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# Extreme Heat Events Guidelines:

User Guide for Health Care Workers  
and Health Administrators



Canada 



# **Extreme Heat Events Guidelines:**

User Guide for Health Care Workers  
and Health Administrators

Prepared by:  
Water, Air and Climate Change Bureau  
Healthy Environments and  
Consumer Safety Branch

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# 1. Introduction

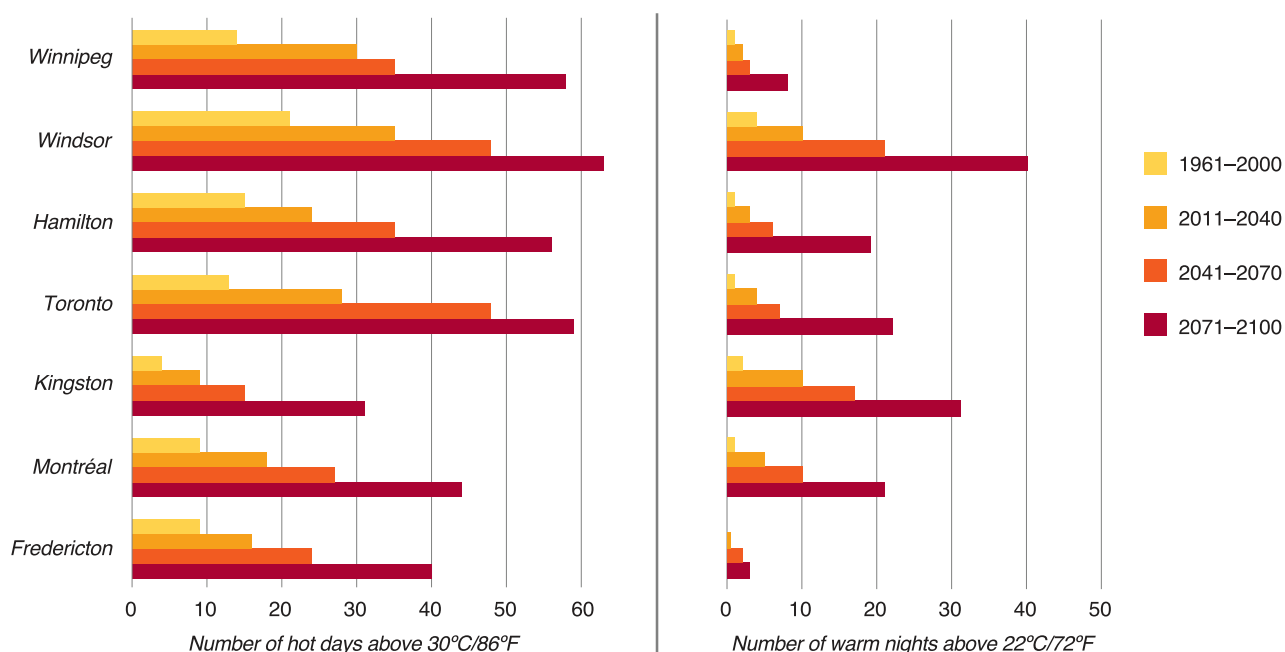
Health care workers and health administrators are well positioned to address vulnerable populations and the emerging health threats arising from extreme heat.

Extreme heat events are an increasing concern in Canada and abroad. As the climate changes, the frequency, intensity and duration of these events are expected to increase, as are their related adverse health effects. In recent years, extreme heat has resulted in a significant number of preventable deaths. The European heat wave of 2003 resulted in over 70 000 deaths and, more recently, the 2010 Russian heat wave caused over 55 000 deaths.

Within Canada, the effects of extreme heat have already been observed, and are expected to increase. In 2009, British Columbia experienced an extreme heat event that lasted eight days. Temperatures reached 34.4°C at the Vancouver airport, and even higher in the city core. This

extreme heat event contributed to 156 excess deaths. Montreal also experienced an extreme heat event in July 2010, with average maximum temperatures exceeding 33°C for five consecutive days. In combination with nighttime temperatures above 20°C, the extreme heat event contributed to 106 deaths.

Climate modelling has indicated that the number of “hot days” (daytime temperature above 30°C) and “warm nights” (nighttime temperature above 22°C) are expected to increase (Figure 1). Although an increase in the number of hot days is dangerous, it is the combination with warm nights that cause significant increases in heat-related morbidity and mortality. This is because warm nights prevent a reprieve from the heat which is important for allowing the body to cool off. This is especially true for urban areas, as the large number of surfaces that absorb heat during the day (i.e. asphalt and concrete) release this additional heat at night contributing to the urban heat island effect. Air pollution has also been associated with increases in extreme heat suggesting that confounding factors may be at play.



Source: Casati, B. and Yagouti, A. (In Press).

**Figure 1: Historical and projected number of hot days and warm nights for Canadian cities.**

Many opportunities exist for health administrators and health care workers to address or mitigate the impacts of extreme heat. Health care workers have the capacity to reduce heat-related health risks by focussing planning and adaptation decisions on protecting vulnerable populations, and by promoting actions to reduce heat-health risks during daily professional activities, as well as within their own communities.

The *User Guide for Health Care Workers and Health Administrators* (User Guide) accompanies the *Extreme Heat Events Guidelines: Technical Guide for Health Care Workers*<sup>1</sup> (Guidelines) and the targeted Fact Sheets; *Acute Care, Community Care and Health Facilities Preparation during Extreme Heat*. The Guidelines were designed to provide evidence-based information regarding the recognition, treatment and prevention of heat-related illness for health care workers. The targeted Fact Sheets have been developed as a reference for three distinct audiences and provide health care workers with information to enhance their understanding of vulnerability to extreme heat and to identify effective prevention measures.

The purpose of this User Guide is to provide information on prevention strategies that health administrators, health care workers and health organizations and institutions can implement to

prevent heat-related illness. This audience encompasses a range of roles which can include health care service managers and staff (e.g. hospitals, long term care, and retirement homes), community services (e.g. community centres, children and youth services, services for persons with disabilities), clinical managers and small health office managers.

The information in the User Guide will help the reader:

- Understand the human health risk factors associated with extreme heat events.
- Recognize key vulnerability factors in specific populations.
- Understand options and opportunities for managing heat-health risk factors, for example, by tailoring and targeting health protective actions to at-risk individuals.
- Provide information for health administrators and health care workers to identify opportunities for integrating activities to reduce heat-health risks into work and planning.
- Facilitate the exchange of knowledge regarding extreme heat and health among health administrators, health care workers and the public.

<sup>1</sup> Health Canada. (2011). *Extreme Heat Events Guidelines: Technical Guide for Health Care Workers*. Water, Air and Climate Change Bureau, Healthy Environments and Consumer Safety Branch, Health Canada. Ottawa, Ontario, 149.

## 2. Vulnerability to Extreme Heat

The adverse health impacts from extreme heat can often be traced to the vulnerability of communities and individuals.

Community and individual risk factors are a key component to understanding susceptibility to heat-related illness. Communities in Canada differ in their potential risk from extreme heat events. Some larger communities can be especially susceptible to extreme heat events because of their large city centres and the urban heat island effect. Alternatively, smaller communities may have difficulties establishing a heat alert and response system due to competing priorities and resources. Figure 2 identifies various factors

at a community and individual level that can affect a person's vulnerability to heat-related illness and that are important to consider when in contact with patients.

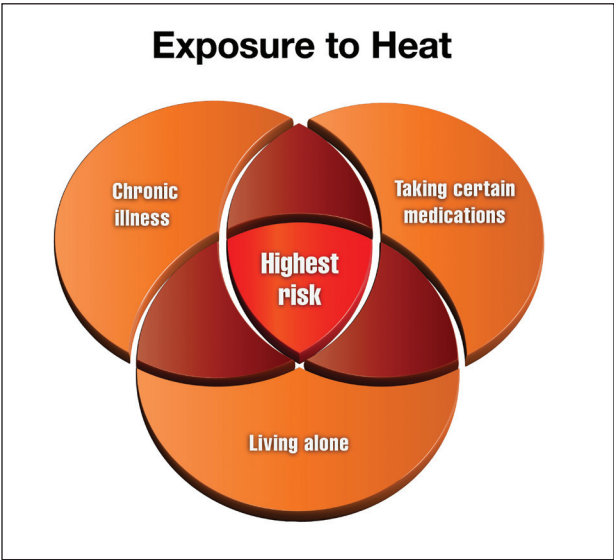
Understanding the risk factors associated with an increased likelihood of heat morbidity and mortality is important in order to advise patients and caregivers who may be unaware or unconcerned about the potential dangers from extreme heat. However, identifying the interactions between these risk factors is complex. People may not adapt their behaviours during extreme heat events, perhaps because they are simply unaware that they are at increased risk. In addition, due to a person's socio-economic reality, many of the best options for protection are not always feasible.



Source: *Adapting to Extreme Heat Events: Guidelines for Assessing Health Vulnerability (2011)*.

**Figure 2: Factors that affect a person's vulnerability to extreme heat at a community and individual level.**

Various risk factors associated with heat-related illness are interrelated and may overlap. Chronic illness, social isolation, and taking certain medications are examples of factors that increase an individual's risk of developing a heat-related illness, as illustrated in Figure 3. Subsequently, the more risk factors an individual has, the higher their risk.



**Figure 3: The relationships between heat exposure risk factors.**

Health care workers who are in direct contact with patients or clients are in a unique position in that they are a trusted resource for health information. Advising patients of how to recognize whether they are at-risk and identify someone in distress, such as a family member or friend, are important ways that health care workers can reduce heat-related illness and death. Once aware of heat-vulnerable groups, health administrators can tailor facility emergency response plans and communication campaigns to incorporate heat so that the organization is able to reach and care for individuals most at risk.

It is important for health administrators to consider vulnerable populations and the associated barriers to action when implementing heat safety and adaptation plans within a facility or organization. Table 1 identifies heat-vulnerable

groups within the community and examples of challenges they may face when adapting to extreme heat.

Past extreme heat events have demonstrated the significant adverse health impacts on community populations. Reduced ability to mobilize resources and limited coordination between service providers during an emergency have been associated with an increased incidence of heat-related illness and death. It is important that these services are also accessible in communities where they are needed the most.

During the 1995 Chicago heat wave, many valuable services were not activated such as local units designed to assist older adults, a warning system for heat emergencies, transportation for the most vulnerable to cooling centres, and coordination of emergency medical services. This resulted in a large proportion of heat-related deaths occurring in marginalized populations and socially isolated older adults. These events demonstrate the importance of understanding the relationships between social factors, environmental change and health equity and the necessity of adequate preventative action from health services during extreme heat events.



**Table 1: Vulnerabilities of At-Risk Groups**

Heat-Vulnerable Groups	Examples of Challenges
<b>Older adults</b>	<ul style="list-style-type: none"> <li>• Reduced sweating ability</li> <li>• Decreased plasma volume</li> <li>• Decreased blood flow to skin and extremities</li> <li>• Reduced cardiac output</li> <li>• Lower fitness, increased body fat, reduced lean body mass</li> <li>• Reduced thirst sensation leading to increased susceptibility to chronic dehydration</li> <li>• Dependence on caregivers for awareness and recognition of the impact of heat</li> </ul>
<b>Infants and young children</b>	<ul style="list-style-type: none"> <li>• Reduced sweating ability</li> <li>• Inability to increase cardiac output</li> <li>• Faster heat gain from the environment if air temperature is greater than skin temperature, due to greater surface-area-to-body weight ratio</li> <li>• Lower exercise intensity when active but often active for longer</li> <li>• Dependency on caregivers for awareness and recognition of the impact of heat</li> </ul>
<b>People with chronic illness or who are physically impaired</b>	<ul style="list-style-type: none"> <li>• Physiological characteristics that may amplify health risks, such as cardiovascular and respiratory illness, hypertension, mental illness, renal illness, diabetes and obesity</li> <li>• Taking certain medications that affect heat sensitivity or that interfere with the body's cooling functions or water and salt retention</li> <li>• Confinement to bed or dependence on caregiver for daily living</li> <li>• Presence of co-morbidities</li> <li>• Social isolation</li> </ul>
<b>The physically active</b>	<ul style="list-style-type: none"> <li>• Increased metabolic heat production</li> <li>• Pooling of blood in the cutaneous circulation</li> <li>• Insufficient blood replenishment and blood volume loss due to insufficient fluid replenishment and profuse sweating</li> </ul>
<b>Low socio-economic status</b>	<ul style="list-style-type: none"> <li>• Limited financial resources to adequately take protective actions</li> <li>• Reduced access to drinking water and cool places</li> <li>• Limited access to health care and social services</li> <li>• More environmental exposure (e.g. homelessness, living on higher floors without air-conditioning)</li> <li>• Social isolation</li> </ul>
<b>Newcomers to Canada and transient populations</b>	<ul style="list-style-type: none"> <li>• Language and literacy barriers for non-English or French speakers</li> <li>• Cultural differences, such as food consumption habits, clothing choices, pre-existing cultural or social beliefs</li> <li>• Limited knowledge of local alert systems, health and social service programs</li> </ul>



## 3. Information for Health Care Workers and Health Administrators

### 3.1 Information for Health Care Workers

Recognizing the risk factors and the signs and symptoms of heat-related illness as well as the precautionary measures that can be taken to prevent the development of heat-related conditions are essential.

Heat-related illness has a range of effects. Some effects can be less severe such as with heat cramps, heat rash and heat edema, but others can be more harmful such as with heat syncope, heat exhaustion and heat stroke. Heat stroke is a medical emergency and can cause organ damage and even death if not treated immediately.

Signs and symptoms of heat-related illness to be aware of during an extreme heat event include:

- Dizziness or fainting
- Nausea or vomiting
- Rapid breathing and heart rate
- Extreme thirst
- Decreased urination and unusually dark yellow urine

When it is hot outside and the potential for heat exposure increases, it is important to be aware of the increased possibility that a person will develop a heat-related illness. If a client or patient is showing one or more of the signs and symptoms listed above, actions such as removing the person from the hot environment, providing water, cooling the person down, and alerting others may be life saving.

It is also important to consider that various medications are known to interfere with the body's thermoregulatory mechanisms, predisposing individuals to heat-related illness. Research indicates that this relationship appears to be under recognized. Some of the known medications that can increase susceptibility to heat-related illness and their mechanism of action are outlined in Table 2.



*Health care workers can communicate the heat-health risks of certain medications to patients before and during the heat season.*

**Table 2: Some Medications that Increase the Health Risks from Extreme Heat**

<b>Drug Type</b>	<b>Mechanism</b>
<b>Antiadrenergics and <math>\beta</math>-Blockers</b> (e.g. Atenolol, Metoprolol)	Can decrease cardiac output, and therefore shunt warm blood from the body core to the periphery, limiting cooling.
<b>Anticholinergics</b> (e.g. Scopolamine)	Can prevent sweat glands from functioning properly (i.e. inhibits the rate of sweating and therefore the rate of cooling).
<b>Antidepressants</b> (e.g. Prozac, Zoloft, other SSRIs)	Many have anticholinergic properties (see above) and some can raise the brain's thermal set-point decreasing centrally induced thermoregulation. SSRIs can increase the risk of hyponatremia.
<b>Antihistamines</b> (e.g. Brompheniramine)	Can inhibit the sweating mechanism.
<b>Anti-Parkinsonians</b> (e.g. Benztropine, Levodopa, Trihexyphenidyl)	Can inhibit the sweating mechanism.
<b>Antipsychotics</b> (e.g. Olanzapine)	Can inhibit the sweating mechanism. Can induce a hyperthermic syndrome (neuroleptic malignant syndrome) on their own, which would be compounded by the effects of heat.
<b>Sympathomimetics</b> (e.g. Pseudoephedrine)	Can prevent dilation of the blood vessels in the skin of the periphery (hands, feet, face) reducing the ability to dissipate heat by convection.
<b>Diuretics</b> (e.g. Lasix)	Can lead to dehydration. Hyponatremia is a common side effect.
<b>Several drug classes</b> (e.g. cholinesterase inhibitors, antiarrhythmics, calcium blockers)	Can provoke diarrhea and/or vomiting, leading to dehydration.

Health care workers are able to take actions to reduce heat-health risks themselves and also communicate the benefits of such actions to others, thereby increasing their uptake and leading to positive health outcomes (Box 1).

The information outlined here can act as a starting point for understanding the risks from extreme heat and how to recognize them. A more complete and detailed explanation of these issues is included in the *Extreme Heat Events Guidelines: Technical Guide for Health Care Workers*.

### **Box 1: Actions for Health Care Workers to Reduce Heat-Health Risks**

- Understand the risks of excessive heat exposure and understand the diagnosis, treatment and clinical manifestations of heat-related illness.
- Identify at-risk patients or clients and encourage proper education about heat-related illness before and during the heat season.
- Raise awareness and communicate the potential side-effects from exposure to extreme heat when taking certain medications.
- Become a heat-health ambassador in the community and communicate the dangers of extreme heat to the public. A multidisciplinary risk communication strategy developed with public health is ideal for a successful approach. It is also important that health care workers and organizations are aware of the available resources in their community and are prepared to refer patients to these resources when needed.
- Encourage health administrators to incorporate extreme heat into emergency preparedness plans, especially in long term care facilities and hospitals.
- Encourage the provision of cooling options within the community with an integrated multi-agency approach. This includes advocating for support for communities where residents may not have access to cooling options such as air-conditioning and wading pools or splash pads. Some examples could include extended hours at swimming facilities, opening cooling centres, and other outreach campaigns to the most vulnerable.



### 3.2 Information for Health Administrators

Health administrators fulfill the ‘train the trainer’ role, and are in a good position to facilitate knowledge transfer regarding extreme heat events to health facility staff, as well as in the community.

When addressing extreme heat in a health or community facility, a multi-faceted approach to planning and a diverse range of interventions are recommended. Many protective measures can be adopted to reduce heat-health risks to both patients and staff, as outlined in Box 2. Ensuring protective measures are implemented and operational before the heat season is the best approach for successful heat-adaptation plans.



#### Box 2: Actions for Health Administrators to Reduce Heat-Health Risks

- Implement heat-health adaptation strategies. This could include offering cooling options for patients and staff, transportation of vulnerable populations to a cool area, distributing information on heat and health and offering in-service training for staff.
- Anticipate and plan for future extreme heat events in health facilities through communication systems, effective response plans and application of preventative actions.
- Ensure community and health facilities are prepared for an extreme heat event, including possible power outages and water shortages.
- Heighten awareness regarding the health co-benefits of adapting to extreme heat and climate change (decreased demand on hospitals, ambulances and other health care services, improved quality of life, and facilitating community engagement).
- Ensure adequate access to medications for staff and patients, such as critical medications, during extreme heat and to plan for, and avoid possible shortages.

## Considerations when Addressing Key Client Groups

- Many heat-related deaths occur at home before consultation with a health care worker. Increased awareness of heat-related illness among at-risk patients, especially those who are socially isolated, and members of their support network is crucial.
- Recognition of when to call a nurse help-line, an ambulance or when to administer a home remedy. Clarification for at-home patients can help reduce emergency response times.
- Individuals with compromised mental health have been found to have a higher incidence of mortality during extreme heat, and are a vulnerable group often overlooked. Many patients with mental health illnesses have a more difficult time functioning during high heat and are less likely to seek medical help. Creating awareness among health facility and community staff can increase efforts to support this vulnerable group during extreme heat events such as increasing the number of scheduled visits, and monitoring more closely those on anti-depressants and antipsychotics.



*Education sessions for staff prior to, and during the heat season will help clarify roles and responsibilities during an extreme heat event.*

## Considerations for Facility Preparation

- Integration of health care facilities into community heat alert and response systems and related disaster response plans will allow facility employees to triage and execute the appropriate care for heat-related illness. The heat emergency plan could be tailored to each facility and consider their function and capacities in the community. For example, a health facility in a rural community will have different roles and responsibilities compared to one in a large urban city.
- Preventing heat-related illness is a challenge in hospitals and nursing homes without air-conditioning. This fact highlights the need to revise patient management practices during an extreme heat event. Loss of air-conditioning is an important consideration during power outages. During these times the priorities are to backup power for refrigeration units to ensure food and medications are not spoiled, and to ensure other critical care services are not affected. Backup power is not often used to keep a facility cool. For this reason, temporary relocation of vulnerable patients and individual cooling techniques, such as cold compresses and fanning, are essential in the event of an extended power outage. An in-house heat emergency plan with alternative cooling options will help alleviate these problems.
- Increased communication between staff, clients and the public regarding effective heat-health preventative measures is a key element of preparation for the summer season. Pre-season education sessions and briefings can help inform and remind staff of the dangers of extreme heat and the appropriate response actions in their facility as well as the signs, symptoms and risk factors for heat-related illness when interacting with patients.

- Misinformation regarding key roles and responsibilities during an extreme heat event can leave important gaps in heat preparedness and response. The best approach is to explicitly outline the role(s) and responsibility(ies) of each team member, followed by coordination with managers to ensure correct and pertinent knowledge and information is provided to fulfill the identified responsibilities in a heat emergency response plan. It is also important to have temporary support to fulfill the roles of those on summer vacation.
- Health facilities should be prepared for an extended period of self-sufficiency. It is important that heat emergency response plans are in place prior to the heat season so that all staff and residents can be familiar with the appropriate response.

### 3.3 Collaboration Among Health Care Workers and Health Administrators

By planning ahead and working together, health care workers and health administrators can be effective in reducing heat illness.

Collaboration prior to and during extreme heat events is critical. A lead agency is usually identified in advance and is involved in coordinating communication and response activities. Smaller family health teams and community service teams can designate a team member as a leader in heat education and planning. Engaging many levels of public health and raising awareness about planned activities is essential to build trust and foster partnerships.

Heat considerations can be integrated into a facility's emergency plan through collaborations with all health service providers. To fully



*During an extreme heat event increasing the frequency of visitations to vulnerable groups can reduce the incidence of heat-related health emergencies.*

understand these actions, it is best that both front line workers and health administrators tailor a heat emergency response plan in collaboration to reflect the views and concerns of all members of the staff, prior to an emergency situation. An emergency response plan can include an incident management system (IMS) which would provide the means to coordinate efforts of multiple parties. To further increase the level of collaboration, health care workers can familiarize themselves with their community's response plan and understand how it is linked to their facility's emergency response plan. In addition, both health care workers and health administrators can be involved in the communication and planning process of incorporating extreme heat into a facilities heat emergency response plan.

It is important for health care workers and health administrators to include a protocol to support socially isolated patients when incorporating heat into a facilities existing emergency response plan. This could include arranging transportation for older adults to a cooling room or alternate cooling facility. Heat-emergency responses intended to help inpatients and at-home clients can include measures to address multiple situations, such as when there is no response at a client's door, and outline the

process to increase the frequency of checking in, either by phone or in person. Additionally, allocating time during patient visits for heat-health education could substantially decrease a person's risk. Planning for periods of high demand can also facilitate appropriate responses during a heat emergency.

Consistent communication of information to the public is important for increasing the public's awareness of heat and health. Inconsistencies in messaging create confusion among health care workers as well as the general public. To this end, messages are most effective when they are kept simple and straightforward and are adopted from a decided, trusted source. A successful outreach campaign includes advocates from public health as

well as health care workers. Information regarding the implementation of a proper communications campaign is outside the scope of this document. Health Canada's *Communicating the Health Risks of Extreme Heat Events: Toolkit for Public Health and Emergency Management Officials* covers this information in more detail (see Section 4).

Examples of key messages for health care workers and public health officials to communicate to the public are outlined in Box 3. For more information regarding common questions and responses to the prevention of heat-related illness and for a complete list of heat-health messages, please refer to chapters 6 and 7 respectively in the *Extreme Heat Events Guidelines: Technical Guide for Health Care Workers*.

### **Box 3: Key Messages for Health Care Workers and Public Health Officials to Communicate to the Public**

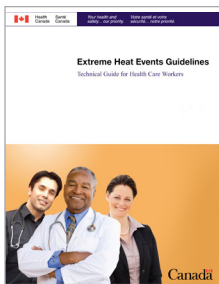
- Heat-related illness is preventable. With awareness and protective actions many of the heat-related illnesses can be avoided.
- Reschedule or plan outdoor activities during cooler parts of the day.
- Frequently visit neighbours, friends, and older family members, especially those who are chronically ill, to make sure they are cool and hydrated.
- Drink plenty of cool liquids, especially water, before you feel thirsty to decrease your risk of dehydration. Once you feel thirsty, you are already experiencing some symptoms of dehydration.
- Wear loose-fitting, light-coloured clothing made of breathable fabric. Clothing thickness and the amount of skin covered will affect the efficiency of heat transfer and the evaporation of sweat from the surface of the skin.
- Take a break from the heat by spending a few hours in a cool place. This could be a tree-shaded area, any public building such as a swimming pool or other air-conditioned indoor sports facility, grocery store or public library. Staying cool at night is also very important for regulating body temperature.



## 4. Additional Resources

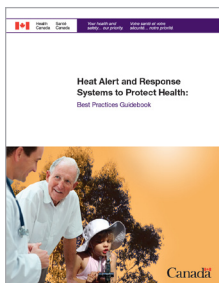
Health care workers and health administrators can enhance their understanding of extreme heat so they can in turn inform patients, families, the general public and colleagues of the associated heat-health risks.

Providing information on extreme heat and health can enable vulnerable groups to take action and implement interventions to mitigate heat-related health risks.

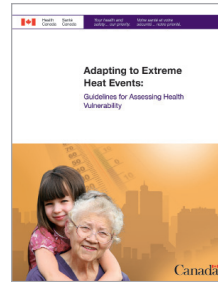


The ***Extreme Heat Events Guidelines: Technical Guide for Health Care Workers*** and the targeted Fact Sheets were developed to provide information on recognizing, treating and preventing extreme heat-related illnesses. In addition, these documents address prevention and mitigation strategies for health service providers and public health staff with a focus on community risk factors and information on preparedness for facilities.

Health Canada has also developed publications to help communities adapt to a changing climate and an increase in extreme heat events:



The ***Heat Alert and Response Systems to Protect Health: Best Practices Guidebook*** outlines best practices implemented in Canada and other countries and discusses steps that communities can take to mitigate heat-health risks and promote heat resiliency among Canadians.



***Adapting to Extreme Heat Events: Guidelines for Assessing Health Vulnerability*** provides guidance for conducting heat-health vulnerability and adaptation assessments as a means to better understand vulnerabilities and stimulate actions to reduce individual and community vulnerability.



***Communicating the Health Risks of Extreme Heat Events: Toolkit for Public Health and Emergency Management Officials*** identifies best communication practices, challenges faced by heat-vulnerable people, and scientifically informed public health messages with explanations. In addition, it provides communication strategies to follow when developing heat-health communication campaigns.



***Audience Specific Public Heat-Health Brochures*** uses consistent and scientifically informed heat-health messages that are tailored to the needs of heat-vulnerable groups. The audiences are older adults, the physically active and parents with young children.

## Notes

[illegible]