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Heat alert and response systems in Canada: A check-up on preparedness

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Key messages

Context:

- Extreme heat events are increasing in number, duration, and intensity due to climate change.
- Heat alert and response systems (HARS) are designed to help governments and communities improve their ability to respond to extreme heat events.
- The NCCEH conducted a pan-Canadian stocktake to gauge the extent of implementation of HARS across provincial/territorial jurisdictions and health authorities, using web searches, surveys, and key informant interviews.

Findings:

- While many health authorities and provincial/territorial governments have HARS plans or heat-health-related information publicly available, many agencies do not, and often plans and documentation are kept as internal documents.
- Most HARS were focused on alert protocols and communication strategies. Some included activities related to pre-season engagement and community response; few included an evaluation plan.
- Key barriers to HARS development and implementation include:
    - Funding shortages, staff turnover, unclear roles and responsibilities for community response
    - Data gaps on where at-risk populations are located
    - Public alert fatigue for heat warnings
    - Language and digital access barriers to communication
    - Underused, inaccessible, or unavailable cooling centres or spaces
    - Housing that is unsafe, with hazardous indoor temperatures and lack of sufficient cooling during extreme heat events
    - Complexity of addressing overlapping hazards like wildfire smoke and power outages
- Key actions that could help strengthen HARS and extreme heat preparedness in Canada, include:
    - Increased funding, especially for developing municipal and community partner plans and for Indigenous, rural, and remote, communities
    - Clearer guidance, standards, and definition of roles and responsibilities
    - Enhanced collaboration, data/information sharing on risk-mapping, health surveillance, and communication strategies
    - Specific guidance for managing overlapping hazards, such as heat and wildfire smoke
    - Support for cool spaces, housing adaptations, heat-health check-ins, and programs to increase social cohesion

Introduction

According to the 2021 report by the Intergovernmental Panel on Climate Change, heatwaves, or extreme heat events (EHEs), are growing longer, more frequent, and more intense as a result of climate change.[1,2] The historic EHE in British Columbia (B.C.) in 2021, referred to as the 2021 Heat Dome, resulted in 619 heat-related fatalities and underscored the urgent need to safeguard people living in Canada from the growing health risks posed by extreme heat.[3] Tools such as heat alert and response systems (HARS) are the primary heat preparedness strategy used by Canadian jurisdictions to respond to extreme heat, but there is a need to understand how they are being implemented, and what challenges exist in HARS implementation.[4]

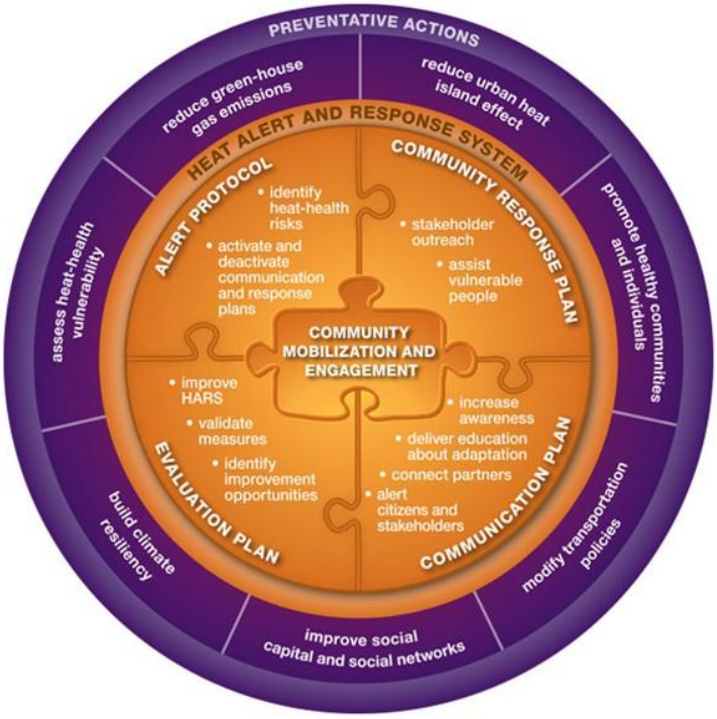
HARS refers to a coordinated series of actions that are developed and implemented by public health and emergency management officials, community health and social service providers, and various community partners and leaders to help prepare and protect public health during periods of dangerously hot temperatures.[4] Although health authorities and provincial and territorial governments have a role to play in community response to extreme heat, local government and community partners are recognized as being primarily responsible for activities including opening of cooling centres and conducting check-ins on at-risk people. Plans that cover a specific organization's activities may also be referred to as heat response plans, heat-health action plans, or heat plans.

HARS actions include alerting the public about dangerously hot temperatures, communicating about heat-health risks, directing and coordinating community response to protect susceptible populations, and supporting individuals to take protective actions before and during EHEs. These systems are composed of five core components, recommended by Health Canada, that have actions to address extreme heat (Figure 1).[4] These five components are most effective when delivered in tandem with preventative measures that provide longer-term action on extreme heat:

- **Pre-season community mobilization and engagement:** Requires a coordinating agency to prepare the community for the upcoming heat season by identifying community needs, recruiting stakeholders, and developing plans to implement a HARS.
- **Alert protocol:** Identifies weather conditions that could result in increased morbidity and mortality in the region. The protocol is used to alert the public, as well as government officials and stakeholders, who then take pre-determined actions to protect health.
- **Community response plan:** Facilitates actions by individuals to protect themselves during periods of extreme heat by directing public health interventions aimed at reaching vulnerable individuals who require assistance.
- **Communication plan:** Raises awareness about the impacts that heat may have on health and provides advice through media releases, interviews, and websites on how to reduce health risks.

- **Evaluation plan:** Assesses HARS activities and facilitates improvements. Aims to evaluate the extent to which implemented measures are timely, relevant, effective, meet local priorities, and contribute to the reduction of health impacts.

Figure 1. Recommended core components of heat alert and response systems (HARS)



Source: Health Canada Heat Alert and Response Systems to Protect Health: Best Practices Guidebook[4]

Box 1. Extreme heat alerts in Canada

In Canada, alerts for weather events, including extreme heat, are issued by Environment and Climate Change Canada's (ECCC) Meteorological Service of Canada (MSC). Alerts are used to generate awareness of current, imminent, or forecasted events, and may be issued as special weather statements, advisories, watches, or warnings.[5] The criteria used by ECCC to issue heat warnings are established in coordination with Health Canada and provincial/territorial health authorities and vary across the country. In Quebec, special weather statements are issued based on the provincial Surveillance and Prevention of the Impacts of Extreme Meteorological Events on Public Health System (SUPREME), which was created by the Institut national de santé publique du Québec (INSPQ).[5]

Given the increased likelihood of future climate-change-driven EHEs in Canada, a detailed understanding of HARS implementation is needed to identify best practices and inform future planning and work on extreme heat response. To achieve this, the NCCEH conducted a pan-Canadian stocktake to gauge the implementation of HARS or similar systems by provincial and territorial governments and regional health authorities[i] across Canada.

[i] The term "regional health authority" (henceforth referred to as health authority in this report), may go by different names in different jurisdictions [for example, Public Health Units (Ontario), Centres intégrés de santé et de services sociaux (CISSS) et centres intégrés universitaires de santé et de services sociaux (CIUSSS) (Quebec)].

Methods

Three key questions informed the research and analysis for this review of HARS implementation:

1. What HARS are in place across health authorities and provinces/territories in Canada?
2. What challenges and barriers exist that impede development, improvement, or implementation of HARS/similar systems?
3. What opportunities or solutions may help to address these challenges and barriers?

We conducted web searches of all thirteen provincial/territorial regional health authority and government websites to collect information on HARS plans and associated actions. We did not search municipal government websites, nor document actions implemented by municipal governments during the web search.

Surveys and key informant interviews were conducted to gather relevant information for this review. While some plans may not be specifically called HARS, these will be referred to as HARS plans if they contain HARS recommended core component activities. The web search was used to identify information on regional health authorities and provincial/territorial government websites related to HARS and preparedness for extreme heat. Search terms were aligned with resources on HARS[4] and supplemented by additional terms that appeared on health authorities and provincial/territorial government websites during initial test searches. We conducted a pilot survey in Ontario (April–May 2024), and a pan-Canadian survey, with some additional questions, for the remaining provinces and territories (October–November 2024). In total, we received 66 survey responses (56 in English, and 10 in French) and conducted 36 key informant interviews (33 in English and three in French). See Appendix A for more details.

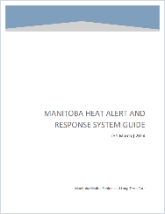
What HARS plans have been implemented in Canada?

HARS developed by provincial and territorial governments

The web search of provincial and territorial government websites identified references to provincial HARS plans in six provinces: B.C., Manitoba, New Brunswick, Nova Scotia, Ontario, and Quebec (Appendix B). A summary of existing HARS plans at the provincial/territorial level are provided in Box 2.

Box 2. Summary of provincial and territorial-level HARS plans

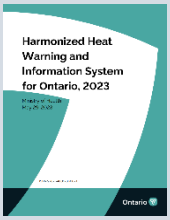
British Columbia: BC Heat Alert and Response System (BC HARS)
Following the devastating 2021 heat dome in B.C., the BC HARS was created by the BC Health Effects of Anomalous Temperatures Coordinating Committee (BC HEAT Committee) and launched in June 2022. The BC HARS document **includes** tables of key messages and recommended actions for different partners, as well as guidance for regional health authorities to develop their own heat plans.



Manitoba: Manitoba Heat Alert and Response System
Manitoba HARS was established in 2017 and was developed by a HARS working group consisting of representatives from Manitoba Health, Seniors and Long-Term Care Public Health Emergency Preparedness, in collaboration with several partners from NGOs, municipal and federal governments, and emergency response organizations. Guidance includes information on roles/responsibilities, messaging, surveillance, and data analysis.

New Brunswick: New Brunswick Heat Alert and Response System (NB HARS)
New Brunswick HARS was implemented across the province in 2016, based on a pilot HARS project in Fredericton in 2012. The Government of New Brunswick's HARS webpage outlines the HARS alert levels, at-risk groups and actions to protect health during heat events, and how heat-advisory messaging is disseminated.

Nova Scotia: Nova Scotia's Heat Alert and Response System*
The Government of Nova Scotia's Department of Health and Wellness was established in 2018 and was developed in partnership with ECCC and Health Canada. The Government of Nova Scotia webpage outlines when heat warnings will be issued, and where heat alert messaging can be found.



Ontario: Harmonized Heat Warning and Information System (HWIS)
Ontario HWIS was established in 2016 and was developed by the Government of Ontario's Ministry of Health & Long-Term Care, with support from Health Canada, ECCC, Public Health Ontario, and PHUs to protect residents from the health risks associated with extreme heat. Guidance in the document outlines roles, responsibilities for public health authorities, local municipalities and community partners, and provincial/federal government partners.[6]

Quebec: Plan ministériel de gestion des épisodes de chaleur extrême
Quebec's "Plan ministériel de gestion des épisodes de chaleur extrême" (Ministerial plan for managing extreme heat events) was established in 2010. This system was developed in collaboration with INSPQ, the Institut national de la recherche scientifique, the Direction de santé publique, and the Ministère de la Santé et des Services sociaux du Québec. An online tool called SUPREME sends warnings and monitors weather hazards including heat waves and impacts on health.

HARS developed by regional health authorities

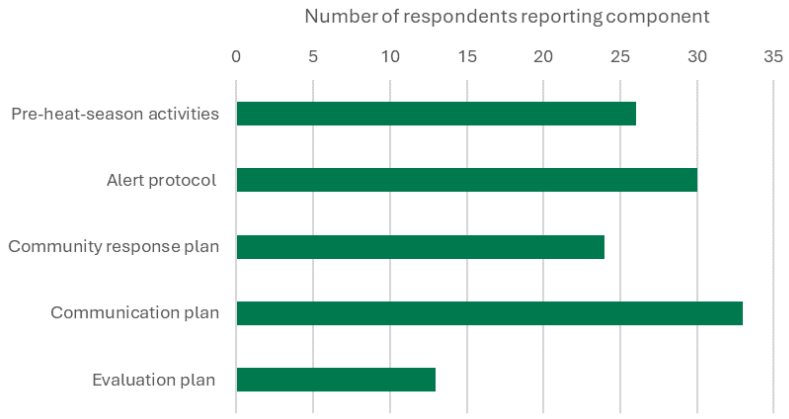
Searches of regional health authority websites revealed publicly available HARS plans only in Ontario and Quebec. In Ontario, seven of 34 health authorities mentioned a HARS or a similar system, but only two provided documents on their websites. In Quebec, four of 26 health authorities explicitly named and shared their regional heat-response plans, while three referenced a plan without providing documentation (Appendix B).

When surveyed about HARS plans, 70% of respondents (48/66) reported that their organizations had existing HARS plans, representing 38 health authorities, emergency management organizations, and provincial/territorial governments. While there were few publicly available health-authority-level HARS plans identified through the web search and survey, some survey respondents and key informants stated that their organizations had internal HARS plans, and other less formalized documents, in either their survey responses or interviews.

Core components of HARS plans

Health Canada identified five core components within their HARS Best Practices Guidebook (Figure 1).[4] Within the surveys, the NCCEH assessed how many of these core components were incorporated in regional health authority, emergency management, and provincial and territorial government organization HARS plans (Figure 2). The "alert protocol" and "communication plan" components were the most frequently reported HARS activities, followed by "pre-heat-season activities," "community response plan," and lastly, "evaluation plan."

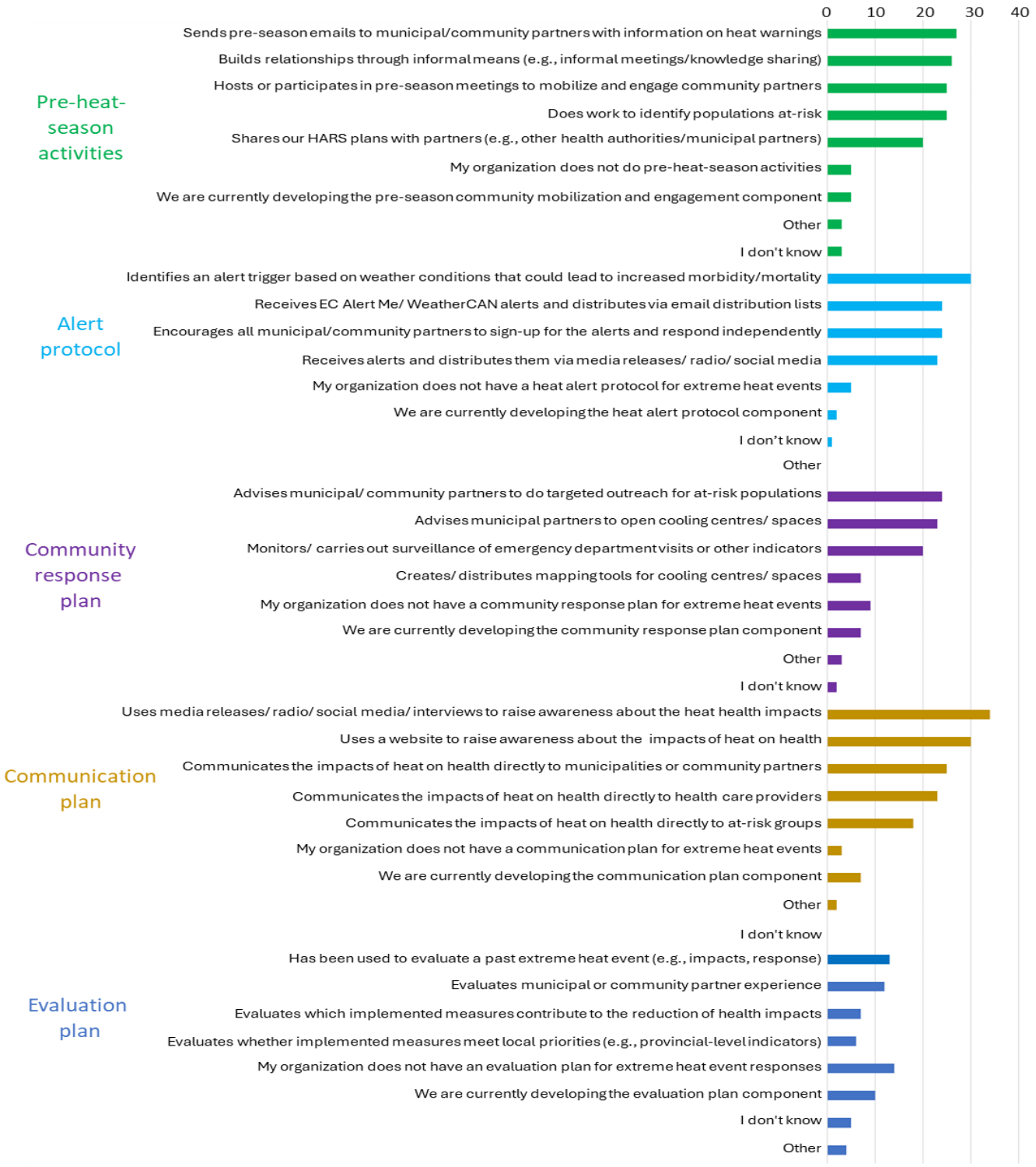
Figure 2. Number of organizations reporting core components in HARS plans (N = 38)



Notes: N refers to 38 health authority, emergency management, and provincial/territorial government organizations across Canada who responded in the surveys; "pre-heat-season activities" refers to community mobilization and engagement implemented prior to when the heat season begins, typically before April or May in many parts of Canada.

Participants of pan-Canadian survey were asked to select the types of HARS activities conducted by their organization (Figure 3). The most frequently selected action was the use of media releases/radio/social media/interviews to raise awareness, and the least frequent action was an evaluation of whether implemented measures meet local priorities. Additional frequently selected activities included alert-trigger identification based on weather conditions, sending pre-season emails to municipalities and community partners, and advising municipal and community partners to conduct targeted outreach or open cooling centres and spaces.

Figure 3. HARS core component activities selected by survey respondents (N = 41 respondents)



Notes: The chart labels for each core component are the multi-select answers provided in the pan-Canadian survey, to answer questions such as "My organization's alert protocol includes: <select from the following options>"; N = 41 respondents; 33/48 respondents reported they had a HARS; 8/48 respondents reported they were developing a HARS plan.

Extreme heat communication, messaging, and tools

While the web search focused on HARS, it also captured information on some provincial/territorial government and health authority website resources that feature extreme heat messaging and tools. These included extreme heat messaging and infographic resources for specific high-risk population groups and the general population on how to be prepared and stay safe during EHEs. There were also additional toolkit resources for municipalities and communities to assist with the development of their own heat plans (Appendix C).

An example of an extreme heat communication tool from the First Nations Health Authority (FNHA) in B.C. and partners is presented in Figure 4.

Figure 4. Example of extreme heat communication infographic from the First Nations Health Authority in B.C.

What are the key challenges and opportunities for HARS in Canada?

The survey and interview results provided insights on key challenges, barriers, and solutions for HARS development and implementation in Canada. The NCCEH research team identified several themes, which are presented below with additional details and anonymized quotes extracted from interviews. Quotes from key informants are in italics with green text.

Limited capacity and resources

All key informants identified capacity and funding as critical challenges in developing or implementing HARS or heat response planning efforts at health authorities and provincial/territorial governments.

> *"Well, I think always an issue is going to be money and capacity. Like I said, I am the head person for the program, […]. But it's not the only thing I look after, I have a different bunch of different other things going on. And, you know, we're small health units, so we don't have a lot of people to back me up."*

These challenges can affect all aspects of HARS, including pre-season engagement, identifying at-risk populations, production and translation of appropriate communication tools and resources for at-risk populations, operating municipal cooling centres, and evaluating actions after heat warnings.

According to key informants, while some municipalities are well prepared, there is a severe lack of capacity to respond to extreme heat among municipal authorities and community partners in many regions. Insufficient capacity and resources, and staff turnover or portfolio changes hinder the development and maintenance of HARS plans.

> *"When you start developing [a HARS plan], you know, you have all these consultations with these different partners who say they'll do something, but then unfortunately something changes, and now extreme heat is no longer in that portfolio."*

Indigenous, rural, and remote communities face the greatest difficulties preparing for extreme heat due to limited capacity, resources, and high staff turnover. These issues are compounded by the fact that

such communities face disproportionate effects of climate change, experience combined or consecutive emergencies (e.g., flooding, wildfires, and heat), and have less infrastructure capacity (e.g., cooling centres or spaces such as malls or libraries) to tackle extreme heat.

Need for clarification of roles and responsibility

According to key informants, community response actions by local governments are not always mandated. This, coupled with unclear definition of roles and responsibilities between health authorities and local governments, has likely hindered the development of plans and HARS-related efforts at these levels. Additionally, there has been uncertainty over who holds the responsibility for cancelling outdoor programs or sports events during heat warnings. Some key informants indicated that there is an assumption that health authorities are responsible for these decisions rather than local governments or community partners.

> *"[T]rying to delineate, […] what all these different programs and plans are, and to what level and who's leading them has been a little bit of a challenge as we navigate forward and trying to communicate that up through the political policy process as well […]."*

Need for templates, standards, and guidance

A recurring theme among key informants and across jurisdictions was the absence of customized plans or templates for local governments and community partners.

> *"…local governments and non-profits like things that are just for them – they don't like having to comb through what's for them versus what's not."*

Increasing funding for community partners and non-profits to develop plans and implement community response initiatives was emphasized as a key step to address these gaps. Additionally, creating tailored HARS templates for local authorities and community partners was proposed as a potential solution to improve preparedness and response efforts. Sharing of plans, tools, and templates and the creation of communities of practice were also raised as possible solutions. There was also a call for standardized HARS guidance, tools, and templates to be developed by provincial/territorial governments, which could help to improve consistency of HARS plans across provinces/territories. Key informants emphasized that ideally these would be adaptable for different local and regional contexts.

Need for guidance on events for multiple hazards

Key informants highlighted that climate change will increasingly complicate HARS planning due to the rise of cascading events involving multiple hazards. For example, heat events may occur simultaneously with wildfires or wildfire smoke exposure, or with power outages that disrupt indoor cooling capabilities. These complex, overlapping events present significant challenges for effective planning and response, and are increasingly compounded in smaller remote communities where rapid seasonal changes and combined events are common.

Power outages co-occurring with extreme heat, including those caused by power demand brown outs (a reduction or restriction on availability of electrical power), or wildfire damage to transmission lines, were a top concern.

> *"I find it absolutely necessary for us to come up with plans on how to keep people cool without utilization of electricity, because that is a major weak point in our plans. If we have transmission failures because of wildfires interruption or because of capacity on our systems, and we are totally reliant on that, it's not going to be helpful."*

> *"My biggest fear is to have a heat event with a large power failure, because like Vancouver, we have a lot of multi-unit dwellings that are 20, 30, 40 stories tall that are glass and concrete, and glass makes a beautiful greenhouse. So, if you don't have power and you don't have air conditioning, those units heat up really quickly, and there's limited ability to open windows and cool things down."*

Key informants expressed a need for more detailed and contextual standard guidance on managing scenarios where multiple natural or non-natural hazards coincide, such as extreme heat combined with wildfire smoke, or extreme heat combined with a power outage. There have been increasing events of wildfire smoke affecting urban cities in Canada,[7] which could in the future coincide with heat events.

> *"So, it's definitely been raised, heat and wildfire smoke…And I don't feel there's a lot of clear direction other than heat is worse, so, you know, prioritize cooling."*

Lack of data on at-risk populations

Key informants emphasized that a lack of data on where people at elevated risk are located significantly undermines the ability to implement HARS actions where they are most needed. This information gap hampers targeted communication of health risks and heat-protective measures, as well as coordination of tailored community responses during heat warnings.

> *"I get a sense that hardly anything is done at all, okay? And one of the gaps that they talked about, though, was having some kind of vulnerable population type of registry. But nobody seemed to be doing anything about that."*

> *"I would really encourage people as they're going through the development of their community action plans to make sure that they know their community, to know what your stats are, where your most vulnerable people are, and really understand the community."*

Alert protocol challenges

Key informants highlighted that a key challenge with heat alert protocols is that the ECCC heat warning threshold criteria do not always align with health risk. This could mean that in some cases, a heat warning may be needed to prevent negative health outcomes, even if established alert thresholds are not met. Further, there are challenges in decision-making around when or whether heat alerts should be issued when temperatures are just outside of, or are forecast to reach, alerting temperature thresholds. Additionally, there are challenges around issuing timely heat alerts that occur outside of typical business hours. Key informants noted that implementation of alerts based on impact-based considerations would be helpful but also challenging, at least initially.

> *"You know, the challenge has always been […] getting our notifications out in a timely fashion after ECCC issues the heat warning, because we rely upon their heat warnings. They're doing the calculation for the heat warning and issuing it. So, we're essentially, you know, sharing that information for when there's a heat warning that's been issued, but making sure that it's timely. But we're not 24/7 so, you know, on weekends or holidays, our emails don't come out, so it's an internal challenge to ensure that our*

information, our supplementary information, is coming out in a timely fashion or accessible."

Respondents also expressed a desire for earlier notifications from ECCC to allow more time to activate response plans. Some found the terminology in ECCC alerts difficult to understand, which could hinder effective communication and response.

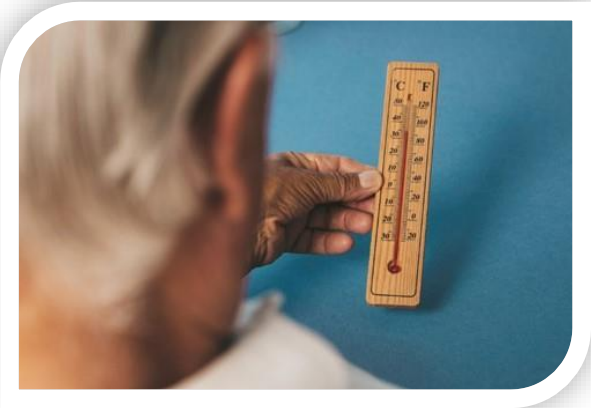
Communication challenges getting the message to those at-risk

Key informants expressed concern about whether their heat warning communications were reaching the people who are at the most risk. For example, there is uncertainty whether messaging is reaching seniors who live alone, those who do not use social media or the internet, those who are not familiar with government or news information sources, or those who do not read or listen in English/French. Terminology used in the messaging can also be complicated, and there were concerns that the meaning of alert thresholds is a challenge to communicate.

"Well, how do we get the information out to the elderly who live on their own, who don't have access to a computer."

Message and alert fatigue were also raised as a key concern that complicates communication about heat health risks.

"One of the things that we struggled with the in the development of the heat warning system was the issue of warning fatigue. And so, if we have a summer that is particularly hot and we are constantly in a heat warning, people stop paying attention, so we need to make sure that not only our partners, but the public, continue to understand the need and risks and that the warning isn't just noise."



To support communications-related work, key informants suggested that heat-related health resources on the internet should be updated to improve accessibility. This is especially important for seniors and those who do not speak English or French. Printed resources may need to be used more frequently, compared to online sources. Creating pre-approved messages in advance was also highlighted as a key advantage. There was, however, a common concern about a lack of capacity to produce simplified, targeted, and translated, paper-based or radio/TV communication. This is made even more challenging in regions with many different languages.

Challenges with public cool-space infrastructure

Challenges related to cooling centres emerged as a prominent theme, particularly based on experiences shared with key informants by municipal partners. While cooling centres are seen as a valuable resource in a community, many people lack mobility to access cooling centres or choose not to attend them. Remote areas frequently lack the infrastructure to offer cooling centres to the public. A recurring issue raised by key informants is the difficulty in staffing these centres, especially on weekends. There were also concerns about managing mental illness and substance use at cooling centres, in a way that ensures patron and staff safety. Additionally, the rigid approach of funding cooling centres, in which funding is contingent on active heat warnings, can lead to problematic "yo-yo" activation and deactivation.

> *"In a remote community of 1000 or less, you don't have a library, you don't have a shopping centre, you don't have any other private space or public space which can be used as a cooling centre."*

To address these challenges, key informants suggested normalizing the use of publicly accessible spaces, such as libraries, community centres, faith-based buildings, and malls as alternative cooling spaces. This approach could help mitigate some of the operational and attendance issues associated with traditional municipal cooling centres.

"And our experience with, like, dedicated cooling facilities, people didn't want to go to them anyway, even when it's in their own apartment building, right? If you just have, like, a common room or something that's air conditioned, it's not really much of a draw for people to go and sit in a room that's cool with nothing else there."

The use of publicly accessible infrastructure as cooling spaces is already a strategy of urban municipalities in Canada, with examples in Vancouver, Toronto, and Montreal.[8-10] However, this approach is not a viable strategy in remote regions and smaller communities, which may not have libraries or shopping centres, and where gathering places may be in old buildings with inadequate heating, ventilation, and air conditioning systems, or without air conditioning entirely.

Imperative to make people safe in their homes

Ensuring people's safety in their homes was identified as an extremely important, yet often overlooked, issue. Key informants acknowledged that most individuals prefer to remain at home during EHEs, underscoring the urgent need to adapt the built environment to reduce indoor temperatures to safe levels during heat events. In regions where extreme cold temperatures are frequent, buildings are designed to retain heat, often with windows that do not open fully or at all, and lack air conditioning.

"Our homes are where we find safety. Our homes are a prerequisite for health. Our homes are a place for recovering from health issues. Our homes are what need to be climate safety zones. The way that we've thought about equity in terms of climate safety is to make public spaces climate friendly. And I think what we've learned is that public spaces [aren't] where people go for safety."

Strategies such as implementing maximum temperature bylaws for rental properties, promoting cooling retrofitting initiatives, and expanding passive cooling measures were highlighted as key approaches to mitigate the risks of extreme heat indoors. Additionally, conducting heat check-ins and fostering social cohesion were emphasized as essential steps towards keeping people safer in their homes during EHEs.

Lack of evaluation

Challenges remain in evaluating whether HARS actions are effective at reducing morbidity and mortality of EHEs, but increased indicator data sharing between partners could enhance future efforts. Many key informants highlighted the need for broader engagement with community partners and better coordination across health services to address these data gaps. Real-time surveillance data were also

identified as a valuable tool to support a more focused and coordinated response, as well as to aid in the evaluation of HARS initiatives.

One key informant noted that systematic quantitative evaluation is challenging because there is a lack of data on intermediate outcomes. Examples of such data gaps include a lack of data on high-risk populations and their heat risk comprehension, behavioural change, and any changes made to home or community environments. Additionally, the infrequent nature of EHEs makes evaluating interventions challenging.

> *"So, it's really hard to quantitatively evaluate our interventions, which I think I struggle with. So, then you're left with qualitative evaluation […] and in general, I would say, we've had really positive feedback from our work. […S]ometimes we get some helpful, constructive criticism, and then sometimes we get information that's like, we can't act on. I think it would be great for us to do more systematic evaluation, but I also struggle with being confident that that would tell us whether we're succeeding or not."*

What can support further development and implementation of HARS?

Funding to support plans and actions

While resource and capacity constraints are major challenges for the development and implementation of all HARS actions, additional funding to support pre-season mobilization, engagement activities, and the creation of community response plans or toolkits could be prioritized. These plans and toolkits could also be adaptable to other hazards (e.g., cold temperatures and storms). Funding of partnerships for community response actions (e.g., heat check-ins, social cohesion programs) should also be explored with non-profits, including faith-based organizations.

Evaluation activities, being the recommended core component with the least traction across all organizations, could be supported through modifiable evaluation templates, or other activities to support evaluation plan development. Funding related to cooling spaces should be more flexible and not always tied to heat warning triggers. Other heat adaptations to make people safe in their homes should be given more funding, given ultimately this is what people prioritize over attending cooling spaces.

Indigenous, rural, and remote communities should be prioritized for increased funding, given these communities face the largest capacity and resources challenges.

Collaboration and sharing of key resources

Organizations that develop HARS or heat response plans may wish to share them publicly, or at least with relevant local organizations. These plans could outline the layers of responsibility and organizations involved for all five recommended HARS core components, and highlight current gaps and challenges related to development, implementation, and evaluation. Using a community of practice such as the Ontario Public Health Climate Network or Health Canada's pan-Canadian Heat Community of Practice, could facilitate collaboration, knowledge and resource sharing (e.g., pre-approved messaging and communication strategies, health surveillance approaches), and discussion concerning these plans as they evolve.

Creation of new guidance and setting standards, roles, and responsibility

In the absence of a provincial/territorial level HARS framework (e.g., BC HARS), standard approaches or templates for HARS plans that lay out organizational roles and responsibility could be developed by provincial/territorial governments to support health authorities, local governments and community partners. Additionally, standardized guidance tools and templates that are top-down (i.e., developed by provincial/territorial governments), set roles and responsibilities, and are adaptable to local and regional contexts, could help to improve consistency of HARS plans. Integrating guidance for cascading events into HARS should be a priority moving forward.

Access to technology and data

New or improved data access and technological tools could be made and shared for surveillance, risk mapping, and communication for better pre-season identification of populations at risk, alerting people to health risks, community response, and post-event evaluation.

Creation of cool spaces and homes

Approaches that increase equitable access to cool spaces at home and in the community warrant specific attention. Maximum temperature bylaws, retrofitting initiatives, and passive cooling improvements to the built environment are important tactics that should be explored in the coming years. While heat-health check-ins for at-risk people can be used in the immediate term to improve

health outcomes, short- to long-term actions that increase social connectedness will be needed, especially in urban centres. Indigenous, rural, and remote communities in Canada will likely need additional support to build and retrofit cool space infrastructure that can protect at-risk populations against extreme heat.

Summary

This stocktake of HARS plans across Canada identified six provincial/territorial government-level provincial HARS plans in B.C., Manitoba, New Brunswick, Nova Scotia, Ontario, and Quebec, as well as health-authority-level HARS plans in Ontario and Quebec. The publicly available examples of HARS plans typically included alert protocols and public communication/messaging strategies. Survey respondents also reported that HARS plans often included activities for pre-season engagement and community response activities.

Through survey and key informant interviews, several challenges were identified that hinder the development and implementation of HARS, including funding shortages, staff turnover, and unclear roles and responsibilities. These issues are particularly relevant in rural, remote, and Indigenous communities. Additional barriers include limited data on at-risk populations, language barriers, challenges reaching at-risk populations, and public alert fatigue. Furthermore, cooling centres are often underutilized, and many homes are not built to withstand extreme heat. Overlapping hazards, including heat combined with wildfire smoke or power outages, further complicate response efforts.

To strengthen HARS, recommendations include increased funding for plan development, clearer roles and responsibilities, improved collaboration and data sharing, enhanced guidance for overlapping hazards, and support for cooling strategies, such as temperature bylaws and passive cooling designs. Support for check-ins and models of social cohesion are also important to improve community resiliency to prepare for extreme heat.

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Appendix A: Technical methods

Search terms

The English search terms were HARS, heat alert and response system, heat alert, heat warning, alert, extreme heat and the French search terms were plan régional de chaleur extrême, des systèmes d'avertissement et d'intervention en cas de chaleur, SAIC, avertissement OR alerte OR d'avertir, vague de chaleur, chaleur accablante, chaleur extreme.

Surveys

Participants accessed surveys via a unique weblink hosted on REDCap® and were offered the option of completing the survey in English or French. The project team sent survey invitations by email between April and October 2024 to 375 individuals (122 in Ontario, and 253 across the remaining PTs) working on extreme heat in Canada, primarily in public health or emergency management in regional, provincial, and territorial governments. We received 66 survey responses, including 18 from the Ontario pilot survey, and 48 from the pan-Canadian survey (n=38 in English, and n=10 in French). Job titles of respondents included medical health officer; directors, program managers or supervisors; emergency management and planning specialists; policy developer or analyst; researcher or research analyst; public health nurse; epidemiologist; environmental health officers or public health inspectors; health promotion specialist; and knowledge translation specialists.

Key informant interviews

The project team conducted 36 key informant interviews with 45 individuals from health authorities, emergency management organizations, and provincial/territorial governments who had indicated interest in participating in a follow-up interview or referrals from survey respondents. Interviews were semi-structured with an interview guide that aimed to gain further insights on challenges, barriers, and potential opportunities related to HARS development and implementation. The interviews lasted between 45–60 minutes and were conducted via Zoom. At the start of interviews, key informants were introduced to the project and provided information on privacy and data analysis. Consent was sought to record interviews, report on findings, and quote interviewees anonymously. Interview questions consisted of fixed and open-ended questions.

Transcripts and notes from the interviews were collated in Excel and analyzed for key themes across HARS recommended core components. No responses were received from Nunavut, Prince Edward Island, or Saskatchewan for the interviews; however, representatives from Saskatchewan participated in the survey.

Interview analysis

NCCEH staff conducting the interviews captured both fixed and open-ended responses by taking notes of responses. Interviews were also recorded with permission of the interviewee to ensure accurate notetaking. Notes were combined after the interview and supplemented using the interview transcript and recording where necessary. Responses were analyzed in aggregate and reported anonymously. Responses to individual questions were collated from all interviewees and organized in Excel to allow for thematic analysis. Themes across HARS recommended core components arising across interviewees were identified, noting the frequency and additional relevant context. Additional important findings from individual interviewees were drawn out during the analysis where relevant.

Appendix B: Publicly available HARS systems of health authorities and provincial/territorial governments

Organization	Publicly available HARS or similar system in use by organization	Heat warning definitions, actions taken, and information available on webpage/HARS document
British Columbia		
Government of British Columbia	BC Heat Alert and Response System (BC HARS)	• HARS document: pdf • Date: 20 June 2024 • The BC HARS integrates the existing heat alert criteria used by ECCC in issuing a Heat Warning in BC with new criteria for an Extreme Heat Emergency under a two-tier system. • When forecast indicates Extreme Heat Emergency criteria may be met, ECCC will prompt the Provincial Health Duty Officer to establish a coordination call with members of the BC HEAT Operations Subcommittee and the specific representatives for quorum to discuss issuing an Extreme Heat Emergency notification. • Once an Extreme Heat Emergency alert is issued, several steps are required, including provincial coordination calls for ministries and provincial agencies, chaired by the Ministry of Emergency Management and Climate Readiness (EMCR) and regional coordination call within impacted regions with EMCR as chair, health authorities, including the regional Medical Health Officer (MHO), Indigenous communities, First Nations Health Authority (FNHA), and local authorities. • HARS document includes sections on heat and health, populations at-risk, urban heat islands, BC HARS description, triggers and activation process, and public health preparedness and interventions with tables of key messages and recommended actions.
Manitoba		

Organization	Publicly available HARS or similar system in use by organization	Heat warning definitions, actions taken, and information available on webpage/HARS document
Government of Manitoba	Manitoba Heat Alert and Response System (Manitoba HARS)	• HARS document: pdf • Date: 31 March 2024 • Chief Provincial Public Health Officer or the designated Medical Officer of Health, Manitoba Health, Seniors and Long-Term Care, may issue advisories or special advisories to the public, about the predicted upcoming heat event, when necessary. Other notified provincial stakeholders may also act, using their internally established processes. • HARS document includes sections on health impacts of heat, populations at-risk, establishing alert thresholds; monitoring, alerting and notification, roles and responsibilities; messaging; planning cycle; mitigation strategies; activation and deactivation and response operations; morbidity and mortality monitoring and post incident review.
New Brunswick		
Government of New Brunswick	New Brunswick Heat Alert and Response System (NB HARS)	• HARS document: information provided on webpage • Date: not provided • A three-level heat alert system, based on three factors that characterize an extreme heat event: intensity, duration, and night-time exposure. • The Regional Public Health Offices monitor meteorological alerting provided by ECCC to determine when it is necessary to issue a Heat Alert to alert the public and initiate local response. • The Regional Public Health Offices advise the public that conditions exist that could result in negative health effects. • The heat alert will be issued on the Government of NB Twitter account @Gov_NB.
Nova Scotia		
Government of Nova Scotia	Nova Scotia's Heat Alert and Response System*	• HARS document: brief information provided on webpage • Date: 2018

Organization	Publicly available HARS or similar system in use by organization	Heat warning definitions, actions taken, and information available on webpage/HARS document
		• Heat alerts will be issued through the HARS to inform Nova Scotians and community response partners when a heat event is coming. • The new system is a partnership between ECCC, Health Canada, and the Nova Scotia Department of Health and Wellness.
Ontario		
Government of Ontario	Harmonized Heat Warning and Information System for Ontario (HWIS)	• HARS document: pdf • Date: May 29, 2023 • Before issuing a public-facing Heat Warning, ECCC sends a weather outlook email called the Ontario Vigilance Bulletin (OVB) to their health sector and emergency management partner distribution list, once forecast guidance is certain enough to warrant elevated likelihood of a heat event. Public health units (PHUs) may choose to communicate early notification to key partners or wait for official ECCC warning. ECCC will also issue advanced Heat Warnings to PHUs through ECAlertMe. • When conditions are likely to meet two days or more of warning criteria, ECCC will issue a Heat Warning. PHUs will notify municipalities and partners that conditions have been met, and to prepare. PHUs will also notify media of the Heat Warning, for example to share health protective messaging with the public. • ECCC's Heat Warning that extends for more than three days would constitute an Extended Heat Warning at the local PHU level. PHUs will notify and work with municipalities and partners as defined in local plans and implement response activities. • In the de-escalation phase, ECCC will issue a notification that the heat warning is ending as conditions are no longer met. PHUs will notify municipalities and partners and may issue additional messaging to media as needed. • Additionally, a Special Weather Statement will be issued at the discretion of the Meteorological Service of Canada (MSC) with the first forecast of a heat event in the season up until the Canada Day weekend, when conditions do not meet heat warning criteria but could pose health risks, particularly to those vulnerable to the heat who are not yet acclimatized to the warmer weather.

Organization	Publicly available HARS or similar system in use by organization	Heat warning definitions, actions taken, and information available on webpage/HARS document
Sudbury & District Health Unit	City of Greater Sudbury Hot Weather Response Plan	• HARS document: pdf • Date: November 2023 • Developed by the City of Greater Sudbury (CGS) and Public Health Sudbury & Districts (PHSD) for the Greater Sudbury area. • Three-level heat warning and alert system (Level 1: Heat warning, Level 2: Extended Heat Warning or Heat Alert, Level 3: Extreme Heat Alert). • Plan outlines the objectives of the response plan, the roles and responsibilities of PHSD and CGS, the activation procedure, the deactivation procedure, and evaluation planning.
Toronto Public Health	City of Toronto Heat Relief Strategy	• HARS document: pdf • Date: May 2023 • Strategy outlines description of Heat Warning Monitoring; Heat Relief Services, Roles and Responsibilities, Community Partners.
Quebec		
Government of Quebec	Plan ministériel de gestion des épisodes de chaleur extrême	• HARS document: pdf • Date: 2021 • Coordinated by the MSSS. • If two or more regions reach the “alert” level of their regional plan, the MSSS fully activates the ministerial plan, and assumes leadership in terms of coordination to facilitate the concerted action of stakeholders and the coherence of measures, while respecting the respective attributions and areas of competence of each of the health and social services sectors (regional and provincial). • The ministerial plan does not replace the regional plans, which continue to apply in their entirety; rather, it complements them by giving the MSSS and network response a provincial scope. • HARS document includes sections on health impacts of heat, populations at-risk, predicted issues that might be experienced at the MSSS during an extreme heat event, organizations involved, roles and responsibilities, regional intervention levels.

Organization	Publicly available HARS or similar system in use by organization	Heat warning definitions, actions taken, and information available on webpage/HARS document
Integrated Health and Social Services Centre of the Laurentians	Plan de prévention et de protection en cas de chaleur extrême des Laurentides	• HARS document: pdf • Date: 2019 • Plan outlines the objectives of the response plan, definitions of a heat warning and extreme heat, health impacts and at-risk groups, definitions of the alert levels and response actions. • Plan also contains a table which provides a detailed overview of the activities and management responsibilities for each alert level.
Integrated University Health and Social Services Centre of the Capitale-Nationale	Plan régional de chaleur extreme	• HARS document: pdf • Date: 2019 • Plan outlines the groups involved in the response plan, the objectives of the response plan, definitions of a heat warning and extreme heat, region-specific risks, definitions of the alert levels and response actions. • Plan also contains a table which provides an overview of the heat-related emergency management responsibilities of the Integrated University Health and Social Services Centre of the Capitale-Nationale, as well as the roles of other actors within their region's civil protection structure.
Integrated University Health and Social Services Centre of the West Island of Montreal	Chaleur accablante ou extrême - Plan de traitement du risqué	• HARS document: pdf • Date: 2024 • Plan outlines the alert levels, the communication chain during heat events, and roles and responsibilities during the different levels of heat events, as well as a section on feedback and continuous improvement.
Integrated University Health and Social Services Centre of West-Central Montreal	Plan local de prévention et de protection en cas de chaleur accablante ou extrême	• HARS document: pdf • Date: 2023 • Plan outlines at-risk groups in the region, defines a heat warning and extreme heat for the region, provides an overview of the alert levels, as well as the roles and responsibilities for each alert level, broken down by different areas of the health sector in the region.

*The Nova Scotia Heat Alert and Response System is not active, as of key informant interviews in January 2025.
Abbreviations: BC, British Columbia; ECCC, Environment and Climate Change Canada; HARS, heat alert and response system; HRI, heat-related illnesses; MSSS, Ministère de la Santé et des Services sociaux; NB, New Brunswick.
Search date range: The HARS stocktake search was conducted between January and September 2024.

Appendix C: Examples of publicly available extreme heat resources shared by provincial/territorial governments and health authorities

Resource	Organization	Description of information
		Resource webpage
Resources for the general population, people who are more susceptible to heat-related illness, health care providers and community organizations	Fraser Health (British Columbia)	• Webpage links out to resources for several different population groups, including: the general population; seniors and people with medical conditions; infants, young children and pregnant people; people who use substances or are living with mental health conditions; for preparing your home or rental property; workers and businesses; health care providers; communities and community organizations.
Extreme heat	Vancouver Coastal Health (British Columbia)	• This webpage features several categories of resources on extreme heat, including general information about extreme heat events, resources for community organizations, information for businesses and licensed facilities, and for housing owners and operators.
Preparing for Heat Events	PHSA/BCCDC (British Columbia)	• Includes information on the different types of heat alerts, how to prepare for warmer temperatures, symptoms of heat-related illnesses, those most at-risk during warmer weather, and ways to stay cool.
Staying Healthy in Hot Weather	Toronto Public Health (Ontario)	• Webpage links to resources on where to find cool spaces, how to stay cool during heat events, hot weather plan for landlords, hot weather plan for childcare centres.
		Guidebook

Resource	Organization	Description of information
Extreme heat preparedness guide	Government of British Columbia	• Includes description of extreme heat, how to prepare for heat season, what to do during a heat event • PDF guide is available in English, Simplified Chinese, Traditional Chinese, Punjabi.
Stay Cool, PEI - Preparing for Heat Waves Together Digital Guide	Government of PEI	• Digital guide was developed by Scout Environmental with funding from the Government of PEI's Climate Challenge Fund. • The digital guide is a free, interactive guide that offers practical tips on recognizing heat-related illnesses and preparing for extreme heat at home and in the community.
Infographic		
Be prepared for extreme heat	Government of Alberta	• Includes description of at-risk groups, and actions the public can take to prevent heat-related illnesses. • Available in Ukrainian, Arabic, Simplified Chinese, Traditional Chinese, Punjabi, German, Spanish, French, and Tagalog.
Be prepared for hot weather Stay safe during extreme heat events	FNHA (British Columbia)	• Features infographics to support communicating heat-protective information to the public.
Heat response toolkit for communities		
Developing a Municipal Heat Response Plan: A Guide for Medium-sized Municipalities	PHSA/BCCDC (British Columbia)	• Guide includes information for municipalities to consider when developing a municipal heat response plan, in areas include infrastructure and resources, partners, communications, pre-season preparation, and implementation of the heat plan.
Heat Response Planning for Southern Interior B.C. Communities Toolkit	Interior Health (British Columbia)	• Toolkit includes information and resources to assist community partners in the Southern Interior of BC in developing and implementing extreme heat response systems and strategies.

Resource	Organization	Description of information
Chaleur extrême : Boîte à outils	Centre intégré universitaire de santé et de services sociaux de l'Estrie - Centre hospitalier universitaire de Sherbrooke (Quebec)	• Page links to a toolkit for municipalities in the region, to support their extreme heat response. Toolkit outlines extreme heat definition, intervention options, communication strategies, identifying at-risk neighbourhoods.
Other		
Guide à l'intention des responsables des camps d'été et des terrains de jeux Guidebook for summer camp operators	Centre intégré universitaire de santé et de services sociaux de la Capitale-Nationale (Quebec)	• Infographic outlines considerations during extreme heat events for summer camp operators in the Capitale-Nationale region.
Documents: Plan de traitement et Fiches CAE HARS plan summary	Centre intégré universitaire de santé et de services sociaux de l'Ouest-de-l'Île-de-Montréal (Quebec)	• This HA has broken their heat plan down into several summary sheets, which summarize the actions for each alert level. They're intended to be quick/easy reference tools to break down the heat plan.

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