exposure to cold.⁷ Myocardial infarction (heart attacks) may also occur because of increased physical exertion like shoveling snow.⁸ Researchers have also observed increases in natural cause mortality (i.e., excess winter mortality) following periods of cold weather, often with lagged effects up to several days or even weeks.⁸ The timing of CRI and cold-weather related injuries may be more immediate, with same-day or up to a few days of lagged effects.⁹

Syndromic surveillance has been identified by public health practitioners as a useful tool for providing situational awareness and planning during cold weather events. In a 2015 survey sent to selected representatives of each state health department member of the Council of State

and Territorial Epidemiologists (CSTE) with 34 responses, 41 percent (n=14) of respondents described using syndromic surveillance to monitor extreme cold weather events that could affect health, and 38 percent (n=13) mentioned tracking CRI (e.g., hypothermia). Such information may help hospitals manage staff and supplies appropriately for treating cold-related illnesses and injuries.⁹ Analyzing age groups during cold events has also led to creating more targeted prevention messaging.¹⁰

However, no standard cold-related syndrome existed within the National Syndromic Surveillance Program's (NSSP) Electronic Surveillance System for the Early Notification of Community-based Epidemics (ESSENCE). This system is used by many state and local public health jurisdictions across the country, but some jurisdictions have their own, locally developed systems. Some local jurisdictions have also created a unique syndrome definition based on their stakeholder needs to address cold events. Common key words have included the terms "frostbite", "hypothermia", and "cold exposure."¹¹

In 2017, CSTE's Climate, Health, and Equity Subcommittee convened a workgroup of jurisdictions to develop a CRI query definition, in part, due to a lack of available information and guidance on implementing and using syndromic surveillance for cold-related illness during winter weather events. For example, a literature review performed in December 2017 using the search terms "syndromic surveillance" and "cold illness" in PubMed, yielded only 9 results.

The objectives of the workgroup were to (1) provide a syndromic surveillance query for CRI and (2) provide guidance to public health professionals to implement CRI syndromic surveillance. This report provides a CRI query which jurisdictions can adopt or adapt, discusses limitations of the query, offers suggestions for validating the syndrome in practice, and provides examples of how CRI surveillance has been implemented.

Methods

The workgroup requested existing case definitions used to detect CRI in emergency department (ED) syndromic surveillance data from state and local health departments. For the purposes of this project, only direct cold exposure (i.e., hypothermia, frostbite, and other tissue damage caused by cold weather) was considered. Other winter-weather-related hazards, such as carbon monoxide exposure and icy slips, trips, and falls were not included in this definition. As of June 2018, six state and local health departments had contributed their definitions. A draft of the Centers for Disease Control and Prevention's (CDC) Environmental Public Health Tracking (EPHT) definition for identifying cold-related illness diagnostic codes in hospital discharge data was also shared.

Terms from each query were compiled. Words or phrases used in two or more definitions were added to a master list of CRI query terms. Some jurisdictions used exclusion terms to suppress non-relevant records, and these terms were also compiled. International Classification of Diseases ninth revision Clinical Modification (ICD-9-CM) and ICD-10-CM diagnostic codes were identified with the jurisdictional queries and EPHT definition. Although ICD-10-CM codes are currently in use, the ICD-9-CM codes were listed to allow jurisdictions to assess retrospective CRI data as needed.

Example of Regional Variations in Terms

In validating a CRI query, it is important for each jurisdiction to examine the results of the query to determine how well it is performing, whether there are variations in keywords or presentation to the ED that need to be better captured, and generally whether adjustments need to be made. As a very cold place with sizable year-round outdoor recreation and a population that often lives hours (or even days) from definitive healthcare,

Alaska's Query:

```
(,^frostbit^,or,^hypotherm^,or,^t34^  
,or,^t33^,or,^t68^,or,^x31^),andno  
t,(^recheck^,or,^history of  
frostbite^,or,^history  
frostbite^,or,^dressing change^),
```

Alaska has a significant burden of cold-related illnesses like hypothermia and frostbite. Alaska developed its own query to identify frostbite and hypothermia cases, which is based on using the terms “frostbit*”, “hypotherm*”, and the ICD-10-CM codes T34, T33, T68, and X31 as inclusion criteria. Examination of the cases identified with this query indicated a need to add exclusion terms to remove follow-up care for severe frostbite, and denotations of a frostbite history when the current visit is not frostbite related. For example, a record may have a chief complaint that includes “history of frostbite –no great toe” in text that is otherwise about a person with cellulitis of the foot. As these cases do not represent new instances of cold-related illness, they do not help public health track incident cases or contribute to situational awareness during acute periods of cold and are therefore excluded from the query.

These exclusions affect a relatively small number of visits. For example, in one particularly cold month, there were 112 visits reported with the exclusions and 116 without; a difference of four. However, the exclusion terms are helpful for preventing multiple counts of a single incidence artificially inflating the signal. This can be a major problem in Alaska, where the population in a small ZIP code may have fewer than 1,000 people in it. One example is a case of a patient who had severe frostbite in a North Slope village, which required an emergency airlift to Anchorage. The patient was received in the ED, treated, and discharged. He continued

to visit the ED daily for four days to have his wounds monitored and dressings changed. Since he was from a low-population area, without the exclusion, these repeated visits created an obvious spike in counts and rates for that area that was disproportionate to the actual burden. While other states and regions may not need to exclude follow-up care and history terms for cold-related illness, Alaska and other cold or low population states may find these exclusion terms helpful.

Novel Query for Cold-Related Illness

The CRI query is based on existing definitions from 5 jurisdictions. The query lists inclusion terms for the chief complaint text field and numerical codes for the diagnosis field (Table 1). Both ICD-9-CM and ICD-10-CM (International Classification of Diseases, Clinical Modification, Ninth and Tenth Revisions) are provided. Because the inclusion criteria in Table 1 may retrieve some non-CRI cases, exclusion terms in Table 2 should be included in the query.

Table 1: Inclusions terms for cold-related illness syndrome query

Category	Terms to include in query
Chief complaint search terms	COLD EXP COLD - EXP COLD-EXP COLDEXPOSURE ENV EXP ENVIRONMENTAL EXP EXP TO COLD EXP TO ENV EXPOSURE TO ENV EXPOSURE TO COLD FROST BIT FROSTBIT FROSTNIP FROST NI “FROZE” and (“HAND” or “FINGER” or “THUMB”)

	<p>“FROZE” and (“FEET” or “FOOT” or “TOE”) HYPOTHE “OUT IN THE COLD”</p>
ICD-9-CM diagnosis codes	<p>991 – Effects of reduced temperature E901.0 – Excessive cold due to weather conditions E901.8 – Excessive cold, other specified origin E901.9 – Excessive cold, of unspecified origin E988.3 – Extremes of cold, undetermined intent</p>
ICD-10-CM diagnosis codes	<p>X31 – Exposure to excessive cold of natural origin T68 – Hypothermia T69 – Other effects of reduced temperature T33 – Superficial frostbite T34 – Frostbite with tissue necrosis</p>

Table 2: Exclusion terms for cold-related illness (CRI) syndrome query

Category	Terms to exclude from query
Chief complaint terms	<p>RECHECK HISTORY OF FROSTBITE HISTORY FROSTBITE DRESSING CHANG CHEST CONGESTION COUGH INFECTION</p>

	<p>“FROZE” and hand/foot related terms and not (“MEAT”, or “BURGER”, or “PORK”, or “WART”, or “GROWTH”, or “FOOD”, or “KNIFE”, or “SHOULDER”, or “TURKEY”, or “KNEE”)</p>
ICD-9-CM diagnosis codes	<p>E901.1 – Excessive cold of man-made origin 780.65 – Hypothermia not associated with low environmental temperature</p>
ICD-10-CM diagnosis codes	<p>W93 – Exposure to excessive man-made cold R68.0 – Hypothermia not associated with low environmental temperature</p> <p>Exclude codes ending in D or S to suppress non-incident cases.</p>

Novel Query for Cold-Related Illness in ESSENCE Syntax

To facilitate use by jurisdictions that use ESSENCE systems, we provide below an example of the query in ESSENCE syntax. This syntax includes ICD-9-CM and ICD-10-CM codes, and users should ensure that they are using the appropriate version of the codes according to the year(s) of data that they are examining.

```
(,^cold exp^,or,^cold-exp^,or,^env exp^,or,^environmental exp^,or,^exp to env^,or,^exposure to env^,or,^exp to cold^,or,^exposure to cold^,or,^cold exposure^,or,^coldexposue^,or,^out in the cold^,or,^f[ro][ro]stbit^,or,^f[ro][ro]st bit^,or,^f[ro][ro]stnip^,or,^f[ro][ro]st nip^,or,^f[ro][ro]st ni^,or,^hypothe^),or,(,^froze^,and,(,^hand^,or,^finger^,or,^thumb^,)),ANDNOT,(,^Meat^,or,^burger^,or,^pork^,or,^wart^,or,^growth^,or,^food^,or,^knife^,or,^shoulder^,or,^turkey^,or,^knee^),or,(,^froze ^,and,(,^Feet^,or,^foot^,or,^toe^),ANDNOT,(,^Meat^,or,^burger^,or,^pork^,or,^wart^,or,^growth^,or,^food^,or,^knife^,or,^shoulder^,or,^turkey^,or,^knee^,)),or,(^[/ ]x31^,or,^[/ ]t68^,or,^[/ ]t69^,or,^[/ ]t33^,or,^[/ ]t34^,or,^[/ ]991. [/ ]^,or,^[/ ]991_[/ ]^,or,^[/ ]E901.[089]^,or,^[/ ]E988.3^,or,^[/ ]E901[089]^,or,^[/ ]E9883^),andnot,(,^recheck^,or,^re-check^,or,^history of frostbite^,or,^historyfrostbite^,or,^dressingchang^,or,^chest^,or,^congestion^,or,^cough^,or,
```

^infection^,or,^[;/]w93^,or,^[;/]r68.0^,or,^[;/]r680^,or,^[;/]e901.1^,or,^[;/]780.65^,or,^[;/]e9011^,or,^[;/]78065[;/]]^,or,^[TX]__._XD^,or,^[TX]____XD^,)

Steps for Implementing Cold-Related Illness Syndromic Surveillance in Practice

1. Determine a data source and method for searching clinical records.

This query was developed using chief complaint and discharge diagnosis fields in ED visit and inpatient hospital admission data but was also designed to be flexible. The workgroup recognizes that not all jurisdictions have access to inpatient hospital records. The query could be adapted to identify CRI in other sources of clinical data, such as nurse hotlines, emergency medical system (EMS) runs, or urgent care visits, and other free-text fields, such as triage notes.

A syndromic surveillance system will be needed to search for text and/or diagnosis codes within a clinical dataset. Popular syndromic surveillance systems include the BioSense Platform (CDC NSSP) and ESSENCE (The Johns Hopkins University Applied Physics Laboratory). Some jurisdictions have syndromic surveillance systems that are specific to their state or local health department.

Each syndromic surveillance system will have different methods for building a query. For example, BioSense includes applications where either R code or MySQL programming language may be used to query data. Other jurisdictions may query data with SAS or other software. Refer to documentation within the agency to determine appropriate querying methods.

2. Formally validate the query with local data.

Described in *Syndrome Validation* section below.

3. Decide how often the query will be run and analyzed by the public health agency.

Agencies must decide how frequently to run the query and interpret the data. This will vary depending on the agency's geographical region, relative historical climate, and public health priorities of a given jurisdiction. For example, some agencies may closely monitor CRI throughout the entire cold season, typically October through April, while others may elect to monitor the data more closely during winter storm events. For more see the *Potential Uses of the Data* section below.

4. Decide how the resulting dataset will be analyzed.

Methods for analyzing the CRI data include: producing descriptive statistics to summarize demographics and risk factors for CRI cases; monitoring trends over time (vertical bar chart of case counts by day or week); comparing current trends to historical trends using similar timeframes from previous years; time-series analysis of CRI; or time-series correlation of CRI incidence data with a measure of temperature, such as minimum and maximum temperature. Temperatures should be obtained from a reliable source, such as the National Weather Service (NWS), and should be spatially resolved enough to be consistent with the temperature experienced by the population. Different regions have different standards for declaring cold or winter weather alerts (e.g., blizzard warning, winter storm watch, winter storm warning, snow advisory, freezing rain advisory, ice storm warning, winter weather advisory). Some jurisdictions analyze the data by time period, such as during the usually cooler months of the year (e.g., October to April.) If your jurisdiction lies in a mostly cold climate, you may consider year-round monitoring depending on stakeholder input. Additionally, for those in NSSP and many local versions of ESSENCE NSSP's NWS weather station data are integrated into the tool. Weather factors such as maximum temperature, minimum temperature, average temperature, wind chill, heating degree days, snowfall, and snow depth, among others, are available. Weather data can be overlaid with health outcomes or looked at separately within ESSENCE.

Syndromic data may also be used to identify individual patients, obtain medical records, and perform an in-depth review. However, it may be difficult to obtain a medical chart. CRI is not a communicable disease, and most jurisdictions do not mandate reporting of the condition. Before requesting records, check local policies and data use agreements between the public health agency and the submitting facility.

5. Decide how the data will be used to make decisions and take public health action.

Described in *Potential Uses of the Data* section below.

Syndrome Validation

Because there may be variations in how data are recorded and how CRI cases present, jurisdictions should examine and validate the syndrome definition on local data before implementing surveillance. There are several ways to validate the definition, including:

1) Manual review of the records identified by the syndrome.¹² Reviewing records with CRI discharge codes may also help identify chief complaint terms that could be important for syndrome classification;

2) Comparison with hospital discharge data at either the individual or aggregate levels, and/or assessing whether syndrome counts follow patterns relative to the time of year and cold weather conditions; and

3) Examining medical chart data to understand whether records identified through syndromic surveillance were actually diagnosed as CRI.

These methods are described in more detail in the [2016 CSTE Heat Syndrome Case Definition Guidance Document](#).¹³ To validate the proposed CRI definition, New York City (NYC) compared syndrome records with hospital discharge data. A matched hospital discharge and ED syndromic surveillance dataset for 2014 was examined during cold season months of the year (January through April and October through December). Sensitivity, specificity, positive predictive value (PPV) and negative predictive value (NPV) were calculated (Table 3).

The sensitivity was relatively low (39%) and the PPV was 61%. The specificity and NPV were high (Table 3). In addition, temporal variations between the two data sources were similar (Pearson $r = 0.9$ for correlation between daily counts of syndromic and hospital discharge data). While the definition is likely to miss some cases, the cases it captures are more likely to represent CRI and could provide a useful indicator of morbidity patterns. Sensitivity and PPV were similar to an analysis of a heat-related illness (HRI) syndrome in New Jersey, which found that the sensitivity and PPV were 23% and 59%, respectively, during heat events. However, that analysis also observed that the HRI syndrome identified all the major episodes of HRI in billing data over the study period and was useful in providing situational awareness.¹⁴

Table 3: Cold-Related Illness (CRI) Emergency Department and Syndromic Surveillance Data,¹
New York City, 2014 Cold Season Months

Prevalence	0.04
Sensitivity	38.99
Specificity	99.99
Positive Predictive Value	61.23
Negative Predictive Value	99.98

1) Data source: New York State Department of Health, Statewide Planning and Research Cooperative System (SPARCS) and Bureau of Communicable Disease Syndromic Surveillance Unit.

Potential Uses of the Data

Syndromic surveillance systems allow for the observation of CRIs in real-time or near-real time, which can provide situational awareness and inform emergency response actions during extreme cold or other types of winter weather emergencies.

For example, Michigan routinely monitors CRIs and releases a weekly cold-report during the winter season. Syndromic data describe the number of self-reported cold-related illness complaints analyzed in a time series compared with minimum temperatures from across the state. Data are further stratified to show type of complaint, such as carbon monoxide exposure, cold exposure, hypothermia, etc. Additional charts show data by gender, age group, and region of the state. The report is disseminated to state public health and healthcare partners (see Appendix A for an example report).

Trends in CRIs can be monitored to help inform public health and its partners for prevention messaging for situations including winter storm travel, outdoor safety, indoor safety, and power outages. Additionally, trends can guide the use of winter weather toolkits, such as those from Kansas and Wisconsin (see appendix 1 and 2, respectively), which contain steps and strategies for public health partners as well as the public to appropriately prepare and respond to cold weather.

Continued or sharp increases in CRIs may prompt mitigation for the health impacts of cold weather. This could be paired with weather forecast data to determine actions such as when and where to open warming centers or emergency shelters. For example, Multnomah County (Portland) Oregon has monitored CRI in conjunction with visits made by persons experiencing

homelessness during extreme weather events to aid decision-making by local service organizations.

Limitations

Many of the same limitations explored in the CSTE Heat Syndrome Case Definition Guidance Document also apply to the cold syndrome definition.¹³ Misclassification may result from exclusion terms removing true CRI cases or not completely removing false cases; inclusion terms not detecting all true cases may also result in misclassification. As with heat surveillance, however, cases identified by the CRI indicator can be considered a stable measure of the relative amount of illness, rather than a complete count of all cases. In addition, exclusion criteria can be re-evaluated as syndromic data quality changes, improves, and/or receives more reliable diagnostic codes.

The use of a pre-defined static query does not allow for systematic detection when new words or codes have been introduced, requiring periodic and potentially labor-intensive re-assessment of the query. Machine learning, which involves creating algorithms that can be trained to detect and use new keywords and codes, may improve accuracy and efficiency.

It is also important to note that surveillance of CRI in ED data does not represent the total burden of CRI being treated in health systems. People may be treated at urgent care facilities or utilize emergency medical services without visiting an ED, for instance. Surveillance of these types of health care providers may also be important to understanding the full burden of CRI during an emergency or cold season. Near real-time ED data, however, are readily available to most health departments and provide an indicator of impact severe enough to require a hospital visit.

Conclusions and Recommendations

Syndromic surveillance of CRI can provide useful information for modifying public health action on a timely basis. Accessible syndromic data can be used to aid resource deployment logistics during winter storm events, prevention messaging for targeted audiences, and development of health safety alerts or thresholds. This CRI surveillance query can be coupled with syndromic surveillance of other cold weather health impacts, such as carbon monoxide poisoning, weather-related injuries such as slips and falls, and cold weather-related death surveillance. The near real-time collection and dissemination of data through systems like ESSENCE provide situational awareness advantages, which would not be possible when using hospital discharge billing data – the latter being hindered by delays in timeliness. In addition,

these efforts can be implemented with minimal added costs because syndromic surveillance systems are already in place. Public health practitioners working on prevention and response efforts for winter-related hazards can benefit from the use of syndromic surveillance.

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Kansas Cold Weather Toolkit

Planning for Cold Weather Safety in Kansas

For Public Health Professionals & Emergency Preparedness

Version 1.0

February 2017

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For more information contact:

Kansas Extreme Weather Workgroup
Kansas Department of Health and Environment
1000 SW Jackson, Suite 330
Topeka, KS 66612
Kdhe.ksepht@ks.gov

Kansas Cold Weather Toolkit

Overview of the Toolkit

The purpose of the toolkit is to help decision-makers in the public and private sectors, as well as citizens, increase their level of preparedness during the cold season. The toolkit focuses on examples and processes in Kansas that describe practical, implementable steps and strategies to prevent morbidity and mortality from extreme cold weather at the local level. It is organized into multiple interdependent guides to be used in conjunction with each other. There is coordinated message mapping located at the back of the document.

Introduction to Cold Weather Events

According to the National Weather Service (NWS), cold temperatures and wind chills cause an average of at least 32 deaths per year and winter storms cause an average of 40 deaths per year in the United States.

Winter weather creates dangerous conditions including icy, snow and sleet-covered roads; In Kansas, these conditions are responsible for thousands of vehicle accidents and at least 15 deaths each winter.

Although Kansans are familiar with bad winter weather, extreme cold, snow, ice, rain, and sleet heighten the risks of injury and death when unprepared--particularly for susceptible populations. Those include the elderly, the very young, socially isolated persons, those living with comorbidities, persons with special health care needs, and those with low socioeconomic status.

Guide One: Winter Weather Alerts

Wind Chill Watch: Conditions are favorable for wind chill temperatures to meet or exceed local wind chill warning criteria in the next 24 to 72 hours. Wind chill temperatures may reach or become colder than -25 degrees Fahrenheit.

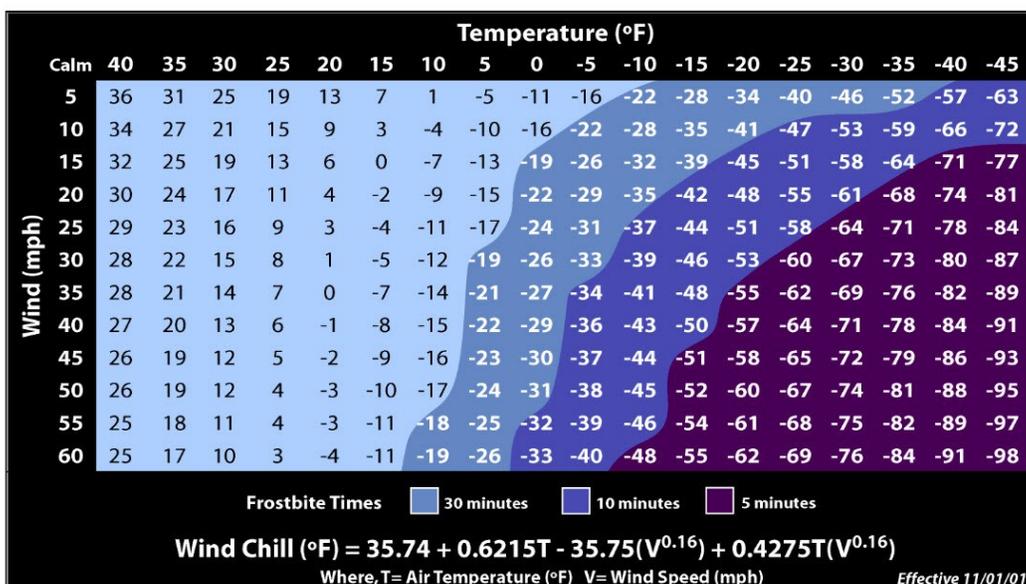
Wind Chill Advisory: Wind chill is expected to exceed local wind chill advisory criteria in the next 12 to 36 hours. Wind chill temperatures may reach or become colder than -15 degrees Fahrenheit.

Wind Chill Warning: Wind chill temperatures are expected to meet or exceed local wind chill warning criteria in the next 12 to 24 hours. Wind chill temperature may reach or drop below colder than -25 degrees Fahrenheit.

Winter Weather Advisory: A winter storm event (sleet, freezing rain, snow and blowing snow or a combination of events) is expected to meet or exceed local winter weather advisory criteria in the next 12 to 36 hours but stay below warning criteria. Criteria for snow is 1 to 5 inches of snow in 12 hours or less covering at least 50% of the zone or encompassing most of the population. Criteria for ice are any ice accumulations less than ¼ inch over at least 50% of the zone or encompassing most of the population.



Wind Chill Chart



Guide One: Winter Weather Alerts

Blizzard Watch: Conditions are favorable for a blizzard event in the next 24 to 72 hours. Sustained wind or frequent gusts greater than or equal to 35 mph will accompany falling and/or blowing snow to frequently reduce visibility to less than $\frac{1}{4}$ mile for 3 or more hours.

Blizzard Warning: Blizzard event is imminent or expected in the next 12 to 36 hours. Sustained wind or frequent gusts greater than or equal to 35 mph will accompany falling and/or blowing snow to frequently reduce visibility to $\frac{1}{4}$ mile for 3 or more hours.

Winter Storm Watch: Conditions are favorable for a winter storm event (heavy sleet, heavy snow and blowing snow or a combination of events) to meet or exceed local winter storm warning criteria in the next 24 to 72 hours. Criteria for snow is at least 6 inches or more in 12 hours or less, or at least 8 inches or more in 24 hours covering at least 50% of the zone or encompassing most of the population. Criteria for ice is $\frac{1}{4}$ inch or more over at least 50% of the area or encompassing most of the population.

Winter Storm Warning: A winter storm event (heavy sleet, heavy snow, ice storm, heavy snow and blowing snow, or a combination of events) is expected to meet or exceed local winter storm warning criteria in the next 12 to 36 hours. Criteria for snow is 6 inches or more in 12 hours or less, or 8 inches or more in 24 hours covering at least 50% of the zone or encompassing most of the population. Criteria for ice is $\frac{1}{4}$ inch or more over at least 50% of the zone or encompassing most of the population.

Ice Storm Warning: An ice storm event is expected to meet or exceed local ice storm warning criteria in the next 12 to 36 hours. Criteria for ice is $\frac{1}{4}$ inch or more over at least 50% of the zone or encompassing most of the population.





Guide One: Winter Weather Alerts

General Terms for All Types of Weather

Winter Weather Event: A winter weather occurrence that affects public safety, transportation and/or commerce.

Outlook: An outlook is used to indicate that a hazardous winter weather event may develop in the next 3-7 days. It is intended to provide information to those who need considerable lead time to prepare for the event.

Watch: A watch is used when the risk of a hazardous winter weather event has increased, but its occurrence, location and/or timing is still uncertain. It is intended to provide enough lead time so those who need to set their plans in motion can do so. Watches are generally issued 36-72 hours before the onset of a weather event.

Warning: Warnings are issued when a hazardous winter weather event is occurring, is imminent or has a very high probability of occurrence. A warning is used for conditions posing a threat to life or property.

Advisory: An advisory is appropriate for less serious conditions compared to a warning that can cause significant inconveniences and, if caution is not exercised, could lead to situations that may threaten life and property.

Wind Chill: Wind chill is the temperature the body feels, calculated using the actual temperature outdoors and the wind speed. It is always lower than the actual temperature (see table on page five).

Sleet: Sleet is defined as rain that turns to ice pellets before reaching the ground. Sleet can cause dangerous and slick outdoor conditions.

Freezing Rain: Defined as rain that freezes on contact when it hits the ground. It can cause extremely dangerous and slick outdoor conditions and have destructive impacts on trees, power lines and other utility infrastructure.

Cold-Related Fatality: Cold related fatality includes deaths that are attributed to cold weather events.

Guide Two: Cold-Related Health Effects

Health effects such as hypothermia, frostbite, overexertion, dehydration, carbon monoxide, falls and car crash-related injuries are all illnesses and injuries that are associated with cold weather.

Hypothermia

Hypothermia occurs when the body's temperature becomes abnormally low. It often occurs after prolonged exposure to cold temperature.

Early Symptoms:

- Shivering
- Fatigue
- Loss of coordination
- Confusion and disorientation

Late Symptoms:

- No shivering
- Blue skin
- Dilated pupils
- Slowed pulse and breathing

First Aid Instructions

- Request immediate medical assistance.
- Move victim into a warm room or shelter.
- Remove wet clothing.
- Warm the center of their body first then the chest, neck, head and groin, using an electric blanket; or use skin-to-skin contact under loose, dry layers of blankets, clothing or towels.
- If the person is conscious, then warm beverages may help increase the body temperature. Do not give alcohol to someone suffering from hypothermia.
- Once body temperature has increased keep them dry and wrapped in a warm blanket, including the head and neck.
- When there is no pulse detected, begin CPR immediately and call 911.

Guide Two: Cold-Related Health Effects

Frostbite

Frostbite is an injury to the body that is caused by freezing, which most often affects the nose, ears, cheeks, chin, fingers and toes.

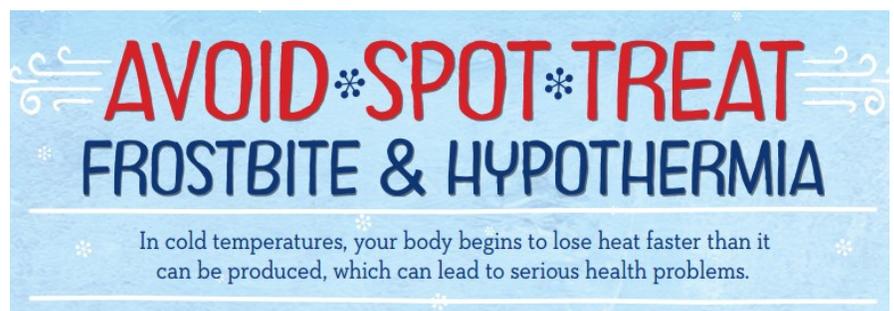
Symptoms:

- Reduced blood flow to the hands and feet
- Numbness
- Aching
- Tingling or stinging sensation
- Bluish or pale waxy skin

First Aid

- Get into a warm room as soon as possible.
- Unless necessary, do not walk on frostbitten feet or toes.
- Immerse the affected area in warm, (not hot) water or warm the affected area using body heat. Do not use a heating pad, fireplace or radiator for warming.
- Do not massage the frostbitten area because doing so may cause more damage.

To download an infographic that you can use from the Centers for Disease Control and Prevention, go to https://www.cdc.gov/phpr/documents/hypothermia-frostbite_508.pdf.



Guide Three: Cold Weather Health Risks

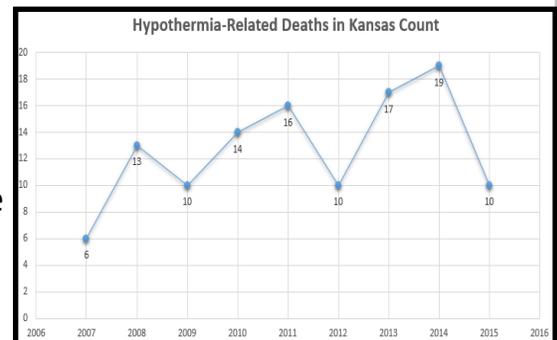
During cold weather and especially during periods of extreme cold, the risk of associated health effects increase. Knowing in advance what to watch for can help prevent some of these risks.

Heart Health Risk

Your risk of heart attack can increase when you are in the cold because it can constrict or narrow your blood vessels. Performing strenuous outdoor activity combined with this effect may stress your heart. To reduce the risk you should dress warmly, regulate your activity and pay attention to how you feel.

Body Temperature Risk

Cold temperatures put you at risk for hypothermia, especially if you are an older adult. Hypothermia is not just caused by extreme cold conditions. Even prolonged exposure to milder cold conditions can lead to increased risk. If at all possible take time to acclimate to the cold and decrease the work load. Dressing in warm layers, covering extremities and staying aware of your body signals can help you handle the cold and prevent hypothermia.



Immune System Risk

Respiratory illness risk tends to increase in winter months when people are concentrated indoors and exposed to dryer air circulating viral infections. Take precautions to reduce risk.

- Stay Hydrated
- Get a flu shot
- Practice good hygiene and stay away from people who are sick
- Wash your hands frequently using soap and water for 20 seconds
- Always cover your nose, and mouth when you cough or sneeze with a tissue or your arm
- Avoid touching your nose, mouth and eyes as much as possible



Guide Four: Cold Weather Preparation

Emergency Supply Kit

There is a possibility that you can lose heat, power, telephone service, and suffer from a shortage of supplies if a winter storm continues for more than a day. Therefore, it is important to assemble an emergency supply kit and be prepared in advance.

Items to add to your emergency supply kit are:

- Blankets
- Matches
- First aid kit with instructions
- Multipurpose dry chemical fire extinguisher
- Flashlight or battery-powered lantern
- Battery powered radio
- Battery powered clock or watch
- Non-electric can opener
- Extra batteries
- Snow shovel
- Rock salt
- Special needs items (diapers, medications, medical equipment, etc.)
- Paper towels and/or tissues for sanitary purposes

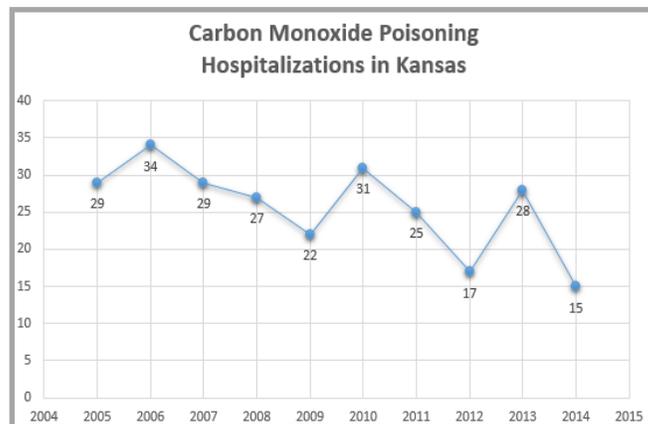
Guide Four: Cold Weather Preparation

Stockpile Food and Water

- It is a good idea to stock three days worth of non-perishable food items that don't need to be cooked or refrigerated.
- Have on hand at least one gallon of water per person for three days. Store water in clean containers or purchase bottled water that can be used for drinking and other household needs.
- Remember that the more isolated your home is, the more stockpiling of food, water, and medications is necessary.

Winterize Your Home

- Install a smoke detector and a battery-operated carbon monoxide detector before winter begins and test them to make sure they work.
- Insulate exterior water lines, attics, and walls.
- Install storm windows and insulated doors.
- Install a thermometer in a readily visible location to monitor the indoor temperature.
- Have your chimney, furnace and other heating utilities inspected by a professional before the winter season begins.
- Don't forget about any pets. Provide them with adequate warm shelter if they aren't indoors and ensure they have access to unfrozen water at all times.





Guide Five: Winter Storm Travel

Prepare Your Car for Travel

Just like preparing your home for cold weather, it is important to put together emergency supplies in your vehicle. Placing as much as you can in one or two plastic totes with a lid will help keep it contained and readily available. Be sure to remove any snow on your vehicle's windows, lights, brake lights, and signals. Ensure you are able to see and be seen!

The following are good items to have for winter traveling:

- First Aid Kit and emergency numbers in an accessible location
- A can and waterproof matches (to melt snow for water)
- Ice scraper and brightly colored cloth to use as an emergency alert
- Road maps if traveling in an unfamiliar area and extra gas
- Cell phone and charger
- Tools or toolkit and tow rope
- Canned compressed air with sealant for emergency tire repair
- Bag of sand or cat litter to pour on snow for traction or traction mats
- Battery-operated radio and flashlight with extra batteries
- Jumper cables and a collapsible shovel
- Emergency flare and whistle
- Extra winter clothes or blankets
- Container of water and high calorie preserved food

Winterize Your Car

- Have your vehicle regularly serviced and replace worn tires to help with traction.
- Maintain high antifreeze levels and use wintertime windshield wiper fluid.
- Try to keep your gas tank full in order to prevent ice formation.

Guide Five: Winter Storm Travel

Driving in a Winter Storm

- Travel only if necessary and check for traffic updates and highway closures by calling 511 for information related to winter weather or check out KanDrive.
- Notify a friend or family member of your destination and the expected time of arrival and return. Ask them to notify authorities if you don't arrive when you are supposed to.
- Keep an emergency kit in your car at all times.
- Avoid driving at night and don't drive alone if you have the option.
- Try to stay on main highways and avoid untraveled country roads whenever possible.
- Avoid driving in low, visibility conditions and on icy snow covered roads, bridges and overpasses.
- If conditions become too hazardous, pull off the road and turn your hazard lights on. Notify emergency services of your location.
- Always dress as if you were going to get stranded and keep extra layers in the vehicle.



What to do when Stranded

- Stay inside your vehicle, turn your hazard lights on, tie a brightly colored cloth to your antennae, move supplies close to you and notify emergency services of your location.
- Remove snow from around your tail pipe to prevent carbon monoxide buildup in the vehicle and wear your seatbelt when sitting inside.
- Run your heat for 10 minutes every hour and crack your window for ventilation.
- Wrap yourself in extra clothes and blankets and huddle with others to keep warmer.
- Stay awake and move your arms and legs routinely to keep blood flowing.



Guide Six: Outdoor Safety

What to Wear

Wearing multiple warm layers of clothing and staying dry is essential to safety during cold weather. If you must be outside, dress properly, stay dry as much as possible and if you get wet or sweat change into dry clothes when you return indoors.

- Pay attention to wind chill and wear several layers of loose fitting clothing with an outer layer and footwear that is wind and water resistant. Cover all exposed parts of the body as much as possible.
- The risk of frostbite is increased in people with reduced blood circulation and those not dressed appropriately for the winter weather conditions. Frostbite is caused by the freezing of the skin and tissues. Reddened skin develops gray/white patches in extremities causing tingling, aches, loss of feeling and blisters in the affected area.

Limit Time Outdoors

- Limit the amount of time outdoors and listen to your body. Go indoors to take a break and warm up.
- Work outdoors during the warmest part of the day.
- Acclimate to cold and decrease work load.
- Carry a cellular phone with you to call for help if needed. Be sure to let others know where you are and what you will be doing.



Guide Six: Outdoor Safety

Avoid Ice

Walking on ice is extremely dangerous. Many cold weather injuries result from falls on ice-covered sidewalks, steps, driveways, and porches. Keep your steps and walkways free of ice using rock salt or another chemical de-icing compound. Sand may also be used on walkways and steps to reduce the risk of slipping.

Avoid Overexertion

Do not overexert yourself outdoors in extreme cold or during winter storms. Sweating cools the body and wet clothing loses its insulating value, therefore staying dry is important.

- Avoid overexertion when shoveling snow or doing other outdoor chores. Take breaks in warm dry areas and when possible push snow instead of lifting it. Do not shovel snow if you have heart disease or high blood pressure, as the cold puts more stress on your cardiovascular system.
- Shivering is one of the first signs of hypothermia and signals that you need get warmed up. Signs of hypothermia are uncontrollable shivering, confusion, loss of coordination, slurred speech, drowsiness, exhaustion and dangerously low body temperature.



Guide Seven: Indoor Safety

Lack of Indoor Heat

During the winter power outages can occur due to weather events. Extreme cold can also lead to insufficient heat indoors, depending on heat sources. If you are exposed to cold temperatures due to lack of indoor heat try to seek alternative shelter through family, friends, neighbors or by contacting your local extreme weather shelter.

- Conserve body heat by not overexerting yourself.
- Eat a well-balanced meal to help you stay warmer. Avoid alcohol because it can cause your body to lose heat more rapidly. Drink warm beverages to help maintain body temperature.
- Dress warmly in multiple layers of clothing and wrap up in blankets.
- Avoid frequent opening of doors and close off unused rooms. Prevent drafts by using towels under doors to conserve interior warmth and close draperies or cover windows with blankets at night.

Prevent Frozen Pipes

- Extreme cold temperatures can damage and freeze pipes. Vulnerable pipes include those found on exterior walls, in unheated rooms, and outside supply lines.
- Winterize your home by sealing out drafts, insulating water lines and covering exterior water spigots or hydrants before cold weather begins.
- Keep an emergency water supply that will last for several days in case pipes do freeze.
- Keep the temperature in your home constant during the day and night. If you leave the house unattended, keep your heat at a minimum of 55 degrees Fahrenheit.
- Open cabinet doors for warm air to circulate around plumbing pipes. Remember to keep any household chemicals out of reach of children.
- Leave water taps slightly open so they can continuously drip. If pipes are frozen, completely open all faucets. Shut off the main water valve immediately if a pipe bursts.



Guide Seven: Indoor Safety

Safely Use Alternative Sources of Heat

Alternative sources of heating produce major risks including fires and carbon monoxide poisoning. Have a plan and prepare in advance to use some other back-up source of heat during a power failure or another event. There are numerous safety considerations to keep in mind when using other sources of heat such as all types of space heaters, fireplaces, and wood or pellet stoves.

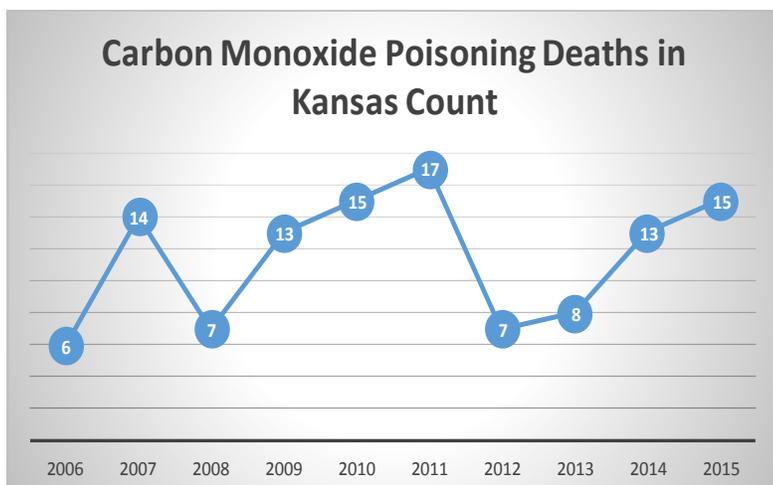
- Never use electric generators, grills, or other gasoline, propane, natural gas or charcoal burning devices indoors, as this may cause carbon monoxide poisoning.
- Ensure adequate ventilation for a heat source by keeping flues clean, cracking windows and keeping doors open.
- Do not plug space heaters into extension cords.
- Do not put a space heater on anything that could catch fire. Place it on a noncombustible surface.
- Only use the designated fuel for your heat source.
- Follow all building codes and manufacturer's instructions.
- Monitor the heater or heat source yourself to make sure it works safely.
- Keep young children away from working heaters and stoves to avoid injuries.

Guide Seven: Indoor Safety

Avoid Carbon Monoxide Poisoning When Using Alternative Heat

Use of alternative heating sources during power outages increases the risks of carbon monoxide poisonings. Don't take chances and be sure to follow all precautions.

- Carbon monoxide poisoning occurs when the body is in contact with carbon monoxide, an odorless, colorless gas that is given off by fuel burning equipment.
- Install battery operated carbon monoxide detectors and smoke detectors on every level and near sleeping areas.
- Warning signs of carbon monoxide poisoning include shortness of breath, headache, confusion, nausea, dizziness, and loss of consciousness. These early warning signs should be taken very seriously because carbon monoxide poisoning is life threatening.
- If you suspect a carbon monoxide leak in your house or if your carbon monoxide alarm goes off, leave the house immediately and call 911.



Carbon monoxide poisonings happen every year in Kansas.

It is Preventable!

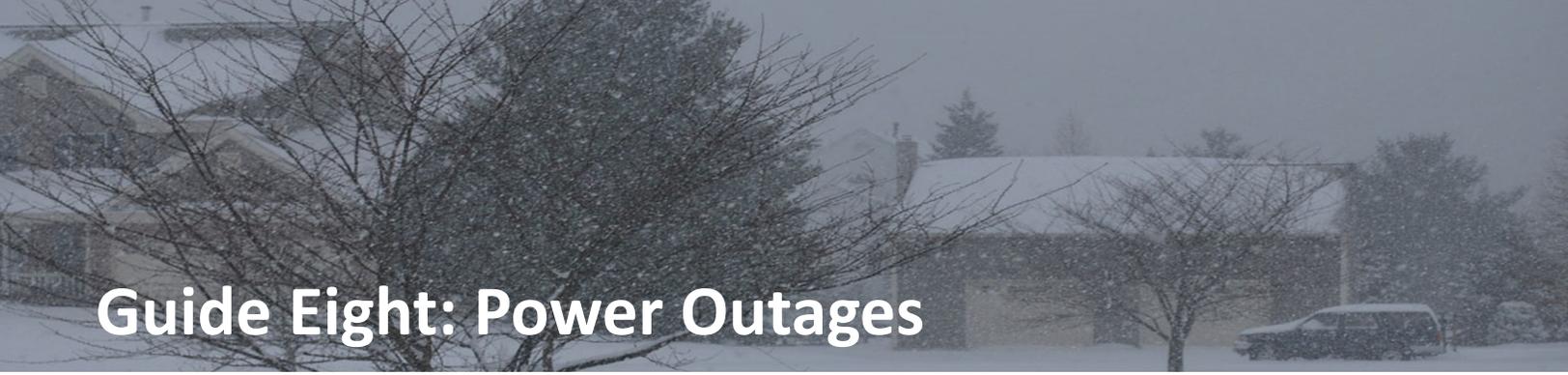


Guide Eight: Power Outages

Keep Food Safe

Keep the refrigerator and freezer doors closed as much as possible to keep food cold.

- Eat perishable foods from the refrigerator first.
- Eat freezer food after the refrigerator food is eaten.
- Eat non-perishable foods (such as those stored in cans or jars) after food from the refrigerator and freezer is eaten.
- If it seems the power outage will last more than 4 hours, prepare a cooler with ice and transfer your refrigerator items to the cooler.
- If it seems the power outage will last more than a day, prepare a cooler with ice and transfer your freezer items to the cooler.
- If possible, use food or appliance thermometers to monitor food temperatures. Refrigerated food should be 40°F or below and frozen foods should be 0°F or lower.
- To evaluate when to discard food items, use the charts at https://www.foodsafety.gov/keep/charts/refridg_food.html and https://www.foodsafety.gov/keep/charts/frozen_food.html.
- Keep food in a dry, cool spot away from sunlight and keep it covered at all times.



Guide Eight: Power Outages

Monitor Electrical Equipment

- Turn off and unplug all unnecessary electrical equipment. When the power comes back on surges or spikes can damage equipment.
- Leave one light on so you'll know when the power comes back on.
- Eliminate unnecessary travel, especially by car. Power outages may be occurring throughout the area resulting in congested roads and traffic light outages.

Use Generators Safely

- If you are considering buying a generator, get advice from a professional, such as an electrician, before the purchase. Make sure the generator you purchase is rated for the power you need.
- Keep the generator outside, at least 20 feet from windows, people, or homes.
- When using a portable generator, connect the equipment you want to power directly to the outlets on the generator. Do not connect a portable generator to a home's electrical system.
- Never use a generator, grill, camp stove or other gas or fuel-powered device inside a home, garage, basement, crawlspace, or partially-enclosed area.

A black metal swing set stands in a park covered in snow and frost. The trees in the background are heavily laden with white snow, creating a serene winter scene. The sky is a pale, overcast blue.

Guide Nine: Vulnerable Populations

Elderly

Elderly adults may live alone, suffer from chronic disease or have a disability that makes them more vulnerable to extreme weather conditions. The elderly have a slower metabolism and often don't create as much body heat as other adults. They may not sense air temperature as well, therefore temperature drops could go unnoticed. These are a few reasons to check on elderly neighbors and family often to ensure their heating source is working and they maintain a healthy body temperature. The elderly are especially vulnerable if they are socially isolated or live in an isolated setting and contact is limited. If the heat supply stops, this population will be at extreme risk for indoor and outdoor winter weather hazards.

Low Socioeconomic Status

Cold weather often disproportionately affects people with low socioeconomic status, especially the homeless. The colder the temperature the more heating costs rise placing an additional burden on those with low income. The absence of central heating in the home or a poorly heated home can often lead to the use of unsafe heating sources; placing the occupants at greater risk of injury and death due to fire and carbon monoxide poisoning. Kansans facing heating problems in their homes should contact the local utility companies for assistance with their heating bills. Additionally, cold weather shelters may be available in the area. They should contact local nonprofit organizations such as the Red Cross, libraries, or churches to inquire about shelters.

A black metal swing set stands in a snowy, wooded area. The trees are covered in snow, and the ground is a thick layer of white. The swing set has two seats hanging from a central bar.

Guide Nine: Vulnerable Populations

Young Children

Infants cannot produce enough body heat by shivering and lose heat easier than adults. Make sure that infants sleep in a heated room and dress them in warm clothing.

- In an emergency, hold your baby close, as your body heat can keep the baby warm.
- If you are without heat for a long time, go to a shelter or someone's home that has heat.
- Do not put your infant in bed with you, as rolling onto infants is a risk.

Special Populations

Families that include a member with special health care needs/disabilities may require additional assistance during extreme weather events. Identifying potential emergency situations and planning ahead is essential for this population.

- Assemble a 5 day supply kit of food, water, specialty formulas, medical supplies and personal supplies.
- Stock a 5 day supply of medications. For medication requiring refrigeration, have a plan for how you will keep that medication cold during a power outage.
- Charge durable medical equipment prior to the cold weather event.
- If life-sustaining medical equipment is used, families should make sure the utility company has been notified to get priority status when restoring power.
- Develop a personal contact list, emergency preparedness plan, and an evacuation plan.
- Don't forget to include pets and service animals in those plans.





Guide Ten: Weather Communications

General Guidelines

Be Concise

- Keep key messages brief and consistent throughout different media outlets.
- Stick to three key messages, or one key message with three parts, for each underlying concern or specific question.
- Messages should be constructive, solution-oriented, and promote action.

Be Credible

- Develop key messages that cite credible third parties. Coordinate and collaborate with other credible sources.
- Being trustworthy and timely is very important to the reception of your message.
- Avoid unnecessary use of “absolute” words such as no, not, never, nothing and none. Keep a positive tone. Try to balance negative messages with positive ones.

Be Clear

- Develop messages that are easily understood by the target audience.
- The most important messages should be the first and last thing that people read or hear.
- Use graphics and other visual aids to enhance key messages.

Message Mapping

These tables are message maps designed for preparedness professionals to provide key points to the general public in response to questions about preparing for extreme cold and winter storms.

What should I have in my Family Emergency Kit?		
Key message 1	Key message 2	Key message 3
You want to include food, water and medicine for all members of your family.	You want to include supplies for eating and drinking.	You want to include a first aid kit and other supplies to manage minor emergencies.
Supporting information 1-1	Supporting information 1-2	Supporting information 1-3
Healthy non-perishable snacks are good items to put in a family emergency kit.	Manual can openers, cups and disposable tableware are good items to include in kits for eating purposes.	First aid kit and guide to care for injuries; tools for turning off gas or electricity.
Supporting information 2-1	Supporting information 2-2	Supporting information 2-3
One gallon of water per person per day is recommended.	A trash bag to collect waste tableware, wrappers and cans helps to keep things organized and clean.	Toys or games for children and pets can help keep them occupied.
Supporting information 3-1	Supporting information 3-2	Supporting information 3-3
Try to have a couple of days of medication on hand should you have to shelter or evacuate.	Handi-wipes, hand sanitizer and paper towels help with hygiene in the absence of water for washing purposes.	Flashlights, extra batteries, lanterns and glow sticks to see and find each other.

Message Mapping

What should I do to prepare my vehicle?		
Key message 1	Key message 2	Key message 3
Keep your vehicle maintained and fueled.	Plan your travel.	Have supplies in case you get stranded.
Supporting information 1-1	Supporting information 1-2	Supporting information 1-3
Keep a minimum of 1/4 tank of fuel in your vehicle.	Give others your route and estimated departure and arrival times; let them know when you have left and arrived.	Keep extra clothes, gloves, coveralls and/or a blanket in your vehicle to stay warm.
Supporting information 2-1	Supporting information 2-2	Supporting information 2-3
Have a spare, empty, approved fuel container in your vehicle in case you run out.	Be aware of road conditions at www.kandrive.org and follow travel restrictions.	Have a signaling device: KHP “Need Help” sign, emergency triangles, etc. to get attention should you
Supporting information 3-1	Supporting information 3-2	Supporting information 3-3
Be sure to maintain the engine by changing fluids as recommended and keeping tires inflated to correct pressure.	Have emergency numbers handy, like *47 (*HP), to contact the Kansas Highway Patrol should you become stranded.	Keep some snack bars, a bottle of water and a spare cell phone charger in your glove compartment.

Message Mapping

What cold weather injuries should I look out for?		
Key message 1	Key message 2	Key message 3
Exposure to the cold can cause injuries to the skin and cause dehydration.	Poisonings and fires can occur from heating devices.	Slips, falls and overexertion can also lead to injuries and death.
Supporting information 1-1	Supporting information 1-2	Supporting information 1-3
Frostbite and hypothermia can cause pain, loss of feeling and even death if severe.	Furnaces and wood heaters can produce carbon monoxide, which could cause carbon monoxide poisoning.	Many cold weather injuries occur from falls on ice and overexertion.
Supporting information 2-1	Supporting information 2-2	Supporting information 2-3
Frostbite and hypothermia may start as numbness or tingling that progresses to vigorous shivering, confusion and sleepiness.	Warning signs of carbon monoxide poisoning includes shortness of breath, headache, confusion, nausea, dizziness and loss of consciousness.	Sweating cools the body and wet clothing loses its insulating value. The cold puts more stress on the cardiovascular system.
Supporting information 3-1	Supporting information 3-2	Supporting information 3-3
Prevent cold injuries by keeping clothes dry, taking frequent warm breaks and dressing in layers.	Install carbon monoxide detectors and fire alarms. If an alarm goes off, leave immediately and call 911.	Stay off the ice, pay attention to wind chill, acclimate to the cold and decrease the work load.

References and Resources

<https://www.foodsafety.gov/keep/emergency/>

<https://www.cdc.gov/disasters/foodwater/facts.html>

<https://www.cdc.gov/disasters/foodwater/prepare.html>

<http://www.nws.noaa.gov/om/hazstats.shtml>

<https://www.ready.gov/winter-weather>

<http://icyroadsafety.com/fatalitystats.shtml>

<https://www.dhs.wisconsin.gov/publications/p0/p00652.pdf>

<https://www.cdc.gov/disasters/winter/>

<https://www.cdc.gov/features/winterweather/>

<https://www.cdc.gov/niosh/topics/coldstress/>

<http://www.uwheartmo.org/news/cold-weather-safety-tips-united-way-2-1-1-0>

<http://www.kdheks.gov/cphp/index.htm>

<http://www.kdheks.gov/idp/index.html>

<http://www.safekidskansas.org/>

<http://www.kdheks.gov/bar/index.html>

<https://keep.kdhe.state.ks.us/Ephtm/>



WINTER WEATHER TOOLKIT

A planning toolkit for public health and
emergency response professionals

BUILDING RESILIENCE AGAINST CLIMATE EFFECTS PROGRAM

Bureau of Environmental and Occupational Health

<http://www.dhs.wisconsin.gov/climate> | OCTOBER 2016 | dhsclimate@wi.gov

State of Wisconsin | Department of Health Services | Division of Public Health | P-00652 (Rev. 10/2016)



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Appendices

Appendix A: References

Appendix B: Additional Resources

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Eleanor Ganz, BRACE LTE, DHS

For more information, please contact:

Colleen Moran, MS, MPH

Climate and Health Program Manager

Bureau of Environmental and Occupational Health

1 W. Wilson St., Room 150 | Madison, WI 53703

Colleen.Moran@dhs.wisconsin.gov

608-266-6761





INTRODUCTION

Purpose

The purpose of this winter weather toolkit is to provide information to local governments, health departments, and citizens in Wisconsin about preparing for and responding to winter weather events. The toolkit provides background information, practical guidance and strategies, media releases and talking points, definitions, and useful reference materials on this topic.

The guides in this toolkit may be copied and printed onto local government or health agency letterhead for distribution to residents affected by winter weather. Additional documents may be found in Appendix B: Additional Resources.

Background

According to the National Weather Service (NWS), cold temperatures and wind chills cause an average of 28 deaths per year and winter storms cause 39 deaths per year in the United States.¹ Winter weather creates dangerous conditions including icy, snow- and sleet-covered roads; in Wisconsin, these conditions are responsible for an average of 50,000 vehicle accidents and 45 deaths each winter.² Although winter is familiar to Wisconsinites, extreme cold, snow, ice, rain, and sleet place all of us at risk; particularly susceptible populations are the elderly, young children, anyone who is socially isolated, and those with low economic status. Therefore, it is imperative that Wisconsin governmental units, citizens, and businesses prepare for the effects of winter weather.

In Wisconsin, winter conditions cause an average of 50,000 vehicle crashes and 45 deaths each year.²

Climate Trends

University of Wisconsin climate scientists have completed studies demonstrating that the state's climate is becoming wetter and more variable. According to the Wisconsin Initiative on

Climate Change Impacts (WICCI), a 14% increase in wintertime precipitation occurred statewide from 1950 to 2006. Climate scientists suggest this trend will continue, with wintertime precipitation increasing into the mid-21st century. Trends also indicate that winter temperatures in Wisconsin are warming, increasing the likelihood that winter precipitation occurs as freezing rain rather than snow, making travel conditions more hazardous.³

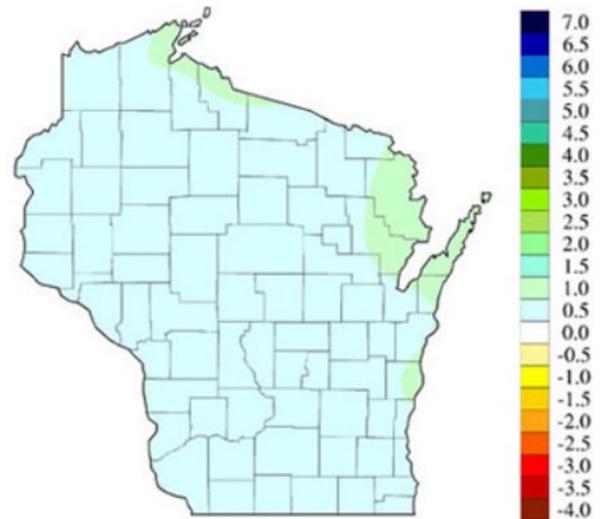
Health Impacts

The dangers of winter weather require Wisconsin to prepare for freezing temperatures, life-threatening wind chills, and dangerous weather conditions that can cause health impacts including hypothermia, frostbite, trench foot, and even death. Emergency planning must consider cold-related needs such as safe usage of electrical appliances, planning for power outages, prevention of carbon monoxide poisoning, and placement of warming centers. Preparedness efforts must be made in order to maintain the health and safety of Wisconsin residents.

Wildfire Response and Recovery Guidance

Under the Wisconsin “Home Rule” principle, winter weather preparedness and response are considered local activities. The local or county emergency management office, health agency, or police and fire first responders will be the lead agency during a winter weather event. However, when requested, state resources will be provided to assist and support the local response.

Fig 1. Projected Change in Winter Average Precipitation (inches) from 1980-2055





DEFINITIONS

General Terms for All Types of Weather

Outlook

Conditions are possible in the next two to five days.

Advisory

Conditions are expected to cause significant inconveniences and may be hazardous.

Watch

Conditions are possible within the next 36-38 hours.

Warning

Life-threatening severe conditions have begun or will begin within 24 hours.

Winter Weather Event

A winter weather occurrence that affects public safety, transportation, and/or commerce.⁴

Wind Chill

The temperature the body feels, calculated using the actual temperature outdoors and the wind speed. The wind chill is always lower than the actual temperature (see box on next page).

Sleet

Rain that turns to ice pellets before reaching the ground. Sleet can cause dangerous and slick outdoor conditions.

Freezing Rain

Rain that freezes when it hits the ground. Freezing rain can cause dangerous and slick outdoor conditions.

Cold-Related Fatality

Death attributed to cold weather events.

GUIDE 1: WINTER WEATHER ALERTS

Freezing Rain Advisory

Any accumulation of freezing rain is expected in the next 12 to 36 hours (but will remain below a half inch) for at least 50% of the zone or encompassing most of the population.

Wind Chill Advisory

Wind chill is expected to exceed local wind chill advisory criteria in the next 12 to 36 hours. Wind chill temperatures may reach or exceed -15°F. See table at bottom of page.

Winter Weather Advisory

A winter storm event (sleet, snow, freezing rain, snow and blowing snow, or a combination of events) is expected to meet or exceed local winter weather advisory criteria in the next 12 to 36 hours but stay below warning criteria. Criteria for snow is 4 inches or more in 12 hours or less covering at least 50% of the zone or encompassing most of the population. Use "mid-point" of snowfall range to trigger advisory (i.e., 2 to 5 inches of snow = advisory). Criteria for ice is any ice accumulation less than 1/2 inch over at least 50% of the zone or encompassing most of the population. Winter Weather Advisory can also be issued for black ice. This is optional.

Blizzard Watch

Conditions are favorable for a blizzard event in the next 24 to 72 hours. Sustained wind or frequent gusts greater than or equal to 35 mph will accompany falling and/or blowing snow to frequently reduce visibility to less than 1/4 mile for three or more hours.

Wind Chill Watch

Conditions are favorable for wind chill temperatures to meet or exceed local wind chill warning criteria in the next 24 to 72 hours. Wind chill temperatures may reach or exceed -25°F.

Winter Storm Watch

Conditions are favorable for a winter storm event (heavy sleet, heavy snow, ice storm, heavy snow and blowing snow, or a combination of events) to meet or exceed local winter storm warning criteria in the next 24 to 72 hours. Criteria for snow is 7 inches or more in 12 hours or less; or 9 inches or more in 24 hours covering at least 50% of the zone or encompassing most of the population. Use "mid-point" of snowfall range to trigger a watch (i.e., 5 to 8 inches of snow = watch). Criteria for ice is 1/2 inch or more over at least 50% of the zone or encompassing most of the population.

How Wind Chill Works

		Actual Temperature (°F)									
		40°	30°	20°	10°	0°	-10°	-20°	-30°	-40°	
Wind Speed (mph)		How Cold It Feels									
		10	34°	21°	9°	-4°	-16°	-28°	-41°	-53°	-66°
		20	30°	17°	4°	-9°	-22°	-35°	-48°	-61°	-74°
		30	28°	15°	1°	-12°	-26°	-39°	-53°	-67°	-80°
		40	27°	13°	-1°	-15°	-29°	-43°	-57°	-71°	-84°
		50	26°	12°	-3°	-17°	-31°	-45°	-60°	-74°	-88°
		60	25°	10°	-4°	-19°	-33°	-48°	-62°	-76°	-91°

Frostbite times: 30 minutes 10 minutes 5 minutes



Blizzard Warning

Blizzard event is imminent or expected in the next 12 to 36 hours. Sustained wind or frequent gusts greater than or equal to 35 mph will accompany falling and/or blowing snow to frequently reduce visibility to 1/4 mile for three or more hours.

Ice Storm Warning

An ice storm event is expected to meet or exceed local ice storm warning criteria in the next 12 to 36 hours. Criteria for ice is 1/2 inch or more over at least 50% of the zone or encompassing most of the population.

Wind Chill Warning

Wind chill temperatures are expected to meet or exceed local wind chill warning criteria in the next 12 to 36 hours. Temperature may reach or exceed -25°F.

Winter Storm Warning

A winter storm event (heavy sleet, heavy snow, ice storm, heavy snow and blowing snow, or a combination of events) is expected to meet or exceed local winter storm warning criteria in the next 12 to 36 hours. Criteria for snow is 7 inches or more in 12 hours or less; or 9 inches or more in 24 hours covering at least 50% of the zone or encompassing most of the population. Use "mid-point" of snowfall range to trigger warning (i.e., 5 to 8 inches of snow = warning). Criteria for ice is 1/2 inch or more over at least 50% of the zone or encompassing most of the population.



GUIDE 2: COLD-RELATED HEALTH EFFECTS

Below are conditions that are cold-related. Keep in mind the overconsumption of alcohol decreases decision-making capabilities and has been found to increase the likelihood of cold-related health effects.⁵

Medical Condition	Symptom(s)	Causes	Safety Tips
Hypothermia ⁶	<p>Adults</p> <ul style="list-style-type: none"> • Shivering, exhaustion • Confusion • Memory loss • Slurred speech • Drowsiness <p>Infants</p> <ul style="list-style-type: none"> • Bright red, cold skin • Very low energy 	Body temperature that is too low	<ul style="list-style-type: none"> • If the body temperature is below 95°, seek immediate medical attention. • Move the victim into a warm room. • Remove wet clothing and keep the victim dry. • Warm the center of the body first.
Frostbite ⁶	<ul style="list-style-type: none"> • Redness or pain • White or grayish-yellow skin • Numbness 	Freezing of body parts exposed to cold	<ul style="list-style-type: none"> • Relocate to a warm room. • Do not walk; do not use frostbitten body parts. • Warm the area by submerging in warm water or using body heat. • Do not massage or use heating pads, lamps, stoves, or fires to warm the area.
Trench Foot ⁷	<ul style="list-style-type: none"> • Pain, tingling sensation • Swelling • Cold, numbness • Blisters may form after feet are dry 	Feet are wet for an extended period of time	<ul style="list-style-type: none"> • Clean, dry, and elevate feet. • Warm feet by using warm packs or by soaking in warm water. • Seek medical attention.

GUIDE 3: WINTER WEATHER PREPARATION

Prepare Your Home

Step 1: Assemble an Emergency Supply Kit

- Prepare to heat your home during a power failure
 - Do not use a gas stove, charcoal or gas grill, or electric generator inside to heat your home, as this may cause carbon monoxide poisoning.
 - Dry firewood for a fireplace or wood stove, or
 - Kerosene for a kerosene heater
- Furnace fuel (coal, propane, or oil)
- Electric space heater with automatic shut-off switch and non-glowing elements
- Blankets
- Matches
- Multipurpose, dry-chemical fire extinguisher
- First aid kit and instruction manual
- Flashlight or battery-powered lantern
- Battery-powered radio
- Battery-powered clock or watch
- Extra batteries
- Non-electric can opener
- Snow shovel
- Rock salt
- Special needs items (diapers, hearing aid batteries, medications, etc.)

Step 2: Stockpile Food and Water

- Stock three days worth of non-perishable food items.
- Store one gallon of water per person for three days.

Step 3: Winterize Your Home

- Install a smoke detector and a battery-operated carbon monoxide detector; before winter begins, test the detectors. Insulate your exterior water lines to prevent freezing pipes; insulate attics and walls; install storm windows and insulated doors.
- Install a thermometer in a frequently visited location and check the indoor temperature regularly.
- Have your chimney, furnace, and other heating utilities inspected by a professional before the winter season begins.





GUIDE 3

Prepare Your Car

Step 1: Have Essentials in Your Car

Assemble an emergency supplies kit and place it in your car in a plastic tote with a lid.

- First aid kit
- A can and waterproof matches (to melt snow for water)
- Windshield scraper
- Booster cables
- Road maps
- Cell phone and charger
- Toolkit
- Bag of sand or cat litter (to pour on snow for traction)
- Battery-operated radio
- Emergency flare and whistle
- Tow rope
- Tire chains (only legal when used for safety)
- Shovel
- Container of water and high-calorie canned or dried food and a can opener
- Flashlight and extra batteries
- Canned compressed air with sealant (for emergency tire repair)
- Brightly colored cloth
- Extra gas
- Emergency numbers and cash in a Ziploc bag
- Extra winter clothes or blankets

Step 2: Winterize Your Car

- Have your vehicle regularly serviced following the manufacturer's suggestions.
- Maintain high antifreeze levels and use wintertime windshield wiper fluid. These supplies can be found at your local automotive retail store.
- Replace worn tires.
- If possible, keep your gas tank close to full in order to prevent ice formation.



GUIDE 4

GUIDE 4: INDOOR SAFETY

Safely Use Alternative Sources of Heat

Alternative sources of heating produce major risks including fires and carbon monoxide poisoning. When using alternative sources of heat like fireplaces, wood stoves, and space heaters, take the following precautions.

- Never use electric generators, grills, or other gasoline, propane, natural gas, or charcoal-burning devices indoors, as this may cause carbon monoxide poisoning.
- Install a battery-operated carbon monoxide detector and a smoke detector. You can get both at hardware stores for about \$20.
- Ensure adequate ventilation for a heat source by cracking windows.
- Do not plug space heaters into extension cords.
- Do not put a space heater on anything that could catch fire. Place it on a noncombustible surface.
- Only use the designated fuel for your heat source.

Know the Signs and Symptoms of Carbon Monoxide Poisoning

- Carbon monoxide poisoning occurs when the body is in contact with carbon monoxide, an odorless, colorless gas that is given off by fuel-burning equipment.
- Signs of carbon monoxide poisoning include shortness of breath, headache, impaired coordination, nausea, dizziness, and loss of consciousness.
- If you suspect a carbon monoxide leak in your house or if your carbon monoxide alarm goes off, leave the house immediately and call 911.



Know What to Do When There is No Heat

- Seek alternative shelter by texting SHELTER and your zip code to 43362.
- Conserve body heat by not overexerting yourself.
- Eat well-balanced meals and avoid alcohol or caffeinated beverages.
- Dress warmly using hats, mittens, and scarves.
- Close off unused rooms and prevent airflow by positioning towels under doors.

Prevent Frozen Pipes

Extremely cold temperatures can damage and freeze pipes. Vulnerable pipes include those found on exterior walls, in unheated rooms, and outside supply lines.

- If possible, insulate water lines before winter begins.
- Keep an emergency water supply that will last for several days.
- Keep the temperature in your home constant, night and day.
- If you leave for vacation, keep your heat at a minimum of 55°F.
- Do not turn faucets completely off; let faucets drip continuously.
- Open cabinet doors and inside doors so that pipes are in contact with warm air.
- If pipes are frozen, completely open all faucets.
- Thaw frozen pipes with a hairdryer or by pouring hot water on the pipes. Do not thaw pipes with open flames.
- If a pipe bursts, close your main water valve immediately.

GUIDE 5: POWER OUTAGES

Keep Food as Safe as Possible

- Keep refrigerator and freezer doors closed as much as possible. Eat perishable foods from the refrigerator first.
- Use freezer food after refrigerator food.
- Use your non-perishable foods after using food from the refrigerator and freezer.
- If it looks like the power outage will last more than a day, prepare a cooler with ice for your freezer items.
- Keep food in a dry, cool spot and keep it covered at all times.

Monitor Electrical Equipment

- Turn off and unplug all unnecessary electrical equipment.
- Turn off or disconnect any appliances, equipment, or electronics you were using when the power went out. When the power comes back on, surges or spikes can damage equipment.
- Leave one light on so you'll know when the power comes back on.
- Eliminate unnecessary travel, especially by car. Travel lights will be out and roads will be congested.

Use Generators Safely

- Keep the generator outside, at least 20 feet from windows, people, or homes.
- When using a portable generator, connect the equipment you want to power directly to the outlets on the generator. Do not connect a portable generator to a home's electrical system.
- If you are considering getting a generator, get advice from a professional, such as an electrician. Make sure that the generator you purchase is rated for the power you think you need.
- Never use a generator, grill, camp stove, or other gas or fuel-powered device inside a home, garage, basement, crawlspace, or partially enclosed area.
- Install carbon monoxide alarms in central locations in your home.
- If the carbon monoxide alarm sounds, move to fresh air and call 911.





GUIDE 6

GUIDE 6: POPULATIONS VULNERABLE IN WINTER WEATHER

What you can do to help

Elderly

Elderly adults may live alone. The elderly have slower metabolism and often do not create as much body heat as middle-aged adults. Also, the elderly do not sense air temperature as well as middle-aged adults; therefore, temperature drops in their homes can go unnoticed. For these reasons, it is necessary to check on elderly neighbors and family often in order to ensure their heating source is working and they maintain a healthy body temperature.

Young

Infants cannot produce enough body heat by shivering and lose heat easier than adults.

- Make sure that infants sleep in a heated room.
- Dress infants in warm clothing.
- In an emergency, hold your baby close, as your body heat can keep the baby warm.
- Do not put your infant in bed with you, as rolling onto infants is a risk.
- If you are without heat for a long time, go to a shelter or someone's home that has heat.

Socially Isolated

Check often on neighbors and family that live in an isolated setting. If the heat supply stops, this population will be at extreme risk for indoor and outdoor hazards.

Low Socioeconomic Status

Wisconsin residents that live at or below 60% of the state median income may qualify for the Wisconsin Home Energy Assistance Program (homeenergyplus.wi.gov). Homeless populations are particularly at risk during winter storms and extreme cold. Warming centers are available throughout Wisconsin.



GUIDE 7: OUTDOOR SAFETY

What to Wear

Staying dry is essential to safety during winter weather. If you must work outside, dress properly, change into dry clothes often, and if you get wet, change into dry clothes when you return indoors. Winter clothing suggestions include:

- Scarf, mittens, and a hat
- Several layers of loose-fitting clothing that cover legs and arms
- Outerwear that is wind and water resistant
- Water resistant boots

Avoiding Exertion

Do not overexert yourself outdoors during extreme cold or a winter storm. Sweating will cool your body.

- If you are shoveling snow or doing other outdoor chores, take frequent breaks indoors and work slowly.
- Do not shovel if you have heart disease or high blood pressure, as the cold puts more stress on your cardiovascular system.
- Shivering is the first sign it is time to return indoors. Listen to your body and go inside.



GUIDE 8

GUIDE 8: TRAVEL IN A WINTER STORM

Driving in a Winter Storm

- Travel only if necessary.
- Always dress as if you were going to get stranded. Wear a hat, mittens, scarf, winter coat, and boots.
- Keep an emergency kit in your car at all times.
- Call 511 for traffic updates and highway closures due to winter weather.
- Avoid driving at night and avoid driving alone.
- If possible, drive only on main highways and avoid country roads.
- Avoid driving in low-visibility conditions and on icy or snow-covered roads, bridges, and overpasses.
- Notify a friend or family member of your destination and expected time of arrival and return.
- If conditions become too hazardous, pull off the road and turn your hazard lights on. Notify emergency services of your location.

What to Do When Stranded

- Stay inside your vehicle, turn your hazard lights on, tie a bright cloth to your antenna, and notify emergency services of your location.
- Remove snow from around your tail pipe to prevent carbon monoxide buildup.
- Run your heat for 10 minutes every hour. Crack your window for ventilation.
- Wrap yourself in extra clothes and blankets.
- Stay awake and move your arms and legs routinely to keep blood flowing.

GUIDE 9: TALKING POINTS FOR WINTER WEATHER-RELATED FATALITY

If you are approached by the media regarding a reported winter weather-related fatality in your jurisdiction, the following talking points may be used. Start with message A1 or A2, then follow the instructions within that box.

A1 We were notified by the medical examiner/coroner about a fatality possibly due to winter weather conditions. Our condolences go out to the family.

Go to message B1 or B2.

A2 We have *not* been notified of any recent fatalities linked to winter weather conditions.

Go to message C.

B1 Out of respect for the family, we are unable to share any details.

Go to message C.

B2 On [insert date], a [gender] [“ ___ years old” or “between the ages of ___ and ___”] died during winter weather conditions.

Go to message C.

C Hypothermia can be rapid and fatal. People should remain warm and safe by:

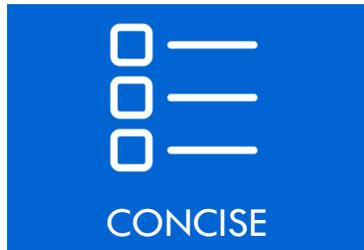
- a. Keeping dry, staying indoors, and wearing appropriate winter clothing.
- b. Making outdoor trips as short as possible.

Check in on family, friends, and neighbors who do not have heat, who spend much of their time alone, or who are more likely to be affected by the cold.

For more information, visit [insert relevant website].

GUIDE 10: MESSAGE MAPS ABOUT WINTER WEATHER-RELATED SAFETY

Message mapping is one of the most important risk communication tools that public health agencies can employ. The goal of a message map is to convey important information in a concise and easy to understand fashion.



General Guidelines for Completing a Message Map

- Stick to three key messages or one key message with three parts for each underlying concern or specific question.
- Keep key messages brief. The reader should ideally spend less than 10 seconds per line.
- Develop messages that are easily understood by the target audience. (For communications with the general public, use a 6th to 8th grade readability level.)
- Place messages within a message set. The most important messages should occupy the first and last positions.
- Develop key messages that cite credible third parties.
- Use graphics and other visual aids to enhance key messages.
- Keep a positive tone. Messages should be solution-oriented and constructive. Try to balance negative messages with positive ones.
- Avoid unnecessary use of “absolute” words such as no, not, never, nothing, and none.⁵

The following is a message map that could be used when addressing the general public regarding winter weather-related safety.

Main Message

“Since [November/December/January/February], there have been ____ winter weather-related fatalities in Wisconsin. To help you and your loved ones stay safe this winter...”

Key Messages <i>Three key messages</i>	Supporting Information <i>Three pieces of supporting information for each key message</i>
<p>Message 1</p> <p>Check on your neighbors to make sure they are okay, especially the elderly and those living alone.</p>	<p>Supporting Info 1</p> <p>The elderly are less likely to sense and respond to low temperatures.</p> <p>Supporting Info 2</p> <p>Those living alone can be isolated and unaware of the dangers posed by winter weather.</p> <p>Supporting Info 3</p> <p>When regularly checking with your neighbors, look for signs of cold-related illness.</p>
<p>Message 2</p> <p>If you must be outside during a winter storm, be alert for signs of hypothermia.</p>	<p>Supporting Info 1</p> <p>Symptoms include shivering, exhaustion, confusion, memory loss, and slurred speech.</p> <p>Supporting Info 2</p> <p>Protect yourself by wearing several layers of loose-fitting clothes underneath a wind and water resistant outer layer.</p> <p>Supporting Info 3</p> <p>Call 911 or seek medical attention if you or someone you know develops hypothermia.</p>
<p>Message 3</p> <p>Warming centers and shelters are available throughout Wisconsin.</p>	<p>Supporting Info 1</p> <p>Warming centers are designated buildings with heat where the public can seek relief from the cold.</p> <p>Supporting Info 2</p> <p>Call 211 to find the warming center closest to you.</p> <p>Supporting Info 3</p> <p>Text SHELTER and your zip code to 43362 to find the nearest shelter.</p>

APPENDIX A: REFERENCES

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10. American Red Cross. Power Outage Checklist. http://www.redcross.org/images/MEDIA_CustomProductCatalog/m4340180_PowerOutage.pdf
11. Covello VT. Message mapping. Accessed March 7, 2014, at: http://www.orau.gov/cdcynergy/erc/content/activeinformation/resources/Covello_message_mapping.pdf
12. Icons from The Noun Project

APPENDIX B: ADDITIONAL RESOURCES

Wisconsin Department of Health Services (DHS)

608-258-0099

DHS Winter Weather

<http://www.dhs.wisconsin.gov/climate/weather/winterweather.htm>

List of Wisconsin Tribal Health Directors

<http://www.dhs.wisconsin.gov/lh-depts/contacts/tribal-health-directors.pdf>

List of Wisconsin Local Health Departments

<http://www.dhs.wisconsin.gov/lh-depts/counties.htm>

Wisconsin Emergency Management

608-242-3232

http://www.ready.wi.gov/winter/winter_weather_facts.asp

Centers for Disease Control and Prevention

<http://www.emergency.cdc.gov/disasters/winter/>

American Red Cross

1-877-618-6628

<http://www.redcross.org/prepare/disaster/winter-storm>

Federal Emergency Management Agency

<http://www.fema.gov>

Spanish Language Portal

<http://www.fema.gov/es/>

Wisconsin Home Energy Assistance Program

<http://www.homeenergyplus.wi.gov>