

NO: R127

COUNCIL DATE: June 27, 2022

REGULAR COUNCIL

TO: **Mayor & Council**

DATE: **June 23, 2022**

FROM: **General Manager, Community Services
General Manager, Parks, Recreation and Culture
Fire Chief, Emergency Planning Coordinator**

FILE: **4710-01**

SUBJECT: **Surrey Extreme Weather Action Plan**

RECOMMENDATION

The Community Services and Parks, Recreation and Culture Departments and Surrey Fire Services recommend that Council:

1. Receive this report for information; and
2. Endorse the Surrey Extreme Weather Action Plan attached as Appendix “I”, and as generally described in this report.

INTENT

The intent of this report is to seek endorsement from Mayor and Council on the Surrey Extreme Weather Action Plan (the “Action Plan”) and to provide an update on preparation for extreme heat events in 2022.

BACKGROUND

Until recently, extreme weather responses in the region primarily focused on supporting the winter Extreme Weather Response (“EWR”) program funded by BC Housing (“BCH”) for people experiencing homelessness during the coldest days of the year. Province-wide agencies such as Emergency Management BC (“EMBC”) and BCH play a key role in these responses by setting standards and delivering responses through funding community-based agencies to provide temporary, overnight shelter spaces during extreme winter weather events that threaten the health and safety of homeless individuals. BCH funds EWR programs in communities where the number of homeless people exceeds the number of available shelter beds, such as Surrey.

BCH contracts the Homelessness Services Association of BC (“HSABC”) to manage the EWR program and to coordinate the implementation of the EWR in Surrey and Vancouver. HSABC’s responsibilities include updating local EWR Plans, identifying and liaising with community agencies and faith-based organizations to secure EWR shelter sites, determining when to activate EWR alerts, and sending out notification of the activation and deactivation of EWR alerts. Individual EWR shelter sites are operated by local non-profit organizations.

Surrey Fire Services (“SFS”) inspects all proposed EWR shelters to ensure that they meet basic health and safety standards. City staff are also included on the EWR notifications sent by HSABC so that, if required, staff can direct people to EWR shelters. The City’s Communications staff amplifies messaging related to the EWR alerts to residents.

With the potential for an increasing number of extreme heat weather events, Environment Climate Change Canada, BC Centre for Disease Control, Fraser Health Authority, Vancouver Coastal Health Authority, EMBC, and BC Housing (collectively the BC Health Effects of Anomalous Temperatures Committee [“BC HEAT Committee”]), and municipalities and partners engaged in EWR have been proactively planning for responses to include the extremes of heat and smoke in the summer months.

Given the extremes of weather our region now faces from cold, heat and smoke, the City has worked to ensure year-round responses that are aligned with provincial authorities.

DISCUSSION

An extreme heat emergency occurs when daytime and nighttime temperatures are well above seasonal norms and are forecast to increase above the regional recommended thresholds for three consecutive days. Driven by climate change, extreme heat days have a severe impact on health, infrastructure, services, the environment, and the economy. The 2021 “heat dome” was the deadliest weather event in Canadian history and underlined the fact that those in our communities who are most vulnerable require additional support.

Recently, HSABC convened the partners involved with the winter EWR to coordinate a heat response for people experiencing homelessness. Actions include supporting non-profits to set up outdoor cooling stations located on non-profit sites and public spaces, and the provision of water, sunscreen and other supplies.

Metro Vancouver Health Authorities also coordinate the distribution of information on locations and opening hours of outdoor cooling stations and civic facilities where people can cool off, such as community and recreation centres and libraries.

A report released on June 7, 2022 from the Chief Coroner of British Columbia, *Extreme Heat and Human Mortality: A Review of Heat-Related Deaths in B.C. in Summer 2021* (the “Report”; attached as Appendix “II”), provides a review of heat-related deaths in BC during the summer of 2021. The Report confirms that the BC Coroner's Service directly attributed 619 deaths to the “heat dome” event in late June 2021. As noted in the Report, “most of those deceased were older adults with compromised health due to multiple chronic diseases and who lived alone.” Other major findings include:

- 98% of deaths occurred indoors;
- more deceased individuals were in homes without adequate cooling systems; and
- most lived in more socially or materially deprived neighbourhoods than the general population.

The report outlines three recommendations for actions for municipalities to take to reduce heat-related deaths. These recommendations are:

1. Implement a coordinated provincial Heat Alert and Response System (“HARS”);
2. Identify and support populations most at risk of dying during extreme heat emergencies; and
3. Implement extreme heat prevention and long-term risk mitigation strategies.

As a result of the increasing extreme heat emergencies, Provincial authorities (PreparedBC) have issued new guidelines under the *Extreme Heat Preparedness Guide* (Appendix “III”) and the City has aligned our approaches accordingly. SFS developed *Surrey’s Extreme Heat Response Guideline 2022* (Appendix “IV”) which aligns with PreparedBC *Extreme Heat Preparedness Guide*.

EMBC announced in May that in an extreme heat emergency, a forecasted extreme heat emergency, or a heat warning where actions are taken as outlined in the BC Provincial Heat Alert and Response System (“BC HARS”) many incurred expenses will qualify for reimbursement. These expenses include the provision of bottled water, staff overtime, facility use costs, provision of emergency services and the work of partner agencies, including First Nation support services. BCH works directly with the agencies they contract for the operation of shelters and supportive housing projects to ensure that the buildings are kept as cool as possible, water is provided, and outdoor misting tents are set up to support the priority population experiencing a challenge with housing stability.

Through the BC HEAT Committee, BC HARS is a heat response pilot project for 2022 coordinated by the Province. The BC HARS has defined new thresholds for declaring a “Heat Warning” or “Extreme Heat Emergency”. The pilot project provides guidance and suggestions for people, property owners, local governments, health facilities and non-profit housing operators to plan and prepare for heat events. BC HARS acknowledges the 2022 pilot was developed in time for the summer heat season, but still requires further consultation with local governments and other stakeholders.

Preparing for Extremes of Cold, Heat and Smoke: Surrey Extreme Weather Action Plan

To ensure coordinated responses to cold, heat and smoke, the City has developed the Action Plan, to ensure our residents are adequately informed year-round of risks and required actions to prepare for and protect themselves during extreme cold, heat and smoke events.

The Action Plan is aligned with the Provincial alert structure, following two alert levels: Warning and Emergency. The Action Plan also outlines how ongoing activities related to raising awareness and providing information to our residents will function in tandem with the two alert levels. The Action Plan provides details on the ongoing awareness communications and provides a matrix outlining the criteria that triggers each alert level and the actions that the City will take at each alert level.

Awareness

Throughout the year, the City utilizes social media and web-based communication to increase awareness amongst residents of the health and well-being risks related to weather extremes. This ongoing work primarily involves the City's Marketing and Communications Division, as well as the Recreation Services teams based in each community and recreation centre, as they are an important conduit for regular users of the centres as well as our most vulnerable residents.

SFS plays a crucial role in raising awareness, as they regularly engage with property owners as part of HomeSafe and other inspection services. Along with dedicated "pop up" events and engagement activities, SFS disseminates key information to residents to prepare for and manage extreme weather events in their homes. SFS and By-Law teams also undertake targeted outreach to businesses to increase awareness of their responsibilities for employees working in commercial and industrial buildings. Each year, SFS proactively engages with property owners to manage increased fire risks in summer as part of their regular outreach efforts for fire prevention. Additionally, SFS launched the "Alertable" Emergency Notification system for Surrey in May 2022. This application allows residents to sign up to receive emergency notifications and alerts from the City related to any emergency event impacting their location.

Alert Levels: Warnings and Emergencies

The Action Plan includes two alert levels. For each of alert level, the City has developed responses that are aligned with those of Provincial authorities. The Province's *Extreme Heat Preparedness Guide* focuses on actions individuals should take, including precautions residents can take to prepare in advance of extreme heat emergencies, what to do as temperatures rise, and what to do once an extreme heat emergency is underway. Precautions to take before summer include identifying those at risk and needing support.

Building on this, *Surrey's Extreme Heat Response Guideline 2022* outlines actions the City will take to support residents and provincial ministries in mitigating risks to life and safety caused from an extreme heat event. The guideline describes the extreme heat alert protocol and response, including monitoring temperatures and outlines when the City will escalate to a heat warning and then an extreme heat emergency.

At a Level 1 alert (Heat Warning), the City:

- Advertises the location and operating hours of City-owned facilities available for heat respite;
- Conducts check-ins to those identified as more vulnerable to a heat event; and
- Employs a multi-modal communication strategy to disseminate relevant information to the public.

At a Level 2 alert (Extreme Heat Emergency), the City continues all actions undertaken at Level 1, and in addition:

- Conducts community outreach focusing on high-risk populations and the groups that support them;
- Extends the hours, as required, for City-owned facilities that can offer respite,

- Distributes resources to the public, such as water; and
- Increases the availability of on-duty first responders.

City of Surrey Facility Availability for 2022 Heat Events

Many civic facilities, which includes various civic recreation and community centres, as well as libraries, are available to offer respite to individuals in need and access to water. On July 21, 2021, the City launched the Summer Cooling: Extreme Heat & Smoke Relief Locations list (Appendix “V”), as an additional resource during the summer season. This list is available to the public on the City’s website and outlines the City of Surrey civic facilities available to anyone seeking relief from extreme heat or wildfire smoke during the summer months. These facilities are also available for respite for extreme cold and/or smoke.

SUSTAINABILITY CONSIDERATIONS

This work supports the objectives of the City’s Sustainability Charter 2.0. In particular, this work relates to the Sustainability Charter 2.0 theme of Inclusion. Specifically, this work supports the following Desired Outcomes (“DO”) and Strategic Directions (“SD”):

- Inclusion SD9: Facilitate the development of shelter facilities and supportive housing as outlined in the Master Plan for Housing the Homeless in Surrey.
- Inclusion SD20: Foster a culture of collaboration and the generation of new ideas and methods for solving complex social issues.
- Inclusion DO12: Everyone in Surrey has a place to call home.
- Inclusion DO13: Appropriate and affordable housing is available to meet the needs of all households in Surrey.
- Inclusion DO24: Surrey has a strong social infrastructure that supports the needs of its diverse and growing population.
- Inclusion DO25: Surrey has a culture of collaboration and innovation to solve complex social problems.

CONCLUSION

With extreme heat as a growing risk for the health and well-being of residents in Surrey, the Surrey Extreme Weather Action Plan is aligned to the Provincial alert structure, functioning at two alert levels: Warning and Emergency. The Action Plan outlines how ongoing activities related to awareness raising and providing information to our residents will function in tandem with the two levels of alerts. The City also works to ensure civic and non-civic facilities are prepared to offer respite to individuals in need when required to respond to extremes of cold, heat and smoke.

Terry Waterhouse
General Manager
Community Services

Laurie Cavan
General Manager
Parks, Recreation and Culture

Larry Thomas
Fire Chief, Emergency Planning Coordinator

Appendix "I" – Surrey Extreme Weather Action Plan

Appendix "II" – Extreme Heat and Human Mortality: A Review of Heat-Related Deaths in BC in Summer 2021 (Report to the Chief Coroner of British Columbia)

Appendix "III" – Extreme Heat Preparedness Guide (PreparedBC)

Appendix "IV" – Surrey's Extreme Heat Response Guideline 2022

Appendix "V" – Summer Cooling: Extreme Heat & Smoke Relief Locations

Surrey Extreme Weather Action Plan

A coordinated response to extreme cold, heat, and smoke for Surrey and its residents.

AWARENESS (ongoing)

- Support emergency preparedness in community
- Tip sheets on staying cool/warm when conditions change – use of social media, web
- Fact sheets on signs of heat exhaustion, dangers of smoke inhalation during wildfires – use of social media, web to promote messages
- Use of recreation centres to raise awareness through posters, advertising, and brochures
- Fire Service outreach via Home Safe and existing property visits and inspections to raise awareness
- Possible involvement of Bylaw property inspection and business outreach activities to promote good practices for residents and businesses – promote access to activities and services during alerts
- Coordinate with EMBC, Fraser Health, BC Housing, and agencies such as Homelessness Services Association of BC (HSABC) to prepare for upcoming alerts/emergencies

EWR ALERT LEVELS	CRITERIA TO ACTIVATE	CITY ACTIONS
<h3>WARNING</h3>	<ul style="list-style-type: none"> • Issued when there is a moderate public health risk (5% possible increase in mortality e.g., due to prolonged exposure to heat or cold) • Health alerts related to EWR can be declared by BC Centre for Disease Control, Public Health Officer or Emergency Management BC • Extreme heat triggers are specific to zones of the province in which the event occurs • Fraser Region: high of 33 and low of 17 or higher for two or more days would trigger a warning 	<ul style="list-style-type: none"> • Alertable app - creates mechanism for text alerts for EWR and disaster alerts – subscription based • Designated response centres • Respite - use of recreation centres for vulnerable residents, unsheltered populations (grant application submitted for new proposed approach) • Ramp up of tips and social media campaign to promote awareness of risks and advertise locations for services • Ensure adequate supplies are procured in advance in anticipation of warnings • Implement contingency plans for emergency power supply and air conditioning in City facilities • Updates to all City staff
<h3>EMERGENCY</h3>	<ul style="list-style-type: none"> • Extreme weather emergencies are where warning criteria are met and potential mortality increases to 20% or more for three or more days in forecast • Major disasters and severe weather events • Province declares emergencies 	<ul style="list-style-type: none"> • Alertable App sends messages to subscribers • Surrey participate in EMBC coordination for region • Enhanced outreach to vulnerable residents (seniors, unsheltered homeless) to promote access to EWR centres • Increase on-call first responders • Staff distribute water and other supplies to residents • EOC process may be initiated and coordinated by Surrey Fire if emergency relates to weather related flooding, fire or other emergency event triggered by extreme weather

Extreme Heat and Human Mortality: A Review of Heat-Related Deaths in B.C. in Summer 2021

Report to the Chief Coroner of British Columbia

Release Date: June 7, 2022

This report is dedicated to the families, friends and communities of those who lost their lives from the impact of the extreme heat event. May their memories endure in our actions to prevent similar deaths in the future.

The BC Coroners Service acknowledges with gratitude that this death review panel was convened on the territory of the Musqueam, Tsleil-Waututh and Squamish peoples.

Preface

On April 20, 2022, the British Columbia Coroners Service (BCCS) convened a panel to review the deaths of 619 persons who died following an extreme heat event that occurred June 25–July 1, 2021. During this period, an unprecedented heat dome resulted in record high temperatures across many parts of the province that persisted over several days.

Panel support was provided by BCCS staff Andrew Tu, Carla Springinotic, Dean Campbell, Quiana Foster and Ryan Panton.

I would like to thank the panel members for sharing their expertise, bringing the support of their respective organizations and participating in a collaborative discussion. I believe the panel has generated actionable recommendations that I am confident will contribute to reducing heat related deaths in British Columbia.

Kristy Anderson – Assistant Deputy Minister, Hospital & Provincial Health Services Division,
Ministry of Health

Dr. Jatinder Baidwan – Chief Medical Officer, BC Coroners Service

Alex Boston – Executive Director, Simon Fraser University, Renewable Cities

Dr. Sam Bugis – VP Physician Affairs and Specialist Practice, Doctors of BC

Rowan Burdge – Provincial Director, BC Poverty Reduction Coalition

Gerry Delorme – Director, Health Emergency Management BC (HEMBC)

Dr. Michael Christian – Chief Medical Officer, BC Emergency Health Services (BCEHS)

Ken Craig – Executive Director, Disaster Preparedness, Emergency Management BC (EMBC)

Dr. Kirsten Everett – Director, Medical Investigation Unit, BC Coroners Service

Dr. Reka Gustafson – Deputy Provincial Health Officer, Office of the Provincial Health Officer

Dr. Sarah Henderson – Scientific Director, Environmental Health Services,
BC Centre for Disease Control (BCCDC)

Christina Krause – Chief Executive Officer, BC Patient Safety and Quality Council

Dr. Shannon McDonald – Chief Medical Officer, First Nations Health Authority

Dr. Kim McGrail – Professor, School of Population and Public Health, UBC

Isobel Mackenzie – Seniors Advocate, Office of the Seniors Advocate

Jim Ogloff – Fire Chief, Coquitlam Fire Department

Norm Peters – Vice President, Fraser Health Authority

Dr. Michael Schwandt – Medical Health Officer, Vancouver Coastal Health

Daniel Stevens – Director, Vancouver Emergency Management Agency, City of Vancouver

Magdalena Szpala – Director, Sustainability and Resiliency, BC Housing

Fiona Wilson – Deputy Chief, Vancouver Police Department

Amina Yasin – City and Regional Planner and Commissionaire, Vancouver City Planning Commission

On behalf of the panel, I submit this report and recommendations to the chief coroner of B.C.



Michael Egilson
Chair, Death Review Panel

Executive Summary

Extreme heat events (EHE) are also described in the literature as “heat waves” or “heat domes”. A heat dome occurs when an area of high pressure stays over the same area for days or even weeks, trapping very warm air underneath - rather like a lid on a pot*. The definition of an extreme heat event varies based on many factors, including geographic location and weather conditions such as temperature, humidity, and cloud cover as well as the duration of the event. During this type of event, the temperature is much hotter than average for a particular time and place.

In late June 2021, British Columbia (BC) experienced an unprecedented heat dome which resulted in record temperatures across many parts of the province over several days. Temperatures started to rise on June 24 and continued increasing to a peak on June 28-29. At the peak, temperatures reached over 40°C in many parts of the province. Overnight temperatures were also uncharacteristically high.

During the week of the EHE (June 25–July 1, 2021), the BC Coroners Service (BCCS) responded to a sudden and significant increase in deaths. More than 800 deaths were investigated by BCCS during that week, with 619 of these deaths later identified as being heat-related.

The Chief Coroner convened a death review panel to review the circumstances around these deaths to identify actions to improve public safety and prevent future deaths. This multi-disciplinary panel was comprised of experts in emergency management, medicine, public health, First Nations health, seniors, city and municipal planning, health administration, poverty reduction, patient safety, policy, research, housing, police, fire and ambulance services.

Most of the deceased were older adults with compromised health due to multiple chronic diseases and who lived alone.

*-[What is a heat dome? | Royal Meteorological Society \(rmets.org\)](https://www.rmets.org/what-is-a-heat-dome/).

Major Findings

- 98% of deaths occurred indoors;
- There was a lag between the heat alerts issued by Environment and Climate Change Canada (ECCC) and public agencies and the public response;
- Heat-related deaths were higher among persons on specific chronic disease registries (schizophrenia, substance use disorder, epilepsy, chronic obstructive pulmonary disease, depression, asthma, mood and anxiety disorders, and diabetes) compared to the B.C. population;
- More than 60% of decedents had seen a medical professional within the month prior to their death;
- 67% (415) of decedents were 70 years of age or older;
- More than half of all decedents (56%) lived alone;
- More decedents lived in socially or materially deprived neighbourhoods than the general population;
- Most decedents were in homes without adequate cooling systems such as air conditioners or fans;
- 74% (457) of deaths occurred in Fraser and Vancouver Coastal Health Authorities;
- Fraser North, Fraser East, and Vancouver had the highest rates of deaths by Health Services Delivery Area (HSDA);
- 911 calls doubled during the peak of the heat dome;
- Paramedics attended 54% (332) of deaths with a median time of 10 minutes and 25 seconds;
- In 50 instances, paramedics took 30 minutes or longer from time of call to scene attendance; and
 - In 17 instances, 911 callers were placed on hold for an extended period of time; and
 - In 6 instances, callers were told that there was no ambulance available at the time of call.

The Panel identified three key areas to reduce heat-related deaths:

A coordinated provincial heat alert response system

Ensuring vulnerable populations are identified and supported during extreme heat events

Implementing prevention and longer-term risk mitigation strategies

These findings are the basis for the following recommendations made to the chief coroner by the Panel.

RECOMMENDATION 1:

Implement a coordinated provincial heat alert and response system (HARS)

Priority actions identified by the Panel are:

(A) By June 30, 2022, the Ministry of Health will be assigned as the lead ministry to coordinate the response to public health impacts from an extreme heat event and the Ministry of Public Safety and Solicitor General will assign Emergency Management BC (EMBC) as the lead agency to coordinate the government provincial response to the non-health related impacts of extreme heat emergencies.

(B) By June 30, 2022, the Ministry of Health, provincial health authorities and EMBC will adopt and implement the HARS pilot, developed by the BC Health Effects of Anomalous Temperatures (BC HEAT) Committee, province-wide.

(C) By June 30, 2022, the Ministry of Health will forward the HARS pilot to local governments for review and adoption of recommended actions as appropriate based on community needs and identified vulnerabilities, including actions specific to vulnerable populations (ie. wellness checks, cooling centres [including mobile cooling centres], water distribution, greening areas, cooling parks).

(D) By June 30, 2022, on the advice of the BC HEAT Coordinating Committee (Ministry of Health), EMBC will issue a Broadcast Intrusive alert for an Extreme Heat Emergency.

(E) By summer 2023 the Ministry of Health will coordinate a gap analysis/evaluation of the HARS pilot.

RECOMMENDATION 2:

Identify and support populations most at risk of dying during extreme heat emergencies

Priority actions identified by the Panel are:

(A) By June 30, 2022, provincial health authorities will ensure that Home and Community Care Services identify and prioritize clients who: are listed on chronic disease registries (schizophrenia, substance use disorder, epilepsy, chronic obstructive pulmonary disease, depression, asthma, mood and anxiety disorders, and diabetes registries); persons with limited mobility; persons with cognitive impairment; and/or live alone, for home visits and contact during an extreme heat emergency.

(B) At their next meeting, the Union of BC Municipalities (UBCM) will review and consider the adoption of community wellness checks, as referenced in the BC HEAT Committee's Pilot HARS plan, as a strategy to identify and support vulnerable persons during an extreme heat emergency.

(C) By summer 2022, the Ministry of Health, in conjunction with the health authorities and the First Nations Health Authority, will develop and distribute public messaging on self-care and caring for vulnerable persons during a heat event, that is culturally appropriate and available in multiple languages.

(D) By December 1, 2022, the Ministry of Health, in collaboration with the Ministry of Social Development and Poverty Reduction, and in consultation with vulnerable populations, will conduct a review into issuing cooling devices as medical equipment accessible to persons most at risk of dying during an extreme heat event, and make public the findings of the review.

(E) By June 30, 2023, the Ministry of Health, provincial health authorities and the First Nations Health Authority will engage and consult with vulnerable populations (elderly, persons with chronic health conditions including mental illness, persons with mobility challenges, and persons living in neighbourhoods and geographic areas most likely to be impacted by an extreme heat event) and local government emergency planners regarding HARS planning, review and evaluation at provincial, regional and local levels.

RECOMMENDATION 3:

Implement extreme heat prevention and long-term risk mitigation strategies

Priority actions identified by the Panel are:

(A) By summer 2022, EMBC, in partnership with the Ministry of Health, provincial health authorities and the First Nations Health Authority, will distribute the Prepared BC Extreme Heat Preparedness Guide to British Columbians and provide public service announcements on extreme heat preparedness in multiple languages and formats.

(B) By summer 2023, the Ministry of Environment and Climate Change Strategy will ensure the CleanBC Better Homes and Home Renovation Rebate Program includes both passive and active cooling measures as eligible for rebates. Rebate priorities should be focused on census areas identified in the lower quintiles of material deprivation index and targeted to low income households and the least energy efficient residential building stock.

(C) The Ministry of Attorney General and Responsible for Housing will ensure that the 2024 release of the BC Building Code incorporates both passive and active cooling requirements in new housing construction, and that the release of the Alterations Code for Energy Efficient, Resilient Buildings explicitly identifies both passive and active cooling standards for existing home renovation.

(D) As the *Local Government Act*, *Community Charter* and the *Vancouver Charter* are reviewed and “Climate Lenses” are crafted for *Official Community Plans and Regional Growth Strategies*, the Ministry of Environment and Climate Change Strategy will ensure that updates and revisions are consistent with the *Climate Preparedness and Adaptation Strategy* and require the protection and restoration of the urban tree canopy and permeable surface areas to absorb water.

Death Review Panel

The *Coroners Act* provides the chief coroner with the discretion to establish death review panels to review the facts and circumstances of deaths to provide the chief coroner with advice on medical, legal, social welfare and other matters that may impact public health and safety and prevention of deaths. A death review panel may review one or more deaths before, during or after a coroner's investigation, or inquest.

Members of the Panel were appointed by the chief coroner under Section 49 of the *Coroners Act* and included professionals with expertise in emergency management, medicine, public health, First Nations health, seniors, city and municipal planning, health administration, poverty reduction, patient safety, policy, research, housing, police, fire and ambulance services.

Regardless of their employment or other affiliations, individual panel members were asked to exercise their mandate under the *Coroners Act* and express their personal knowledge and professional expertise. The findings and recommendations contained in this report need not reflect, or be consistent with, the policies or official position of any organization.

In the course of reviewing heat-involved deaths that occurred in 2021, the panel reviewed:

- Coroners' aggregated investigative findings;
- Information provided by panel members;
- Environmental, social and medical factors associated with the deaths;
- Possible trends or themes;
- The current state of related public policy and strategies; and
- Existing challenges.

Data Limitations and Confidentiality

The BCCS operates in a live database environment. Decedent information, investigative notes, case details and findings are regularly updated during a death investigation. The data presented within this case review is based on open and closed BCCS case files. It includes analysis of BCCS investigative notes, police reports, medical records and other documents collected or protocols completed during the course of the investigation. Some cases are still under investigation and information may be incomplete. Linkages were made to other data sources; however, due to incomplete or incorrect information, not all cases were linked successfully.

Where possible, the best available data was used for analysis; however, discrepancies can still occur. For example, weather data were mapped to the nearest weather station which may have been a large distance away or at a different altitude. Additionally, chronic disease information was obtained from the Chronic Disease Registries which do not include clinical diagnosis. Instead, each registry has its own defined inclusion criteria from administrative data.

Consistent with the International Statistical Classification of Diseases and Related Health Problems, 10th Revision (ICD-10), deaths resulting from environmental heat are considered to be externally caused and are thus deemed accidental deaths. On July 2, 2021, a notice was distributed to medical clinicians to remind them of the requirement to report heat-related deaths to the Coroners Service. Reports of deaths due to exposure to excessive natural heat were received by the Coroners Service for a number of days after the deaths themselves, thus not all deaths were reported in real time, which impacted data collection.

Provisions under the *Coroners Act* and *Freedom of Information and Protection of Privacy Act* allow for the BCCS to disclose information to meet its legislative mandate and support the findings and recommendations generated by the review process. For the purposes of this report, information is presented in aggregate. The BCCS is sensitive to the privacy of individuals and families that it serves and proceeds with caution when reporting findings. Details that could identify the individuals have been omitted to respect the privacy of the person who died and their families.

All **bolded** terms in this report are defined in the glossary.

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Introduction

Extreme Heat Events (EHEs), also referred to as “heat waves” or “heat domes” impact health and result in a significant number of preventable deaths (Government of Canada, 2020; Health Canada, 2011). The number and intensity of extreme heat events is projected to increase as a result of climate change (IPCC, 2021, 2022).

The human body maintains a core temperature of approximately 36.6°C, and significant changes in core temperature are hazardous to our health. The mechanisms and rates of heat gain and loss are impacted by many factors, including age, cardiovascular fitness, chronic conditions, medications, clothing and humidity. Health impacts can include dehydration, heat rashes, cramps, heat exhaustion and, most threatening, heat stroke. Heat stroke refers to when core body temperature reaches at least 40°C, resulting in severe impacts to the central nervous system. Heat stroke can result in confusion or loss of consciousness and is a medical emergency that needs to be treated quickly. If untreated it can lead to death.

In Canada, extreme heat events are the leading weather-related cause of death, with health effects related to several variables:

- The number of days and maximum temperatures of the event;
- When it occurs in the season;
- How accustomed people of the area are to extreme heat;
- The ability of the community to respond; and
- Actions taken, particularly for the most vulnerable, to manage risks.

In late June 2021, British Columbia (B.C.) experienced an unprecedented extreme heat event that resulted in record temperatures across many parts of the province and lasted for several days. Overnight temperatures were also uncharacteristically high.

During the week of the extreme heat event, the BC Coroners Service (BCCS) responded to a sudden and significant increase in deaths. More than 800 deaths were investigated by BCCS during the week of the heat dome compared to an average of approximately 200 deaths during the same week in previous years. At the time of this report, 619 deaths have been identified as being caused by extreme heat.

The BCCS is mandated to investigate and review all unnatural and unexpected deaths in the province. This includes attending the location of the death when possible, completing a physical assessment of the decedent, conducting interviews with family, friends and persons or service providers involved in the decedent's life, arranging necessary post-mortem testing, obtaining medical records, and documenting the investigation's findings in a coroner's report. These investigative findings provide insight into the circumstances of a decedent's life and may also identify issues or challenges, opportunities for preventing similar deaths, and areas for program or policy improvement.

A BCCS investigative protocol for heat-related deaths was implemented during the extreme heat event and is currently being refined and updated. The protocol includes scene, environment and additional data to support a better understanding of heat-related mortality.

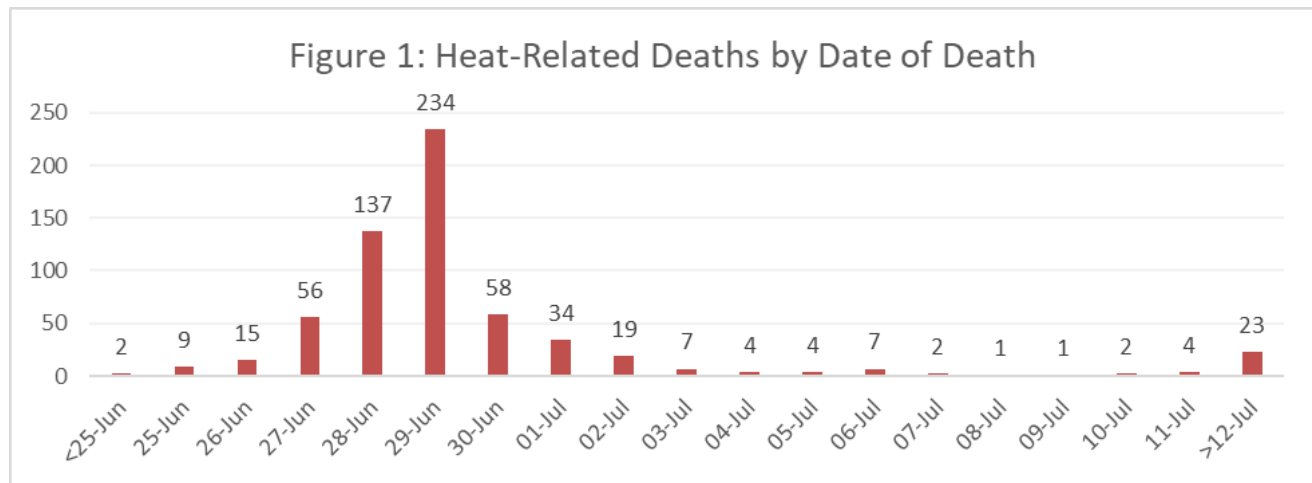
On April 20, 2022, the chief coroner convened a death review panel to review the circumstances around the 619 deaths that occurred in the summer of 2021. The purpose of the Panel is to identify actions to improve public safety and prevent future deaths; it is prohibited from making findings of legal responsibility or expressing any conclusions of law.

Although this report lists many statistics, each data point is an individual life. The people who died were people who, for myriad reasons, were overcome by the effects of extreme heat. Most lacked access to cooler buildings or air-conditioned spaces. Many were older adults who had chronic health conditions. Many communicated that they were feeling unwell and were having difficulty managing in the hot temperatures. Many were also connected to health services and other resources prior to their death.

Part One: BC Coroners Service Review Findings

This review summarizes investigative findings about the deaths of people who died as a result of an extreme heat event that occurred during the summer of 2021 (see Figure 1).

Coroner investigations found that those who died were predominantly older adults with chronic health conditions and relatively compromised overall health. These conditions may have impacted their ability to seek assistance or cooler environments. The majority of those who died lacked access to cooling or ventilation, and were often living in areas of higher material and social deprivation. Although deaths occurred over a seven-month period, in the majority of deaths, the injury event that contributed to the death was sustained during the extreme heat event.



Of the 619 heat-related deaths, 576 (93%) were injured during the week of June 25-July 1. The majority of injuries occurred on June 28 and June 29 which corresponds with the highest temperatures during the extreme heat event. In certain parts of the province, temperatures above 40°C were observed from June 27-June 30.

Extreme heat can cause a range of health effects from mild to life threatening. These effects include: dehydration, heat rashes, cramps, heat exhaustion, and heat stroke. Heat stroke may result in confusion or loss of consciousness. If heat stroke is untreated it can lead to death (Health Canada, 2012).

Age and Sex

More older adults died during the extreme heat event than younger persons.

- 67% of decedents were 70 years of age or older, and 90% were over age 60 (see Appendix 2, Figure 2).
- Males and females were equally affected, however males who died tended to be younger compared to females who died (see Appendix 2, Figure 3).
- There were no deaths among infants or children, or persons younger than age 30.

Indigenous Peoples

Nine (1.5%) of the decedents were identified by coroners as being Indigenous. Indigeneity may not have been identified in many cases where deaths were initially identified as natural or expected, and therefore not under the jurisdiction of the BCCS. Accurate data collection regarding Indigenous morbidity and mortality is understood to be critically important to addressing health inequities experienced by Indigenous peoples. Having heat-related deaths reported as they occur will assist more accurate Indigenous health data collection.

Health Conditions

Chronic conditions, including cardiovascular disease, hypertension, lung disease and diabetes interfere with the body's thermoregulation process increasing susceptibility to extreme heat. Some conditions including schizophrenia can affect a person's ability to recognize overheating and to take protective action (Ebi et al., 2021).

Data matched with the Ministry of Health's Chronic Disease Registry found that 91% of decedents were assigned to at least one chronic disease registry. The most common registry that decedents belonged to was hypertension (71%), mood and anxiety disorders (60%), depression (54%), diabetes (37%), and osteoarthritis (33%) (see Appendix 2, Figure 4). Compared with the B.C. population 65 years and over, a higher percentage of decedents were on schizophrenia, substance use disorder, epilepsy, chronic obstructive pulmonary disease, depression, asthma, mood and anxiety disorders, and diabetes registries.

- More than 80% of decedents were on three or more chronic disease registries (see Appendix 2, Table 1).

Many chronic conditions impact mobility and cognition. Reduced mobility and cognitive decline may potentially impact a person's ability to understand or to respond to extreme heat, or to self-rescue by hydrating, attending a cooling centre, or finding other relief.

- More than two-thirds (69%) of decedents were identified as having chronic illnesses that potentially could impact mobility, including conditions such as heart failure, arthritis or Parkinson's disease.
- Just under two-thirds (64%) of decedents were identified with chronic illnesses that potentially could impact cognition, including mood and anxiety disorders, dementia, or schizophrenia.

This review could not determine how many of the decedents had mobility or cognitive challenges that actually played a role in their death.

Health Care Utilization

According to Medical Services Plan (MSP) billings, just over 60% of decedents had at least one visit with a health professional in the past month while 12% had no visits within the 12 months prior to their death (see Table 2). 62% of decedents had 10 or more visits to a health professional within the 12 months prior to their death.

Table 2: Heat-related deaths by Last Visit to Health Professional

Last Visit	Count	Percent
No visits past year	75	12.1%
Within 7 days	191	30.9%
Between 8-30 days	184	29.7%
Between 31-90 days	114	18.4%
Between 91-180 days	26	4.2%
Between 181-365 days	5	0.8%
Unknown	5	0.8%
Total	619	

Location of Death

During the extreme heat event, heat-related deaths occurred across the province (see Figure 5). However, almost three-quarters of decedents (74%) lived within the Vancouver Coastal or Fraser Health Authorities.

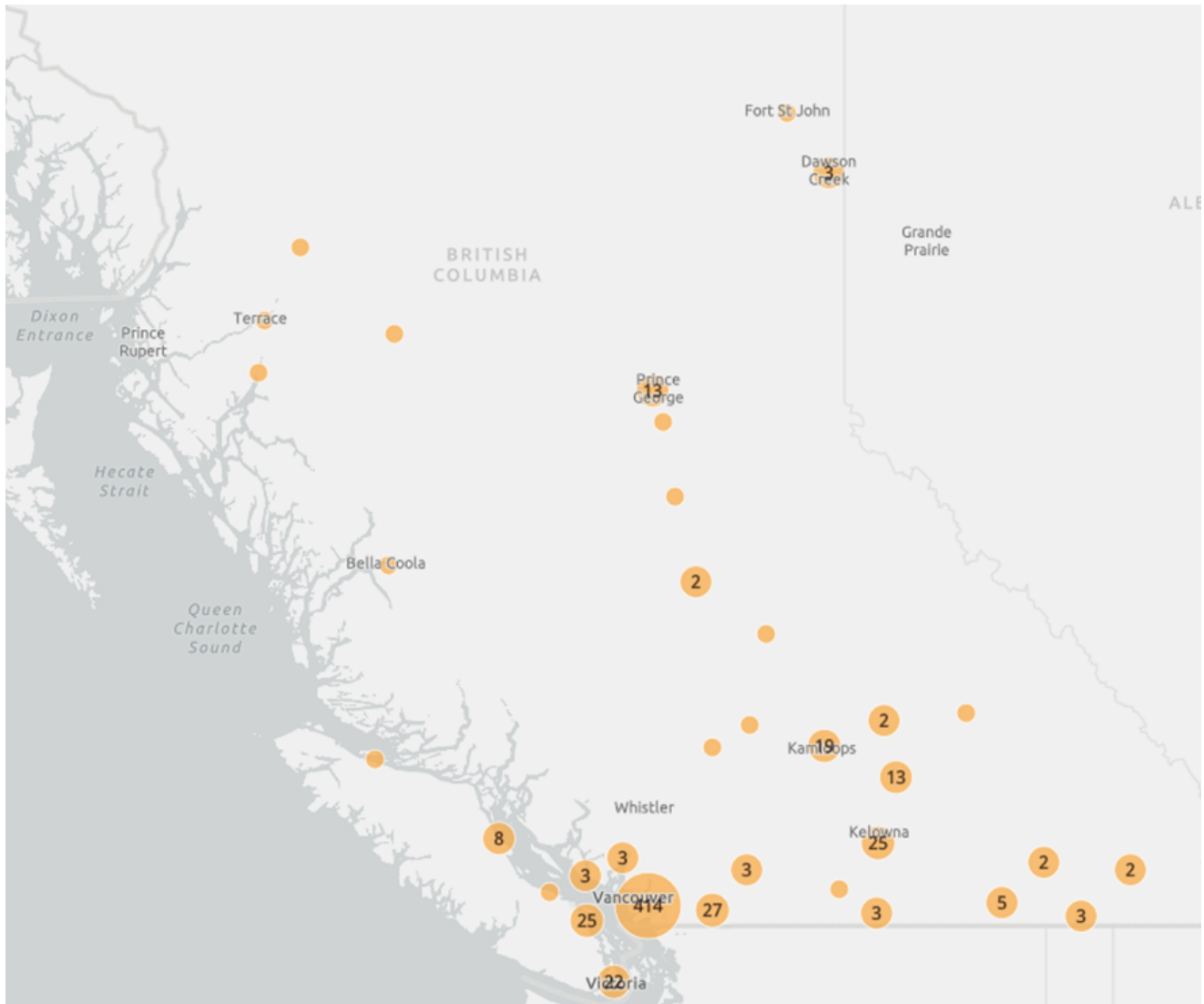
- 51% of deaths were recorded in Fraser Health, and 23% were recorded in Vancouver Coastal Health (see Appendix 2, Table 3).
- By Health Service Delivery Area (HSDA), the highest rates of death were in Fraser North, Fraser East, and Vancouver.
- By township, Vancouver (117) had the highest number of heat-related deaths, followed by Surrey (75), Burnaby (73), New Westminster (33), Chilliwack (27), Abbotsford (23), Langley (23) and Victoria (20) (see Appendix 2, Table 4).

City centers may be hotter than surrounding rural areas because of their design and construction, including:

- *pavement and asphalt roads and walkways which absorb heat,*
- *multi-storied glass buildings which reflect sunlight and block wind, and*
- *the absence of tree canopy and other green space to provide protective cooling.*

Wang et al., 2016

Figure 5: Heat-related deaths mapped by injury location



Note: Locations are mapped to the nearest bubble.

Community and Neighbourhood

This review identified that a number of the deaths were in urban areas with low greenness (fewer trees) surrounded by large roads, large buildings, and high density.

Residential addresses of the decedents were linked to the corresponding material and social deprivation quintile of the area.

- 28% of decedents lived in neighbourhoods that were most materially deprived and 33% lived in neighbourhoods that were most socially deprived (see Appendix 2, Tables 5 and 6), both over-representations of deprivation.

Poor quality housing, homelessness, and overall deprivation are risk factors for increased mortality during extreme heat events (Kenny et al 2019; Kovats and Hajat, 2008).

Urban tree canopy reduces surface temperatures by as much as 12°C (Schwaab et al, 2021). The urban heat island effect increases heat related mortality and morbidity (Santamouris, 2020).

Housing

In almost all (98%) of the deaths, the heat injury occurred indoors in a residence.

- 73% occurred in private residences (39% in multi-unit buildings and 34% in detached buildings);
- 10% occurred in social housing, single room occupancy (SRO), or supportive housing;
- 7% occurred in trailer homes, mobile homes, RVs, or campers; and
- 7% occurred in senior or long-term care homes (see Appendix 2, Table 7).

Living Situation

More than half (56%) of decedents lived alone, 30% lived with spouse or family members; 8% lived in community or assisted living situations (i.e. group home, senior homes, long-term care homes); and 5% lived with unrelated friends or roommates (see Appendix 2, Table 8).

Recent Activity

Very few deaths were linked to physical activity in the heat. BCCS investigative notes found that 20 (3.2%) decedents were known to be recently active prior to their death. Activities included gardening, outdoor home maintenance/repairs, walking outdoors, hiking, or playing a sport.

Reason Found

Place of injury, living situations and social connectedness influenced why and when the deceased was found (see Appendix 2, Table 9).

Half of those who died were found during a wellness check. Wellness checks were completed by family or friends, support workers or health workers who attended the deceased specifically out of concern for their well-being, or were conducted by police due to reported well-being concerns.

32% of those who died were found by someone during regular or routine contact such as a family member returning home or during a scheduled routine visit.

External Environment

Environment and Climate Change Canada is responsible for issuing timely weather forecasts, warnings and alerts across Canada including heat alerts. Heat warnings issued in the days prior to a heat event are intended to allow enough time for the impacted areas to mobilize, activate plans and protocols (Government of Canada, 2022).

Outdoor Temperature

Outdoor temperatures on the day of and the day prior to injury were collected from the nearest weather station to each injury location. The maximum temperature on either day was then calculated. The average maximum temperature on the day of or day prior to injury was 36°C, and for 61% of deaths the maximum temperature was 35°C or greater (see Appendix 2, Table 10).

Within urban areas, landscape and building design can result in significant temperature differences between neighborhoods (Hong et al. 2019).

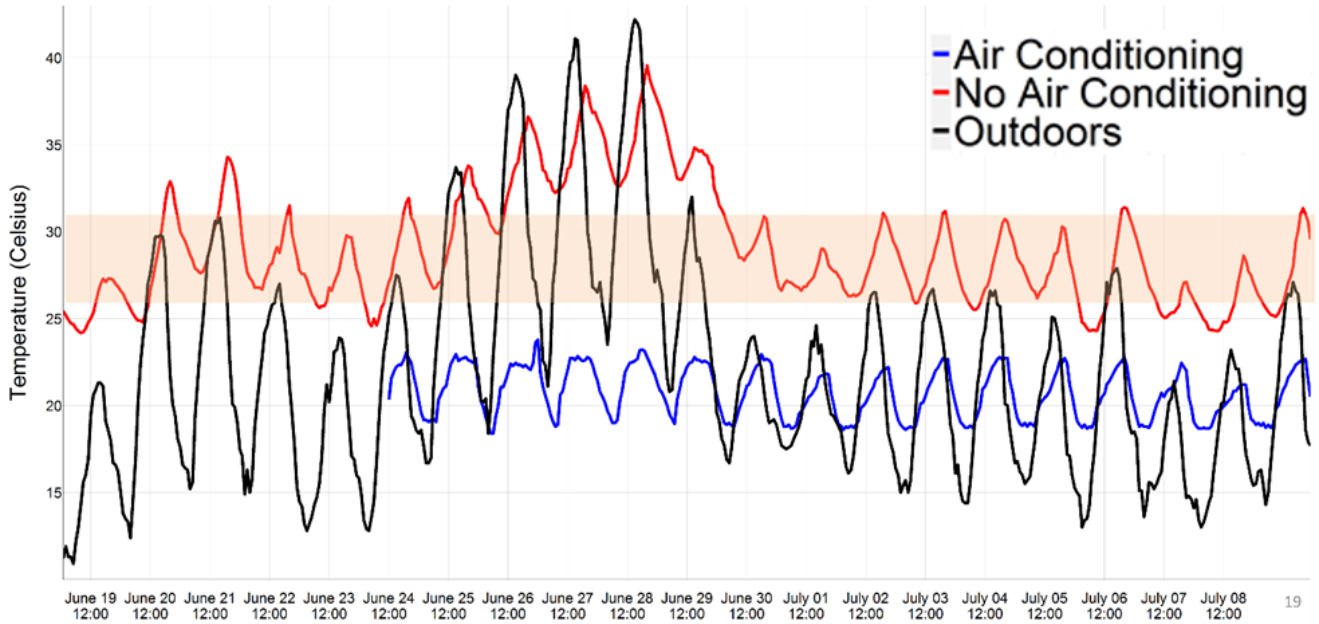
Home Environment

Indoor temperatures are strongly influenced by the building design, construction, cardinal orientation, and size. Indoor air temperature is generally higher when the buildings have greater solar radiation indoors, southward facing, poor insulation, dark materials, low ventilation. Upper floors can be hotter because of cumulative heat transfer from lower floors upwards and downwards through the roof. (Kenny et al., 2018).

Indoor temperature readings were not available at all death locations. Instead, investigative notes indicated temperatures using terminology like “warm,” “hot,” or “extremely hot,” or were described using an estimated temperature range (>25°C to 30°C, 30°C to 35°C, etc.). The presence of air cooling, fan use and/or ventilation was obtained through a review of investigative notes. Information about building size, condition, windows or building orientation was not collected or available.

Figure 6 shows that outdoor temperatures cooled at night but that indoor temperatures remained high, consistently exceeding 26°C during the extreme heat event. Without air conditioning, indoor temperatures remained hazardous throughout this period.

Figure 6 (Abbotsford)



Air Conditioning

Based on information collected by coroners during their investigations, 46 (7%) decedents had air conditioning present in their residence (see Appendix 2, Table 11). Of those, 7 (15%) were on at the time of death but may have been in a different room or improperly used (i.e. blowing hot air).

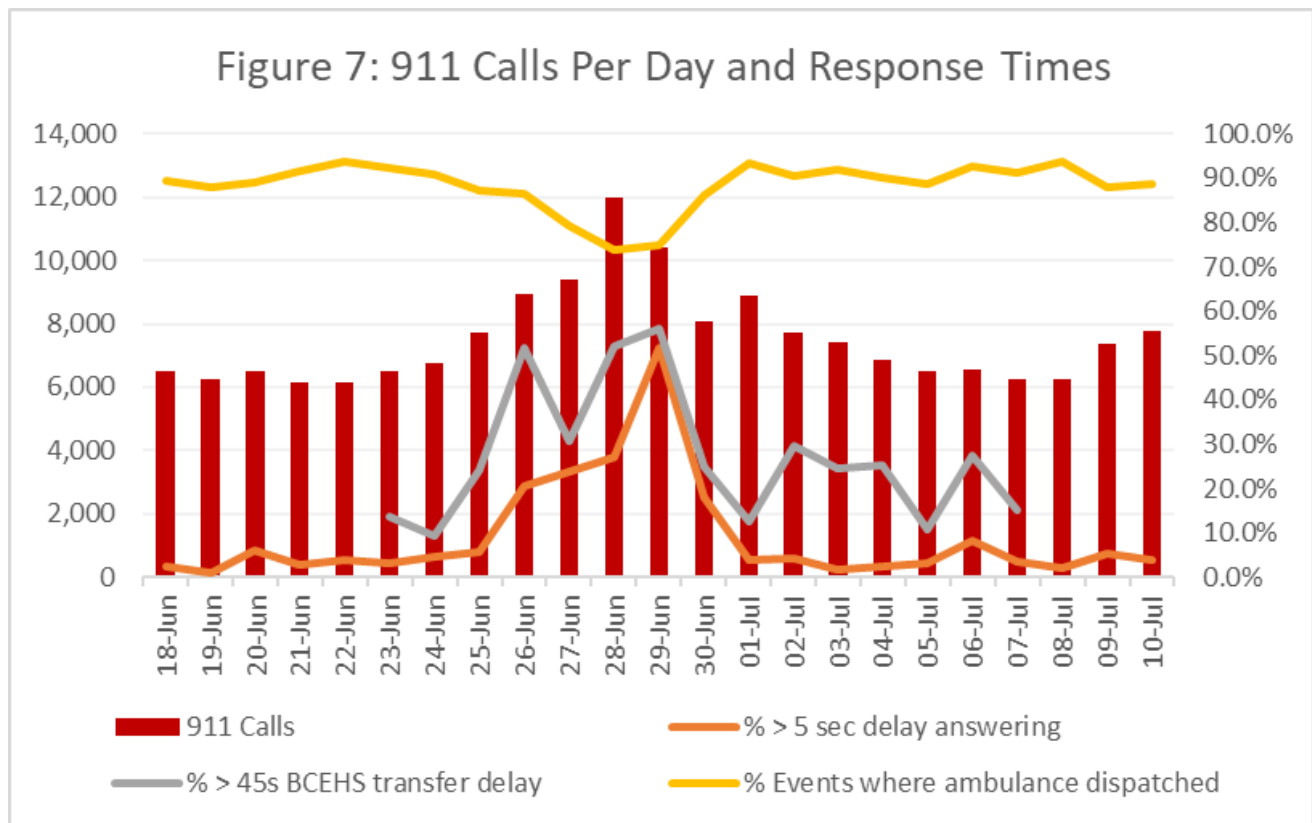
Fans

Fans were used in 24% of residences; however, for 44% of decedents it was unknown if fans were in use (see Appendix 2, Table 12). Of those with fans in use, 70% had them on in the room where the deceased was found.

Provincial Emergency Response

During the extreme heat event, emergency services were significantly impacted, with an increase in calls for ambulance, police and fire (as first responders). First responders reported that lack of other agency availability (including coroner response) resulted in personnel remaining on scene for extended periods until transport of the patient or decedent could occur.

Data from E-Comm 911 found that 911 call volumes increased from between 6,000-7,000 calls in the days prior to and following the extreme heat event, to as high as 11,970 calls on June 28 (see Appendix 2, Table 13). Call delays also increased during the extreme heat event. E-Comm 911’s service level target is for 95% of 911 calls to be answered in five seconds or less. Between June 26-June 30, 29% of calls took more than 5 seconds to be answered and on June 29, 52% of calls took more than 5 seconds to answer. Call transfers to BC Emergency Health Services (BCEHS) were also delayed during this time period, with 44% of transfers between June 26-June 30, taking more than 45 seconds compared to 16% just prior to the heat dome (see Figure 7).



BCEHS also experienced a corresponding increase in the number of calls accepted and the number of events created during the heat dome (see Table 13, Appendix 2). The increase volume seems to have affected the number of ambulances that were dispatched. Between June 26-30, BCEHS dispatched an ambulance to an average of 80% of events, down from over 90% on the days prior and following the extreme heat event.

Data from BCEHS and BCCS investigative notes found that a 911 call for an ambulance was made in 72% of heat-related deaths (Appendix 2, Table 14). Of those calls, paramedics were dispatched to and attended 332 (74%) events (Appendix 2, Table 15). The most common reason that BCEHS was not dispatched was because the patient was determined to be already deceased at the time of the call.

Where BCEHS attended, 83% of patients were dead or died at the scene and 17% were transported to hospital (see Appendix 2, Table 16).

Part 2: Discussion

The Panel considered the investigative findings, a review of the literature and the experiences of the panel members and represented agencies in its discussions.

Extreme heat events (EHE) are also described in the literature as “heat waves” or “heat domes.” A heat dome occurs when an area of high pressure stays over the same area for days or even weeks, trapping very warm air underneath - rather like a lid on a pot. The definition of an extreme heat event varies based on many factors, including geographic location and weather conditions such as temperature, humidity, and cloud cover as well as the duration of the event. The temperature is much hotter than average for a particular time and place.

The Intergovernmental Panel on Climate Change (IPCC) concluded that the climate will continue to warm despite efforts to reduce global emissions, which will result in more frequent heat events (IPCC, 2021).

As identified in the introduction, the human body has a core body temperature of approximately 36.6 degrees Celsius. When the body is unable to maintain this core temperature due to excessive external heat, various life threatening conditions can occur; including dehydration, heat rashes, cramps, heat exhaustion and, most serious, heat stroke. Health problems become more pronounced during a heat event for people who are unable to avoid the heat. The mechanisms and rates of heat gain and loss are impacted by many factors including age, cardiovascular fitness, chronic conditions, medications, clothing, and humidity.

High indoor temperature was the primary cause of injury and death during the extreme heat event. During this time, hot air became trapped indoors and continued to rise over time. Although outdoor temperatures decreased overnight, residences did not cool off, exposing people to harmful high temperatures for extended periods of time. The BC Centre for Disease Control (BCCDC) identified that people were most in danger when indoor temperatures remained above 26 degrees throughout the heat event.

Environment and Climate Change Canada (ECCC) is responsible for issuing timely weather forecasts, warnings, and alerts across Canada, including heat alerts. Heat warnings issued by ECCC in the days prior to a heat event are intended to allow enough time for the impacted areas to mobilize, activate plans and protocol response (Government of Canada, 2022; Health Canada, 2012). ECCC delivers public alerts through several sources including the ECCC Weather Office, the Weather APP, Alert Me APP, subscriber email and through the Weather Network* (ECCC communication, 2022; Government of Canada, 2020). Additionally, ECCC also delivers extreme heat warnings to the B.C. emergency partners and Ministries responsible for heat related coordination and response planning (ECCC communication, 2022).

*-The Weather Network (TWN) is a Canadian weather information specialty channel that delivers weather information on television, digital platforms (responsive websites, mobile and tablet applications) and TV apps.

Heat Alert and Response Systems

In 2012 Health Canada published a best practices guidebook: *Heat Alert and Response Systems (HARS) to Protect Health*. The guide stated:

The effects of heat on the health of Canadians will depend upon actions taken by public health and emergency management officials, community health and social service providers, and by individuals to prepare for and respond to the impacts. Research suggests that the health effects of extreme heat are a function of:

- *the duration and severity of an extreme heat event*
- *when an extreme heat event occurs in the season*
- *the sensitivity of the population*
- *the ability of a community to respond during extreme heat events*
- *actions taken by officials and individuals, particularly the most vulnerable, to manage the risks*

To prepare for extreme heat events, some communities in Canada and internationally have developed Heat Alert and Response System(s) (HARS). These systems have the following core elements:

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.*

A HARS is most effective when it is delivered in conjunction with preventative actions that provide long-term and sustainable protection from extreme heat events (Health Canada 2012).

HARS planning is also applicable when dealing with other types of severe weather events such as extreme cold events and flooding.

A jurisdictional scan completed by the BCCDC in 2017 found most municipal governments and health authorities did not have comprehensive HARS plans. At that time, planning for extreme heat was considered a lower priority because the risk seemed low, there were other competing priorities with fixed resources, or heat response planning was not considered their responsibility. Both the City of Vancouver and subsequently, the Village of Ashcroft were acknowledged by the Panel for their HARS planning.

Table 7: Heat Alert Levels

Alert Level	Level 1	Level 2
Proposed Name	Heat Warning	Extreme Heat Emergency
Public Health Risk	Moderate (5% increase in mortality)	Very high (20% or more increase in mortality)
Descriptor	Very hot	Dangerously hot
Historic Frequency	1-3 per summer season	1-2 per decade
Criteria	Southwest = 29-16-29 Fraser = 33-17-33 Southeast = 35-18-35 Northeast = 29-14-29 Northwest = 28-13-28	Level 1 criteria have been met and forecast indicates that daily highs will substantively increase day-over-day for 3 or more consecutive days

In response to the extreme heat event in 2021, the BC Health Effects of Anomalous Temperatures (BC HEAT) Coordinating Committee was established in January 2022 to support planning and public health response efforts to significant heat events in B.C. The primary goals of the Committee are focused on public health actions and messaging for the heat alert system.

The Committee has established a pilot for a two-tiered heat alert response system in B.C. that would identify Heat Warning and Extreme Heat Emergency (Table 17) thresholds and procedures based on regional criteria. The pilot framework outlines recommended actions to be taken prior to the heat season and during a heat warning, as well as extreme alert and post-heat season actions.

Additionally, EMBC is finalizing an Extreme Heat Preparedness Guide for Provincial Ministries and Agencies that will address Heat Alert and Response Systems (consistent with the work done by the BC HEAT Committee) and will identify government roles and responsibilities regarding extreme heat.

Panel discussions identified that other circumstances may impact personal and community response to a public health emergency. The province’s response to COVID-19 likely further exacerbated the impact of the extreme heat event, as people may have been reluctant to congregate in public areas and as a result may have avoided cooling centres. Additionally, deployment of staff to public areas was also problematic at times with concerns about COVID-19 exposure.

Coordinated Strategy

The 2012 Health Canada HARS best practice guidebook identified very similar findings to this death review panel in terms of who was at risk in terms of age, health conditions and living arrangements.

Panel discussions identified the need to establish clear provincial protocols that outline actions to be initiated when either a heat warning or an extreme heat emergency alert is issued by ECCC. The Panel recognized the need for overall provincial coordination as, like other natural disasters, an extreme heat emergency event is a provincial emergency and may require access to provincial emergency resources.

The Panel also identified the importance of regional and local decision-making in response to an extreme heat emergency as this is where understanding of local communities resides. Extreme heat emergency alerts also need to trigger regional and local level action plans. The BC HEAT coordinating committee has been working on many of the coordinated strategy issues discussed at the death review panel.

The Panel identified that clarity is needed on who should act as the lead agency in coordinating planning and action. Coordinated planning should ensure that agencies are aware of impending heat events which would trigger agency action to address needs such as surge planning around staff and resources to adequately respond to an extreme heat emergency.

Extreme heat emergency alerts need to be paired with clear protocols to ensure no time is lost in responding to a heat emergency. The protocols need to recognize the seriousness of an extreme heat emergency and the potential of a mass casualty event.

In May 2022, the provincial government announced that Alert Ready (a national alert system) had been expanded to include wild fires, floods and extreme heat events in B.C. The alert system was developed to target imminent threats. There was discussion during the panel around the use of the alert system to warn of impending extreme heat events. The discussion identified that the alert system was warranted given the significant number of people who died over a short period and the emergency nature of an extreme heat event.

Provincial coordination is required to ensure that:

- Response to heat events occurs rapidly;
- All ministries, agencies and municipalities clearly understand their roles;
- No ministries/agencies are working at cross purposes with other ministries/agencies;
- Provincial emergency funds can be accessed in a timely manner as for other natural disasters such as windstorms and floods; and
- Robust evaluation and continuous quality improvement occur to assess the adequacy of extreme heat emergency response.

Planning for extreme heat events must also anticipate the possibility of other provincial or public health emergencies as was experienced in 2021 with the province also responding to the COVID-19 pandemic and wildfires during the heat dome.

Vulnerable Populations

Not all people experienced the same degree of heat health risks during the extreme heat event. The elderly, persons with chronic health conditions, persons living alone, those with no access to cooling, and those in particular geographic areas were more impacted by the heat. Wider public awareness about heat, and targeting community training on how to recognize heat concerns is needed.

Universal safety measures and warnings are required for all British Columbians when an extreme heat event is occurring, but vulnerable populations will require additional interventions, support and assistance. One of the challenges is identifying who is most vulnerable and how to adequately meet their needs during an extreme heat event.

Two of the most impactful interventions during a heat event deal with:

1. Ensuring people have a way of staying cool either inside their residence or elsewhere (i.e. a cooling centre, air conditioned lobby, etc.); and
2. Conducting heat-informed checks on older adults, persons with health conditions, those living alone and those with mobility issues to consult them on their on their well-being and support needs.

When issuing extreme weather alerts, recognition will need to be paid to the fact that not everyone accesses social media, has a phone, can read signage or speaks English as their primary language. Alerts and warnings must be multilingual and delivered via a variety of mediums. It is also essential that people working in any type of care facility or who provide housing, are aware of heat dangers and measures required to alleviate those dangers.

Any successful strategy must include the voices and needs of those most at risk of injury or death from extreme heat to find out what would be most helpful during a heat event. In some areas with higher material deprivation, the number of deaths was lower than may have been expected. It is important to learn from the people living in those areas, such as those living in the downtown east side of Vancouver, what communities did to support their members – a journey mapping exercise could be very instructive in understanding the experiences of vulnerable people who lived through the 2021 extreme heat event. Lived experience must inform community strategies for prevention from planning through implementation.

Taking the needs of people with mobility issues into account will also be key in ensuring access to cooling areas. Establishing cooling centres during an extreme heat event is important, but people with mobility issues may not be able to access them and distance could be a further impediment for people lacking funds for transit. Solutions that bring cooling to those who cannot easily leave their residence for health or mobility reasons will be required. Measures such as temporary free transit, mobile cooling centres, or cooling shuttles should be considered.

Many decedents had recent contact with medical professionals, likely due to their age and/or health needs as identified by the number of deceased on multiple chronic disease registries. Leveraging these contact encounters approaching the summer months could provide an opportunity for education on the impacts of heat and assessing any additional health conditions that may place patients at greater risk of heat-related injury.

Mapping geographic areas through census data and the social and material deprivation indexes could also help identify neighbourhoods where access to cooling areas in parks is limited and/or little green space or tree canopy exists. This could help communities prioritize where green space is needed and where parks should be developed with shade and accessibility in mind.

Often when an extreme heat event occurs, air quality due to smoke from wildfires and pollution trapped by the high-pressure systems associated with heat domes can exacerbate the challenges, particularly for vulnerable communities, and people with additional health challenges such as asthma and other respiratory issues.

Indigenous Peoples

Indigenous individuals and communities are identified as vulnerable to and disproportionately affected by climate change and extreme climate events in Canada and globally (Norton-Smith et. al., 2016; Ford, J., 2012). Many Indigenous populations face unique exposures and sensitivities to climate change, as a function of their traditional relationship with and dependence on the land, sea, and natural resources. These differences present risk factors that are different from nonindigenous populations, and among and between Indigenous groups (Ford, J., 2012).

Canada's Indigenous populations, whether living in rural communities or in urban centres are at significantly higher risk of developing chronic disease than non-Indigenous people (Indigenous Services Canada, 2018). For example, First Nations people experience higher rates of heart disease, diabetes and rheumatoid arthritis, all of which potentially increase vulnerability to extreme heat events (Indigenous Services Canada, 2018; Hitchon et al., 2020; Government of Canada, 2010).

Researchers including Deen et al. (2021) find a lack of literature on the impact of temperature and extreme event trends in Canadian Indigenous communities. They identify how climate data can provide a resource for First Nations community resilience planning and resource allocation strategies. The BCCS investigations found that a disproportionately low number of Indigenous people died during the extreme heat event. As previously noted, this may have been the result of under reporting due to data collection processes but consultation with Indigenous peoples will be important to ensure their voices are heard and their needs around heat planning understood.

Risk Mitigation

Governments and other organizations should recognize extreme-heat events as “natural disasters” and include extreme heat in their messaging, in the same way that flooding and wildfire are seen as natural disasters (Eyquem & Feltmate 2022).

In addition to the need to meaningfully respond in real time to an extreme heat emergency, the Panel also discussed the need for, and the importance of, prevention and risk mitigation strategies to reduce the likelihood of another mass casualty event. Adaptation and risk mitigation become more urgent with the increasing likelihood of more frequent extreme heat events due to the impacts of climate change.

Eyquem & Feltmate (2022) identify three categories of action to reduce risks in relation to extreme heat: changing behaviour (non-structural); working with nature (green infrastructure); and improving buildings and public infrastructure (grey infrastructure).

EMBC is finalizing public information regarding heat preparedness in a guide titled *PreparedBC: Extreme Heat Preparedness Guide*. The guide will address how British Columbians can plan and prepare for extreme heat events.

Urban areas can be significantly warmer than surrounding rural areas because of their design and construction, known as the “urban heat island effect.” The increase in heat is attributed to areas with extensive surfaces like asphalt and concrete that absorb solar radiation, have less vegetation to provide a cooling effect, and have heavier concentrations of traffic that generate additional heat. Significant heat differences can be found across and between neighbourhoods due to variations in landscape and building characteristics. Declining tree canopy and permeable surfaces in urban areas will increase vulnerability to extreme heat.

Canadian Census data identifies an ageing population and an increase in one person households. This trend will increase the proportion of B.C.’s population vulnerable to heat-related mortality and morbidity. The BCCS investigative findings showed that elderly, socially-isolated people were at a higher risk of heat-related mortality. Many of the deceased lived in single family dwellings. Building practices such as adding suites to homes could potentially reduce social isolation.

A number of deaths occurred in neighbourhoods with large roads, large buildings, high density, and low greenness. Discussions focused on the importance of increasing shading, heat reflectivity (**albedo**) and reducing evaporation (through increasing the tree canopy and surface permeability to absorb water) as natural cooling measures to help mitigate the impact of a future extreme heat event. Increasing green space and shading, especially in neighbourhoods high on the material deprivation index, would provide naturally cooler areas where people can find respite from extreme heat events.

Indoor temperatures are strongly affected by a building's design, construction, **cardinal orientation** and size. Buildings constructed of materials that conduct solar energy inwards; that have larger windows and/or single pane windows; that have poor insulation and/or low ventilation; that face south or southwest; and that have dark exteriors promote higher indoor temperatures. Larger buildings also tend to get hotter on higher floors and especially floors under the structure's roof. By covering windows during the day, promoting ventilation when it is cooler outside and avoiding the use of ovens and stoves, individuals can help decrease indoor temperatures.

Building codes that require passive and active cooling (heat pumps, building materials, insulation, ventilation, greening, tree canopy, landscape permeability, solar reflectivity, etc.) can mitigate the effects of extreme heat events. Retrofitting codes and rebate programs that encourage active and passive cooling in current housing stock, especially in materially and socially deprived index areas, would further mitigate the impact of extreme heat. Current building codes in British Columbia do not consider cooling in the same manner as heating requirements. As building codes are revised they will need to reflect the latest climate science and consider cooling needs.

Data collection on (health, social and infrastructure) circumstances surrounding heat related mortality and morbidity is important to help communities identify the most at risk populations and neighbourhoods to support evidence-based decision making for community planning.

Although the Panel was specifically reviewing the impact of the 2021 extreme heat event and the mortality that resulted, discussions also recognized the importance that any actions taken to mitigate and adapt to the effects of an extreme heat event need to support and be consistent with the latest climate science.

Part Three: Recommendations

This death review panel has developed a set of recommendations considering the BCCS investigative findings, current research and applying subject matter expert opinion to heat-related deaths. The recommendations arising from the death review panel were developed in a manner that was:

- Cognizant of the scale of the emergency;
- Collaborative;
- Attributable to the deaths being reviewed;
- Focused on identifying opportunities for improving public safety and prevention of future deaths;
- Targeted to specific parties;
- Realistically and reasonably implementable; and
- Measurable.

The Panel identified three key areas to reduce heat-related deaths:

A coordinated provincial heat alert response system

Ensuring vulnerable populations are identified and supported during extreme heat events

Implementing prevention and longer-term risk mitigation strategies

Panel Recommendations

A COORDINATED HEAT ALERT RESPONSE SYSTEM (HARS)

Rationale

To respond effectively to an extreme heat event three elements are necessary:

1. A formal determination that an extreme heat event is likely or emerging. An alert system for heat warnings and extreme heat emergencies has been established with Environment and Climate Change Canada (ECCC). These alerts allow the province to distinguish when weather is predicted to be unseasonably hot and when the weather is predicted to create an extreme heat emergency (conditions that endanger human health).
2. A coordinated plan with protocols to identify roles, responsibilities and actions to be taken once an extreme heat emergency is declared.
3. Affected community, municipalities, health authorities must implement the actions identified in their HARS plan.

RECOMMENDATION 1:

Implement a coordinated provincial heat alert and response system (HARS)

Priority actions identified by the Panel are:

(A) By June 30, 2022, the Ministry of Health will be assigned as the lead ministry to coordinate the response to public health impacts from an extreme heat event and the Ministry of Public Safety and Solicitor General will assign Emergency Management BC (EMBC) as the lead agency to coordinate the government provincial response to the non-health related impacts of extreme heat emergencies.

(B) By June 30, 2022, the Ministry of Health, provincial health authorities and EMBC will adopt and implement the HARS pilot, developed by the BC Health Effects of Anomalous Temperatures (BC HEAT) Committee, province-wide.

(C) By June 30, 2022, the Ministry of Health will forward the HARS pilot to local governments for review and adoption of recommended actions as appropriate based on community needs and identified vulnerabilities, including actions specific to vulnerable populations (ie. wellness checks, cooling centres [including mobile cooling centres], water distribution, greening areas, cooling parks).

(D) By June 30, 2022, on the advice of the BC HEAT Coordinating Committee (Ministry of Health), EMBC will issue a Broadcast Intrusive alert for an Extreme Heat Emergency.

(E) By summer 2023 the Ministry of Health will coordinate a gap analysis/evaluation of the HARS pilot.

ENSURING VULNERABLE POPULATIONS ARE IDENTIFIED AND SUPPORTED DURING EXTREME HEAT EVENTS

Rationale

As identified by the BCCS investigative findings, the effects of the 2021 extreme heat event were not felt equally amongst the population. The elderly, those with chronic health conditions and materially and socially disadvantaged people were disproportionately impacted. Most of the deceased had recent contact with medical professionals prior to their deaths. Mobility or cognitive issues, poverty and discrimination, may prevent some people from accessing cooling areas during an extreme heat event and they will require services coming to them rather than be expected to access services outside of their living area.

To ensure the needs of vulnerable populations are adequately addressed, policy, planning, service development and implementation must all be considered through an equity lens.

RECOMMENDATION 2:

Identify and support populations most at risk of dying during extreme heat emergencies

Priority actions identified by the Panel are:

(A) By June 30, 2022, provincial health authorities will ensure that Home and Community Care Services identify and prioritize clients who: are listed on chronic disease registries (schizophrenia, substance use disorder, epilepsy, chronic obstructive pulmonary disease, depression, asthma, mood and anxiety disorders, and diabetes registries); persons with limited mobility; persons with cognitive impairment; and/or live alone, for home visits and contact during an extreme heat emergency.

(B) At their next meeting, the Union of BC Municipalities (UBCM) will review and consider the adoption of community wellness checks, as referenced in the BC HEAT Committee's Pilot HARS plan, as a strategy to identify and support vulnerable persons during an extreme heat emergency.

(C) By summer 2022, the Ministry of Health, in conjunction with the health authorities and the First Nations Health Authority, will develop and distribute public messaging on self-care and caring for vulnerable persons during a heat event, that is culturally appropriate and available in multiple languages.

(D) By December 1, 2022, the Ministry of Health, in collaboration with the Ministry of Social Development and Poverty Reduction, and in consultation with vulnerable populations, will conduct a review into issuing cooling devices as medical equipment accessible to persons most at risk of dying during an extreme heat event, and make public the findings of the review.

(E) By June 30, 2023, the Ministry of Health, provincial health authorities and the First Nations Health Authority will engage and consult with vulnerable populations (elderly, persons with chronic health conditions including mental illness, persons with mobility challenges, and persons living in neighbourhoods and geographic areas most likely to be impacted by an extreme heat event) and local government emergency planners regarding HARS planning, review and evaluation at provincial, regional and local levels.

IMPLEMENTING PREVENTION AND LONGER-TERM RISK MITIGATION STRATEGIES

Rationale

Due to climate change, extreme weather events are likely to occur more frequently in the future. The number of people vulnerable to an extreme heat event is expected to grow as census predictions show a steadily rising elderly population and an increasing share of one person households.

A number of heat mitigation actions have been considered, and some have been implemented, but current efforts have been insufficient and this work needs to be prioritized and accelerated by all levels of government and the private sector.

Focusing on prevention opportunities, adaptation strategies and longer-term risk mitigation initiatives is necessary if future mass casualty incidents due to natural disaster extreme heat events are to be avoided. In addition to personal risk mitigation, policy and planning related to the built environment and demographic changes are key.

RECOMMENDATION 3:

Implement extreme heat prevention and long-term risk mitigation strategies

Priority actions identified by the Panel are:

(A) By summer 2022, EMBC, in partnership with the Ministry of Health, provincial health authorities and the First Nations Health Authority, will distribute the *Prepared BC Extreme Heat Preparedness Guide* to British Columbians and provide public service announcements on extreme heat preparedness in multiple languages and formats.

(B) By summer 2023, the Ministry of Environment and Climate Change Strategy will ensure the CleanBC Better Homes and Home Renovation Rebate Program includes both passive and active cooling measures as eligible for rebates. Rebate priorities should be focused on census areas identified in the lower quintiles of material deprivation index and targeted to low income households and the least energy efficient residential building stock.

(C) The Ministry of Attorney General and Responsible for Housing will ensure that the 2024 release of the BC Building Code incorporates both passive and active cooling requirements in new housing construction, and that the release of the Alterations Code for Energy Efficient, Resilient Buildings explicitly identifies both passive and active cooling standards for existing home renovation.

(D) As the *Local Government Act*, *Community Charter* and the *Vancouver Charter* are reviewed and “Climate Lenses” are crafted for Official Community Plans and Regional Growth Strategies, the Ministry of Environment and Climate Change Strategy will ensure that updates and revisions are consistent with the *Climate Preparedness and Adaptation Strategy* and require the protection and restoration of the urban tree canopy and permeable surface areas to absorb water.

Appendix 1: Glossary

The following terms are used within this report to mean:

Albedo: A non-dimensional, unitless quantity that indicates how well a surface reflects solar energy. Albedo varies between 0 and 1. Albedo commonly refers to the "whiteness" of a surface, with 0 meaning black and 1 meaning white.

Cardinal orientation: One of the four principal directional indicators (north, east, south and west).

Materially deprived: Includes poorer housing locations and construction, less green space and less recreation areas than in other parts of the community. Materially deprived neighbourhoods are associated with lower education and income levels*.

Socially deprived: Where people are more likely to live alone, be a single parent, separated, divorced or widowed*.

Wellness check: When someone (ie. police, support workers, health care workers, family or friends) specifically contacts an individual(s) who has been unreachable for a period of time. The purpose of the contact is to ensure the individual(s) is safe and to consult with them regarding their well-being and support needs.

*-Material and Social Deprivation Index. INSPQ Public health expertise and reference centre.
<https://www.inspq.qc.ca/en/deprivation/material-and-social-deprivation-index>

Appendix 2: Data Tables and Figures

Figure 2

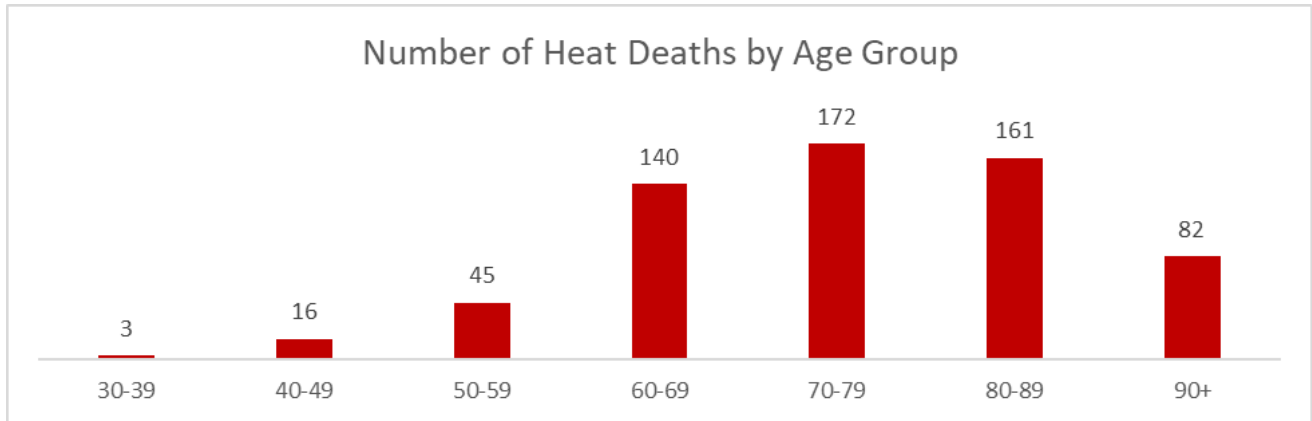


Figure 3

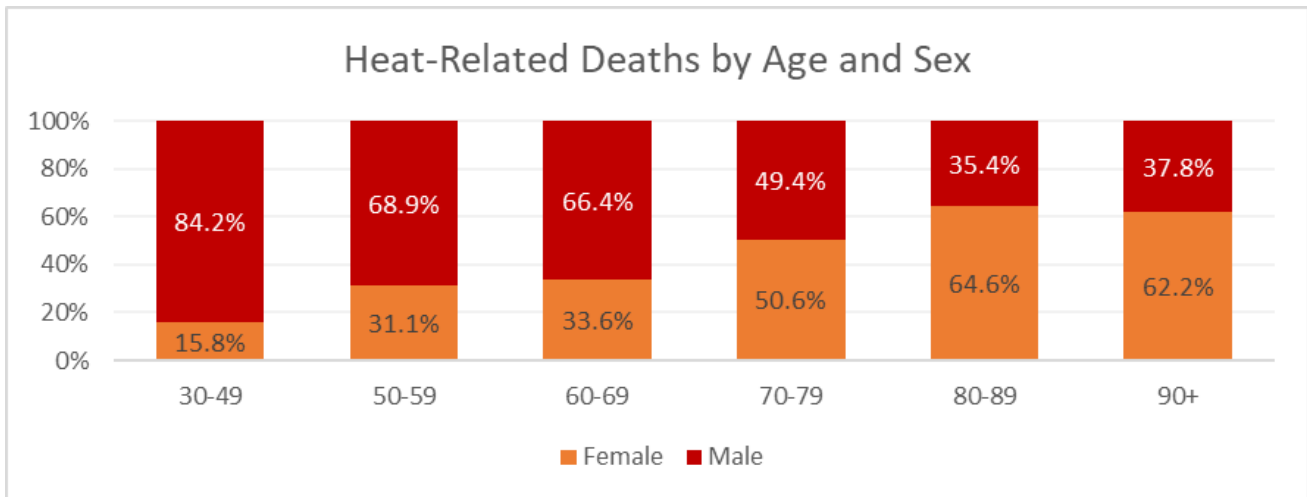
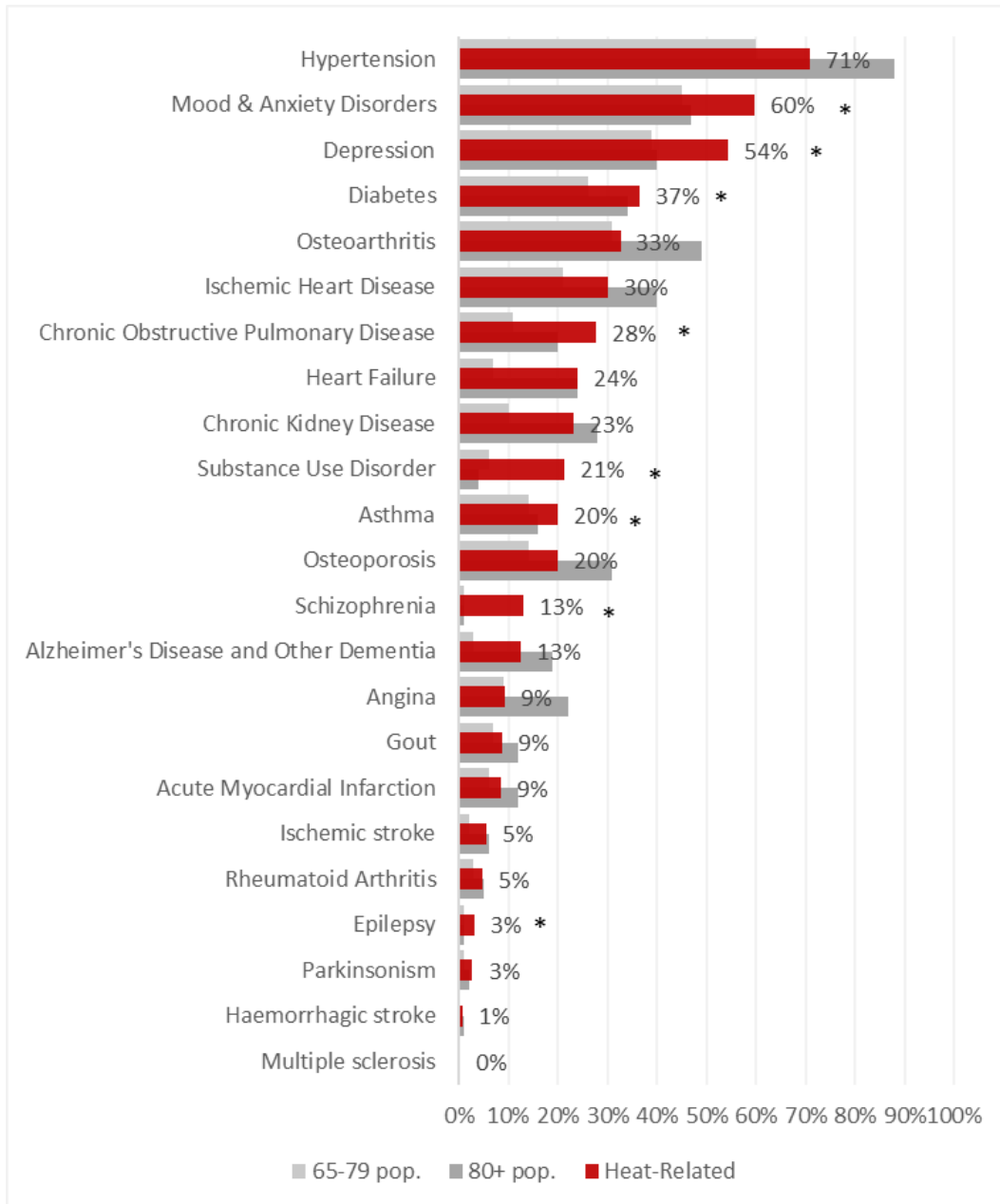


Figure 4: BC Centre for Disease Control Chronic Disease Dashboard



*-The proportion of heat-related deaths with the condition is greater than the prevalence of the condition in the 65-79 and 80+ population.

Source: BC Centre for Disease Control. Chronic Disease Dashboard. <http://www.bccdc.ca/health-professionals/data-reports/chronic-disease-dashboard#Dashboard>

Table 1: Heat-related deaths by Number of Chronic Disease Registries

Number of Registries	Count	Percent
None	27	4.4%
1	30	4.8%
2	51	8.2%
3-5	257	41.5%
6-9	209	33.8%
10+	34	5.5%
Unknown	11	1.8%
Total	619	

Table 3: Heat-Related Deaths by Health Authority of Injury

Health Authority	Count	Percent	Rate (per 100,000)
Fraser	312	50%	15.9
Interior	84	14%	10.2
Island	55	9%	6.3
Northern	23	4%	7.6
Vancouver Coastal	145	23%	11.6
Provincial	619		

Table 4: Heat-Related Deaths by Township of Injury

Township	Count	Percent	Rate (per 100,000)
Vancouver	117	18.9%	17.7
Surrey	75	12.1%	13.2
Burnaby	73	11.8%	29.3
New Westminster	33	5.3%	41.8
Chilliwack	27	4.4%	29.0
Greater Victoria	24	3.9%	6.0
Abbotsford	23	3.7%	15.0
Langley	23	3.7%	17.3
Kamloops	17	2.8%	17.4
Kelowna	15	2.4%	10.4
Coquitlam	14	2.3%	9.4
Prince George	14	2.3%	18.3
Other Townships	168	27.1%	N/A
Provincial	619		

Notes: Deaths are reported to the nearest township of injury; Rates were calculated using census 2021 population counts (<https://www12.statcan.gc.ca/census-recensement/2021/dp-pd/prof/index.cfm?Lang=E>)

Table 5: Heat-Related Deaths by Material Deprivation

Material Deprivation	Count	Percent
Quintile 1 - Least deprived	38	6.1%
Quintile 2 - Less deprived	68	11.0%
Quintile 3 - Average	101	16.3%
Quintile 4 - More deprived	116	18.7%
Quintile 5 - Most deprived	170	27.5%
Unknown	126	20.4%
Total	619	

Table 6: Heat-Related Deaths by Social Deprivation

Social Deprivation	Count	Percent
Quintile 1 - Least deprived	45	7.3%
Quintile 2 - Less deprived	75	12.1%
Quintile 3 - Average	69	11.2%
Quintile 4 - More deprived	100	16.2%
Quintile 5 - Most deprived	204	33.0%
Unknown	126	20.4%
Total	619	

Table 7: Heat-Related Deaths by Place of Injury

Place of Injury	Count	Percent
Private Residence - Multi-unit	242	39.1%
Private Residence - Detached	210	33.9%
SRO/Social Housing/Supportive Housing	62	10.0%
Trailer Home/Mobile Home/RV/Camper	40	6.5%
Senior/Long-Term Care Home	40	6.5%
Outside	13	2.1%
Other Residential	12	1.9%
Total	619	

Table 8: Heat-related deaths by Living Situation

Living Situation	Count	Percent
Lived Alone	347	56.1%
Lived with Family	187	30.2%
Lived with Unrelated Friends or Roommates	28	4.5%
Community or Assisted Living	47	7.6%
Death Related to Outdoor Activity not near Home	7	1.1%
Homeless	3	0.5%
Total	619	

Table 9: Heat-related deaths by Reason Found

Reason	Count	Percent
Wellness check	308	50%
Routine contact	200	32%
Witnessed event	72	12%
Passerby	16	3%
Other	19	3%
Unknown	4	1%
Total	619	

Table 10: Heat-related deaths by Max Outdoor Temperature on Day of Injury or Day Prior

Temperature (°C)	Count	Percent
<30	63	10.2%
30-34	177	28.6%
35-39	207	33.4%
40+	172	17.8%
Total	619	

Table 11: Heat-related deaths by Air Conditioning Present

Air Conditioning Present	Count	Percent
Yes	46	7.4%
No	414	66.9%
Unknown	270	43.6%
Decedent outdoors and not near home	10	1.6%
Total	619	

Table 12: Heat-related deaths by Fans In Use in Residence

Fans in Use	Count	Percent
Yes	149	24.1%
No	190	30.7%
Unknown	270	43.6%
Decedent outdoors and not near home	10	1.6%
Total	619	

Table 13: 911 Calls during the period of the heat dome event

Date	E-Comm 911			BC Emergency Health Services (BCEHS)		
	911 calls	% > 5 sec delay	% > 45 sec delay transfer to BCEHS	Calls Accepted	Events Created	% Events where Ambulance Dispatched
Jun 23, 2021	6,510	3.2%	13.8%	2,162	1,887	92%
Jun 24, 2021	6,771	4.6%	9.2%	2,228	1,974	91%
Jun 25, 2021	7,722	5.9%	24.2%	2,458	2,105	87%
Jun 26, 2021	8,945	20.6%	51.9%	2,748	2,149	87%
Jun 27, 2021	9,387	23.9%	30.7%	2,889	2,279	79%
Jun 28, 2021	11,970	27.2%	51.9%	3,554	2,694	74%
Jun 29, 2021	10,387	51.7%	56.2%	3,373	2,629	75%
Jun 30, 2021	8,081	18.1%	25.0%	2,763	2,200	86%
Jul 1, 2021	8,914	4.0%	12.6%	2,280	1,990	93%
Jul 2, 2021	7,708	4.3%	29.8%	2,504	2,008	90%
Jul 3, 2021	7,437	1.6%	24.4%	2,280	1,950	92%
Jul 4, 2021	6,869	2.5%	25.2%	2,199	1,864	90%

Table 14: Heat-related deaths by BCEHS Calls

Calls	Count	Percent
No 911 call for ambulance	172	27.8%
911 call for ambulance	447	72.2%
Total	619	

Table 15: Heat-related deaths by Ambulance dispatched

Dispatched	Count	Percent
Ambulance dispatched	332	74.3%
No ambulance dispatched	115	25.7%
Total	447	

Table 16: Heat-related deaths by BCEHS Attended Disposition

Disposition	Count	Percent
Dead or died at scene	277	83.4%
Transported to hospital	55	16.6%
Total	332	

Appendix 3: Data Sources

Multiple data sources were used for this review. A full description of each data source can be found below.

BCCS Data: Includes all suspected and confirmed heat-related deaths in B.C. where the injury occurred over the summer of 2021 (Jun-Aug). Data includes dates of injury and death, age, sex, and Indigeneity of the decedent, and the place of injury and death.

BCCS Protocol Data: In response to the significant number of heat-related deaths, BCCS developed a set of questions, called protocol data, to be completed by the investigating coroner, to provide more insight into the decedent and the circumstances surrounding the death. These questions included the decedent's living situation, any recent activities, their mobility, and information about their home environment. The set of questions were developed after the heat dome event so coroners relied on investigation notes to complete the questions.

Chronic Disease Registry: Chronic disease registries are derived from administrative data sources maintained by the B.C. Ministry of Health. There are 26 conditions with registries and registries include date up to 2020/21 fiscal year. People on the registries are not identified by clinical diagnoses but through their healthcare service utilization matching specific case definitions for each condition. Case definitions for each registry can be found at: <http://www.bccdc.ca/health-professionals/data-reports/chronic-disease-dashboard>. Heat-related deaths were linked to the chronic disease registry by the B.C. Ministry of Health.

Medical Services Plan (MSP): MSP data includes all medically necessary services provided by fee-for-service practitioners, including laboratory and diagnostic procedures, to individuals covered by the MSP, B.C.'s universal insurance program. Practitioners include physicians, supplementary benefit practitioners, and out-of-province practitioners. Heat-related deaths were linked to MSP data by the BC Ministry of Health.

BC Housing: BC Housing develops, manages, and administers a range of subsidized housing options and programs across B.C. A list of all BC Housing-funded affordable housing buildings, shelters and supportive housing addresses was obtained from BC Housing. This list was then matched to the injury location of each heat-related death.

BC Emergency Health Services (BCEHS): BCEHS provides pre-hospital emergency services and inter-facility patient transfers throughout the province and oversees the BC Ambulance Service and BC Patient Transfer Services. Information on heat-related deaths were provided to BCEHS to link to an ambulance event. Each ambulance event was then provided back to BCCS.

Weather Data: Each injury location was matched spatially to the nearest Environment and Climate Change Canada (ECCC) weather station. For each case, hourly temperature and humidex values from the nearest station were extracted for the date of injury and the day prior. Daily values were calculated from hourly values by taking the maximum for temperature and the mean for humidex.

Deprivation Index: The Material and Social Deprivation Index (MSDI) was created with the aim of characterizing and highlighting the deprivation at the small area level*. The material deprivation reflects the deprivation of goods and conveniences. The social deprivation reflects the deprivation of relationships among individuals in the family, the workplace, and the community. The residential address of the decedent was linked to the material and social deprivation index quintile of the corresponding dissemination area.

E-COMM 911: E-Comm is responsible for 99% of the province's 911 call volume. Call volume data including the number of calls transferred to police, ambulance, and fire and call response and transfer times were provided by E-Comm for June 18 – July 10, 2021.

*-Institut National de Santé Publique du Québec. Material and social deprivation index. <https://www.inspq.qc.ca/en/deprivation/material-and-social-deprivation-index>

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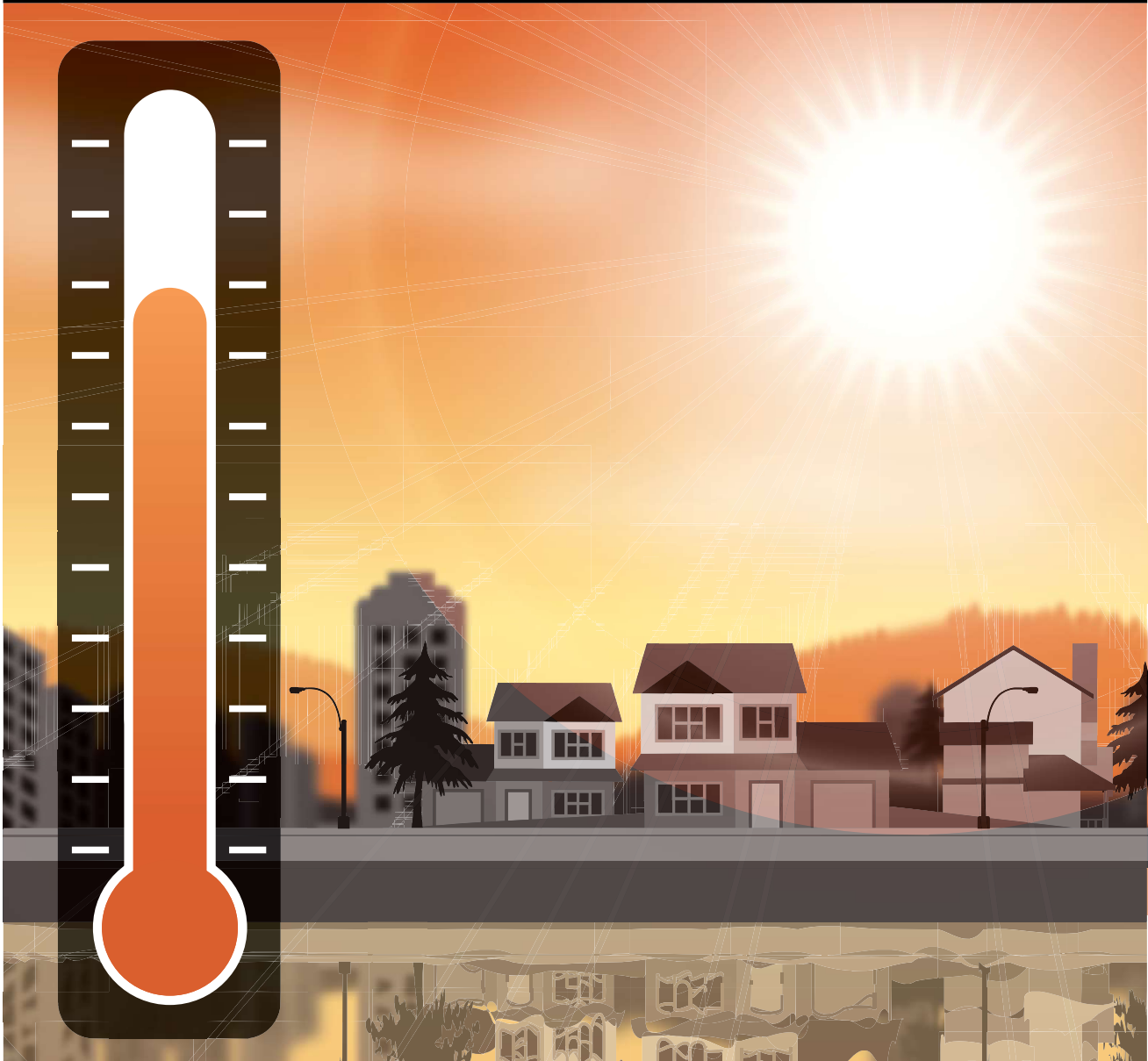
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Extreme Heat Preparedness Guide



A FOREWORD FROM THE PROVINCIAL HEALTH OFFICER

Early in the summer of 2021, we experienced an unprecedented extreme heat event that tragically led to the deaths of hundreds of people in British Columbia. Temperatures were at least 15°C higher than usual across the entire province, but some areas and some people were affected more than others. Most of the people who died were



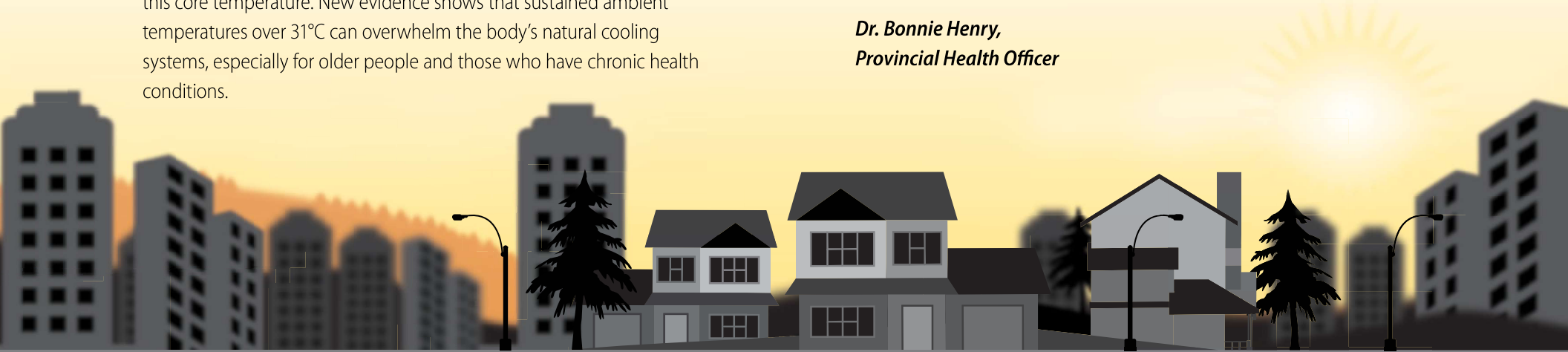
older or were people who had health conditions that put them at higher risk. Most of the deaths occurred inside private residences that got dangerously hot. Some people remember seeing indoor temperatures as high as 55°C on their thermostats.

The human body is calibrated for an optimal core temperature close to 36.6°C. When the surrounding environment gets very hot, the heart and other organs must work harder than usual to maintain this core temperature. New evidence shows that sustained ambient temperatures over 31°C can overwhelm the body's natural cooling systems, especially for older people and those who have chronic health conditions.

This Extreme Heat Preparedness Guide is a roadmap to help you, your family, and your community prepare for the next Extreme Heat Emergency in British Columbia. The extreme heat event of 2021 is a stark example that our climate is changing, and we must prepare for the expectation that these events will become more frequent, longer, and hotter in the decades ahead. The good news is there are many actions we can take both as individuals and in our community to prevent heat-related injuries and deaths – staying cool means staying safe.

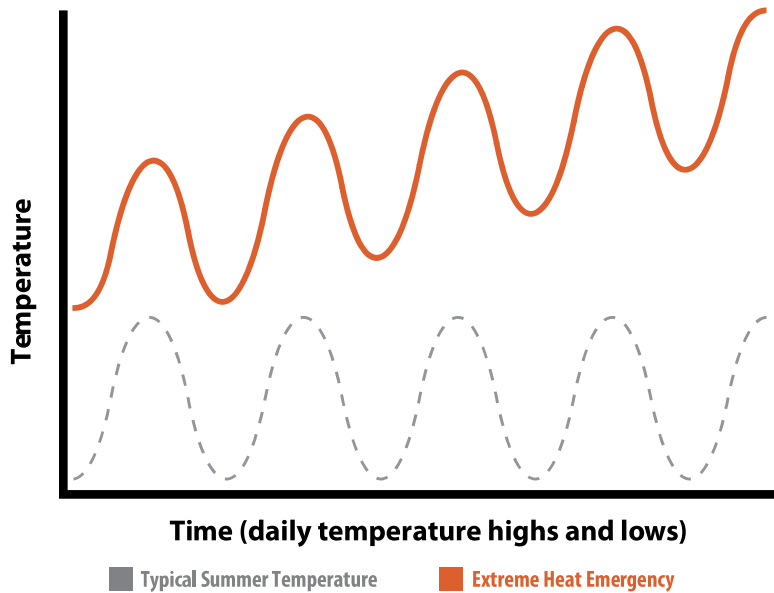
Some people in our families or in our community are at higher risk than others during Extreme Heat Emergencies, but we all go through them together. With careful planning and preparation before the next big event we can collectively identify those at higher risk and use some simple strategies to help them stay safe. Strong social connections are critically important during all types of emergencies, including extreme heat events. This guide provides the best advice we have now about how to stay safe and I encourage everyone to read it and take the actions you need to protect yourself, your family, and your community.

Dr. Bonnie Henry,
Provincial Health Officer



What is Extreme Heat?

An Extreme Heat Emergency is when daytime and nighttime temperatures get hotter every day and are well above seasonal norms.



Extreme heat is dangerous for the health and wellbeing of our communities and is responsible for the highest number of weather-related deaths annually.

In 2021 alone, the BC Coroners Service attributed 595 deaths to the extreme heat event that occurred between June 25 and July 1. Most of those deaths resulted from excessive indoor temperatures in private residences.

CLIMATE CHANGE CONNECTION

British Columbia is experiencing higher summer temperatures and more extremely hot days due to climate change. Average temperatures in Western Canada are already 1°C to 2°C warmer than they were in the 1940s.*

Higher average temperatures lead to a higher likelihood of Extreme Heat Emergencies like the heat dome experienced in 2021. It is critical that people understand the risks, prepare for these conditions, and know where to access support.

*Source: Canada in a Changing Climate; Government of Canada

TABLE: 2021 Record Temperatures

Source: Environment and Climate Change Canada

Location	Average (June, July)	Record	Date (of all-time max temperature)
Lytton	24.1°C, 28.1°C	49.6°C**	June 29, 2021
Kamloops	25.1°C, 28.9°C	47.3°C**	June 29, 2021
Abbotsford	20.8°C, 24.0°C	42.9°C**	June 28, 2021
Quesnel	21.7°C, 24.1°C	41.7°C**	June 29, 2021
Victoria (Gonzales)	17.9°C, 19.8°C	39.8°C**	June 28, 2021

**Record-high temperature at the time of this guide's publication

Before Summer

There are many things you can do to prepare for an Extreme Heat Emergency.

The following section walks you through basic readiness steps and heat specific considerations for your emergency plan. Discuss them with your family, friends, and members of your household and use the spaces provided to write notes.



TIP: You can also find and download our fill-in-the-blanks emergency plan at: preparedbc.ca/emergencyplan. It will have you covered for any emergency.

1. IDENTIFY THOSE WHO ARE AT RISK

While everyone can benefit from planning and preparing for Extreme Heat Emergencies, the following people are especially at-risk if they do not have access to air conditioning. They need to be prepared and supported:

- seniors aged 65 years or older
- people who live alone
- people with pre-existing health conditions such as diabetes, heart disease or respiratory disease
- people with mental illness such as schizophrenia, depression, or anxiety
- people with substance use disorders
- people who are marginally housed
- people who work in hot environments
- people who are pregnant
- infants and young children
- people with limited mobility

2. EVALUATE IF YOU CAN STAY AT HOME

If you are at risk and you live in a building or residence that gets very hot, with inside temperatures of 31°C or higher, plan to go elsewhere during an Extreme Heat Emergency.

3. EVALUATE YOUR HOME'S COOL ZONES

Some areas of your residence may stay cooler than others. During an Extreme Heat Emergency, you should prepare to stay in the coolest part of the residence and focus on keeping that one location cool.

Start by identifying a room that's typically coolest and consider how you can modify the layout to support sleeping and day-to-day living for the duration of the heat event.

4. IDENTIFY OTHER LOCATIONS TO GET COOL

If it is not safe for you to stay at home, consider staying with friends or family that have air conditioning or cooler spaces. Alternatively, identify places in your community you can visit to get cool such as:

- libraries
- community centres
- shopping malls
- movie theatres
- religious centres
- parks and other shaded green spaces

You can also contact your First Nation or local government to find out if cooling centres will be available in your area.

4. IDENTIFY OTHER LOCATIONS TO GET COOL (CONTINUED)

Ideally, choose a location where you will enjoy spending time, as it can take a long time to cool off after getting overheated. Consider whether you will have access to water or if you should bring some with you to stay hydrated.

Identify and write down any locations you can visit to get cool:

Location	Address
-----	-----
-----	-----
-----	-----

5. IDENTIFY AN EXTREME HEAT BUDDY

If you live alone, find an extreme heat buddy to check in on you when it gets hot, and who you can also reach out to for help.

Your buddy should be someone who can take you to cooling centres or help with cooling measures in your residence:

Name	Contact info
-----	-----
-----	-----
-----	-----

6. PREPARE YOUR HOME

A few modifications can make a big difference during periods of extreme heat. Options include:

INDOORS:

- Install a window air conditioner in at least one room
- Install thermal curtains or window coverings
- Keep digital thermometers available to accurately measure indoor temperatures (31°C or higher is dangerous for vulnerable people)
- Have fans available to help move cooler air indoors during the late evening and early morning hours

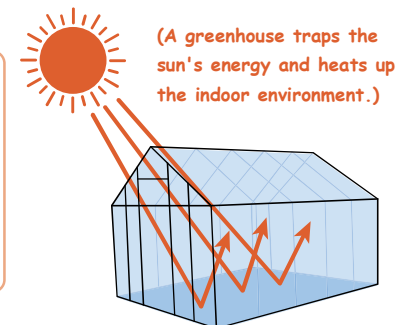
TIP: Fans cannot effectively reduce body temperatures or prevent heat-related illness in people at-risk. Do not rely on fans as your primary cooling method during an Extreme Heat Emergency.

- Install a heat pump (for info: betterhomesbc.ca/heatpumps)

OUTDOORS:

- Install exterior covers or reflective films that block the sun from hitting the windows. This can be as simple as applying cardboard to the outside of the window

Did you know? When the sun shines through windows it causes the indoor environment to heat up, like a greenhouse. Keeping the sun off exterior windows can decrease indoor temperatures by 2°C to 3°C.



As Temperatures Rise

7. KNOW WHERE TO FIND INFORMATION

Pay attention to the media, Environment Canada, Emergency Info BC and your health authority for more information about Heat Warnings and Extreme Heat Emergencies.

Alert	Threat	Action
Heat Warning	Daytime and overnight temperatures are higher than seasonal norms and holding steady.	Take usual steps to stay cool.
Extreme Heat Emergency	Daytime and overnight temperatures are higher than seasonal norms and getting hotter every day.	Activate your emergency plan.

You can do this by following the trusted sources below:

Environment Canada

 https://weather.gc.ca/warnings/index_e.html?prov=bc
 @ECCCWeatherBC

HealthLinkBC

 www.healthlinkbc.ca

BC Centre for Disease Control (BCCDC)

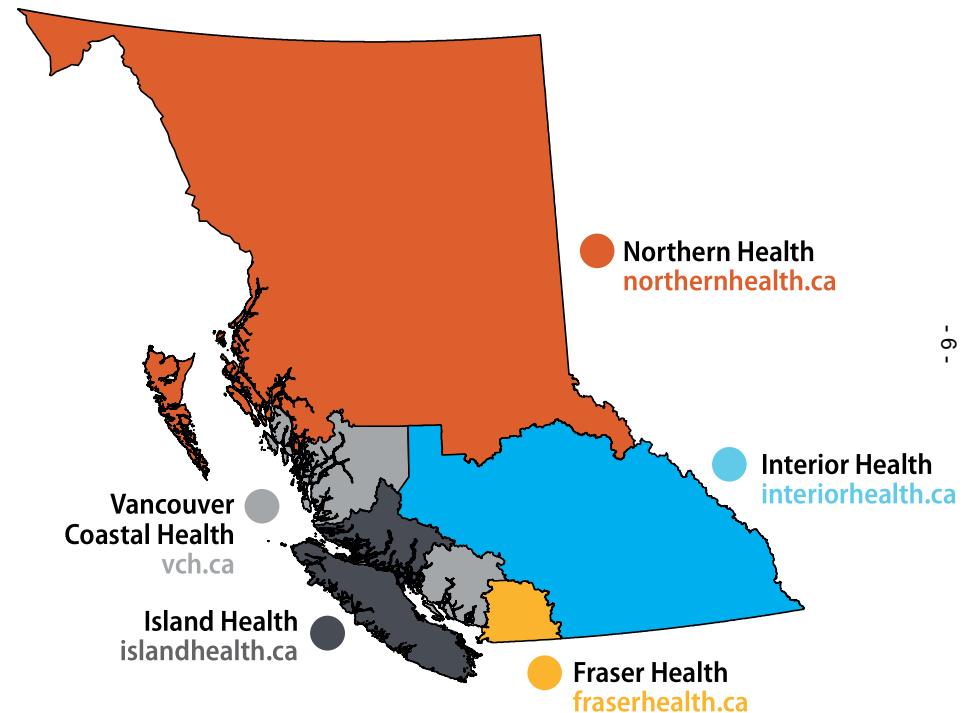
 bccdc.ca
 @CDCofBC

First Nations Health Authority (FNHA)

 fnha.ca
 @FNHA
  facebook.com/firstnationshealthauthority

Regional Health Authorities

There are 5 regional health authorities in BC. They govern, plan and deliver health-care services for their geographic areas. Your local regional health authority is another great source for information:



Emergency Info BC

 EmergencyInfoBC.ca
 @EmergencyInfoBC

Health Canada

 canada.ca/en/public-health
 @GovCanHealth
 facebook.com/HealthyCdns
 @CPHO_Canada



8. ACTIVATE YOUR PLAN TO STAY COOL

An Extreme Heat Emergency will typically be identified three to four days before the hottest temperatures occur. Check the weather daily when it is hot outside. If an Extreme Heat Emergency alert has been issued, it's time to put your plan into action:

- Relocate to a cooler location if you have planned to do so
- Reconfigure the coolest location in your home so you can sleep there at night
- Check in with your pre-identified heat buddy. If you don't have one, try to reach out to someone you trust as soon as possible
- Put up external window covers to block the sun if you can safely do so
- Close your curtains and blinds
- Ensure digital thermometers have batteries
- Make ice and prepare jugs of cool water
- Keep doors and windows closed between 10 a.m. and 8 p.m. to trap cooler air inside. Open them at 8 p.m. to allow cooler air in, and use fans (including kitchen and bathroom exhaust fans) to move cooler air through the house



TIP: Outdoor temperatures usually peak around 5 p.m. in BC, but indoor temperatures usually peak around 9 or 10 p.m. Sleeping in an air-conditioned space or outside is a good option for staying cool if you can safely do so.

During Extreme Heat

9. STAYING COOL INSIDE

In homes without air conditioning, heat builds indoors over the course of a few days. It may stay hotter inside than outside overnight. Without air conditioning, the longer the heat lasts, the more dangerous it becomes.

Take the following steps to keep yourself and members of your household safe:

- If you have air conditioning, turn it on. It does not need to be going full strength to help you stay safe
- If you have air conditioning, and vulnerable friends and family do not, bring them to your home
- If you do not have air conditioning, move to your pre-identified alternate location with air conditioning or cooler spaces
- Sleep in the coolest part of the residence. Outdoor temperatures are usually lower than indoor temperatures overnight, so consider sleeping outside if you can safely do so
- Sleep with a wet sheet or in a wet shirt
- Take cool baths or showers to draw heat from your body
- Drink plenty of water, regardless of whether you feel thirsty. Be aware that sugary or alcoholic drinks cause dehydration
- If you are taking medication or have a health condition, ask your doctor or pharmacist if it increases your health risk in the heat and follow their recommendation
- If your doctor limits the amount you drink, or has you on water pills, ask how much you should drink while the weather is hot

10. STAYING COOL OUTSIDE

- Lower your activity level and avoid strenuous activity. If you must do errands or plan to exercise, do so early or late in the day when it is generally cooler
- Never leave children or pets in a parked car
- Avoid direct sun by staying in the shade and wearing a hat and protective clothing. Use sunscreen and UV-protective eyewear
- Seek cooler, breezier areas when outdoors, such as large parks near to trees and water
- If you work in a hot environment, discuss and act on ways to decrease heat exposure with your employer and coworkers



TIP: Pets are part of the family too. Make sure they have plenty of water and are with you in cool locations. When outside, stay in shady areas and avoid asphalt and pavement. Those surfaces can burn paws.

11. WHAT TO DO IF YOU ARE GETTING TOO HOT

Overheating can be harmful to your health and potentially deadly. If you're experiencing symptoms such as rapid breathing, rapid heart rate, extreme thirst, and decreased urination with an unusually dark yellow colour, take immediate steps to cool down and seek emergency care:

- Get medical attention, or call 911 or your local emergency number
- Submerge yourself or the person you're helping in cool water
- Remove clothes and apply wet cloths to the skin



Heat stroke is an emergency. Call 911 or your local emergency number if you are caring for someone who displays symptoms, then take immediate action to cool them down while waiting for help to arrive.

12. CHECK IN ON YOUR HEAT BUDDY AND NEIGHBOURS

Consider checking in on your pre-identified heat buddy from **page 8**, as well as your neighbours - especially those that are homebound or alone. Check in multiple times a day, especially later in the day when it is hottest.

13. PREPARE FOR WILDFIRES AND SMOKE

Extreme heat can lead to periods of drought and a higher risk of wildfires. For most people, exposure to extreme heat is a bigger risk to health than exposure to wildfire smoke. If you cannot get cool inside, go outside even if there is smoke.

Visit www.bcwildfire.ca for information on current wildfire activity, wildfire prevention and active fire bans and restrictions.

Go to www.preparedbc.ca/wildfires for information on how to get prepared for a wildfire.

Go to <http://www.bccdc.ca/wildfiresmoke> for details on the health impacts of wildfire smoke.

14. ADDITIONAL RESOURCES

For additional resources, please visit www.preparedbc.ca, where you can learn about how to prepare for, respond to and recover from the top hazards in BC, such as wildfires, floods, and earthquakes.



PreparedBC

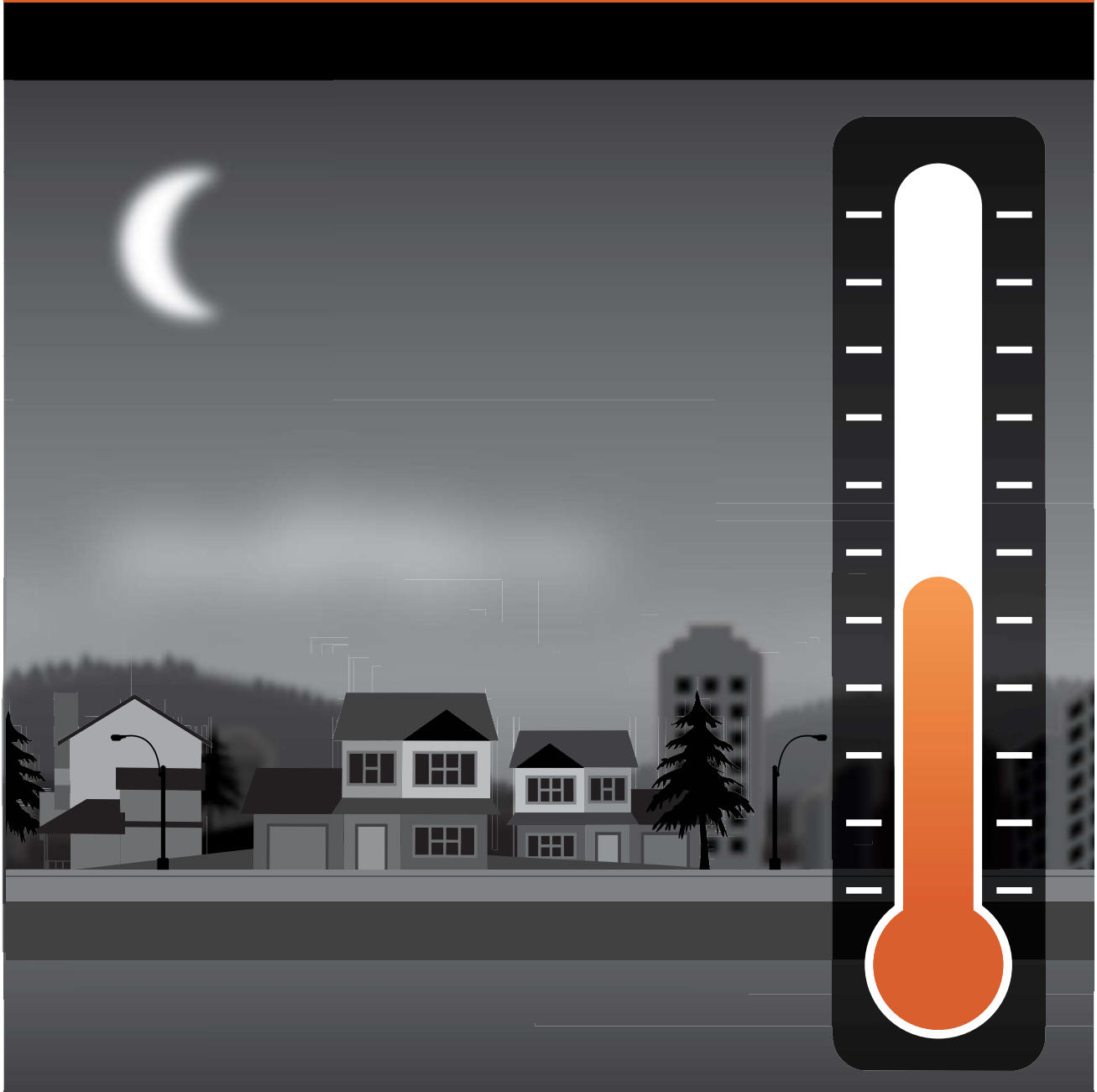
This material has been prepared by the Province of British Columbia in cooperation with:



Ministry of Health



BC Centre for Disease Control
Provincial Health Services Authority



2022

Surrey's Extreme Heat Response Guideline



Surrey

Emergency

Program

6/15/2022

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The City of Surrey Extreme Heat Response Guideline

Intent

The purpose of this plan is to outline the actions available to the City of Surrey to support provincial ministries in mitigating risks to life and safety caused from an extreme heat event.

Background

Urban areas are the hot spots of global warming. Extreme heat is a key risk to the health and well-being of British Columbians. The situation is growing more dangerous, driven by irreversible climate change. Canada is warming, on average, at twice the global rate.¹

As seen locally in the Heat Dome event of June 2021, extremely hot temperatures and heat waves can be deadly and have a severe impact on health, infrastructure, services, the natural environment, and the economy. Not everyone will be affected in the same way, and those most vulnerable will require additional support.

Between June 18 and August 12, 2021, British Columbians experienced heat events that had significant impacts on human health and well-being, resulting in 619 heat-related deaths, with 75% of these being in Vancouver Coastal Health and Fraser Health Authorities. The heatwave that occurred between June 24-30, 2021, was the deadliest weather event in Canadian history. A review following this deadly heat event revealed the following:

- There was a significant increase in deaths of those 70 years of age and older. [1]
- Deaths more frequently occurred in individual residences without adequate cooling systems as opposed to acute or residential care homes. [1]
- Deaths were higher in areas of material and social deprivation as well as low tree canopy cover. [2]

Urban centres face the greatest risk because of the urban-heat-island effect. Surface daytime temperatures can be 10 – 15°C hotter in urban heat islands, while nighttime temperatures can be up to 12°C hotter than in surrounding rural areas. During episodes of extreme heat, everyone is at risk of heat-related illnesses. The danger is greatest for those who are more vulnerable or less able to protect themselves. This includes people who are more sensitive to extreme heat (such as the elderly or chronically ill) and those with fewer resources to adapt (for instance, people on lower incomes who cannot afford actions to retrofit their homes).

¹ BC Coroners Report 2022

² Henderson et al., 2021

Discussion

While posing a significant risk to health and safety, extreme heat mostly affects people where they live and in the privacy of their homes. For this reason, local governments are challenged with developing any response with impactful outcomes. The responsibility to mitigate the risk from extreme heat falls to several levels of senior government agencies as well as people themselves, such as:

- Individuals,
- Property owners & managers,
- Environment and Climate Change Canada (ECCC),
- British Columbia Centre for Disease Control (BCCDC)
- Health Emergency Management BC (“HEMBC”)
- Fraser Health Authority
- Emergency Management BC (“EMBC”)
- BC Housing

Surrey has supplemental resources and can take actions to enhance public safety during these extreme heat events. There are three heat-related support triggers with actions:

- Environment Canada Special Weather Statement for hot weather - communicate educational information for awareness.
- Environment Canada issues a heat warning – educate the public using a multimodal communication strategy.
- When EMBC or the Province declares an extreme heat emergency - open cooling relief facilities, provide additional support for those at higher risk and send out critical health alerts.

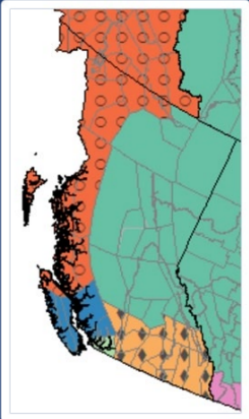
As such, Surrey will follow the heat protocol triggers as developed by Environment and Climate Change Canada. Once a heat event is imminent, Surrey will follow the messaging and recommendations made by the governing health authority to ensure consistent information is distributed.

Extreme Heat Alert Protocol and Response

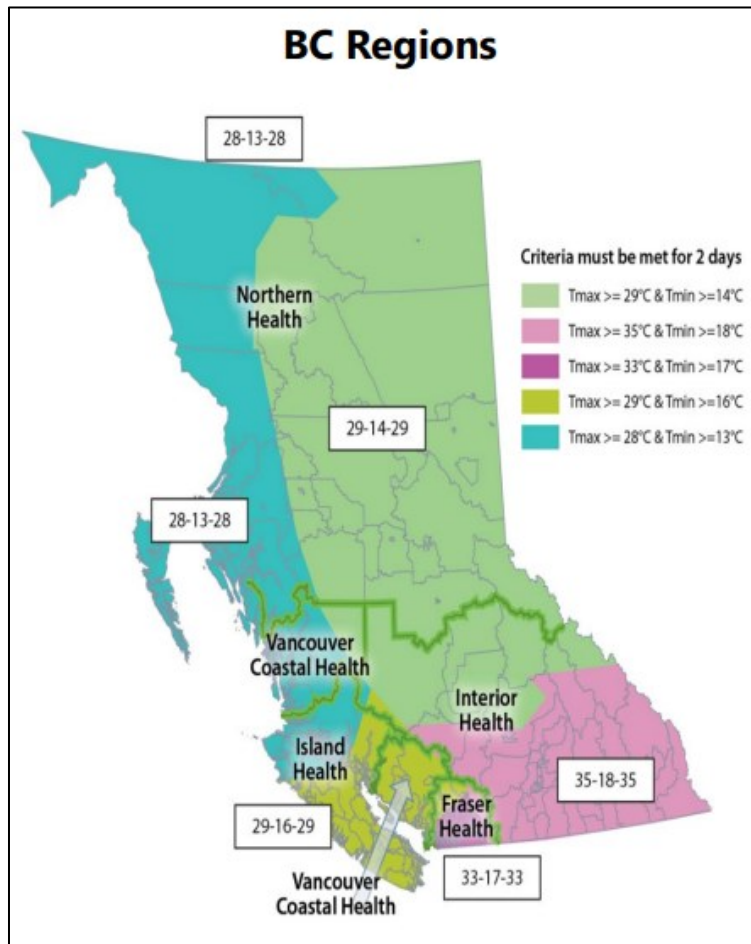
The Heat Alert protocol, developed by ECCC, involves two stages and a stand-down process. Prior to an alert, ECCC will send out special weather statements which forecast increased temperatures approaching an alert stage. This allows for pre-planning and public education messaging to be developed by health authorities and amplified by other agencies throughout the community.

Heat Alerts are activated when conditions deemed severe enough to present a substantial threat to the life or health of the community such as:

- when Environment Canada issues a Heat Warning
- when Environment Canada issues an Extreme Heat Emergency

 <p>BC Regions</p>	Alert level	Heat Warning	Extreme Heat Emergency
	Public health risk	Moderate (5% increase in mortality)	Very high (20% or more increase in mortality)
	Descriptor	Very hot	Dangerously hot
	Historic frequency	1-3 per summer season	1-2 per decade
	Criteria	Southwest = 29-16-29 Fraser = 33-17-33 Southeast = 35-18-35 Northeast = 29-14-29 Northwest = 28-13-28	Heat Warning criteria have been met and forecast indicates that daily highs will substantially increase day-over-day for 3 or more consecutive days

Know as the BC Heat Committee, heat alert stages are coordinated with British Columbia Centre for Disease Control (BCCDC), Vancouver Coastal Health (VCH) & Fraser Health (FH), Health Emergency Management BC (HEMBC) and Environment and Climate Change Canada (ECCC) and are based on the climate attributes of the specific geographical area. The criteria for extreme heat emergencies are a day over day increase in temperature above a heat warning for 3 consecutive days.



Monitoring

BC Centre for Disease Control (BCCDC) will monitor Environment Canada's (EC) daily posted average temperatures at 1400 hrs and the forecasted next day's high.

When the average temperature meets the heat warning criteria BCCDC will send an email notification to Health Heat Response Participants: BCCDC, Vancouver Coastal Health (VCH) & Fraser Health (FH), Health Emergency Management BC (HEMBC) and Environment and Climate Change Canada.

Stage 1: Heat Warning

ECCC Issues a level 1 Heat Warning when criteria for above-average temperatures for the areas have been met. This is the trigger for community agencies and the public to take the appropriate precautions. A BC Heat Committee Consultation will occur between ECCC, Public Health and EMBC. Following this, a regional coordination call will be organized by EMBC to distribute relevant information.

Stage 2: Extreme Heat Emergency

ECCC issues an Extreme Heat Emergency based on a meeting criterion for a day over day increase in temperatures for 3 consecutive days. A coordination call will be organized through EMBC for all impacted regions.

Agency Response Actions

Environment and Climate Change Canada

Provide current and forecasted temperatures, issue weather warnings, heat warnings and extreme heat emergencies. Potential issuing of broadcast intrusive alert by EMBC Alert Ready. Participation in EMBC led coordination calls to provide situational updates to regional stakeholders.

Fraser Health

The local health authority will coordinate proactive services for more vulnerable people who may be at risk during the heat event, including ensuring heat warnings are sent out with tips for staying cool and advice to help vulnerable community members.

Patient monitoring in any Health Authority operated care facilities.

EMBC

EMBC works with local governments and First Nations to support communities. Once the threat of an emergency develops, EMBC will conduct a coordination call between the local governments, First Nations, and lead agencies to ensure relevant information is distributed for appropriate preparedness and response activities. Should resources be needed, EMBC will assist with the logistics for its acquisition. Following the event, EMBC will provide financial reimbursement (Appendix I) for activities that have been authorized such as:

- opening cooling centres
- transportation to and from cooling centres in communities where no scheduled public or reasonable transportation exists
- staff wages and overtime to open a civic facility that would otherwise not be open
- water for distribution within the facility
- public transportation to and from cooling centres
- costs related to fire services responding to increased heat-related medical calls.
- print, radio, and social media messages to the local population
- “Just in time” training for volunteers on wellness checks
- cost of cooling device rentals and utility expenses
- basic snacks for the public

BC Housing

BC Housing works with partners to provide social housing. This is a housing development that government subsidizes and that either government or a non-profit housing partner owns and/or operates. As such, BC Housing has a heat plan to mitigate risks to those within their purview and considered more at risk due to decreased access to resources. Being government-subsidized, many tenants in social housing include the following groups of whom are considered at risk in extreme heat.

- Older adults (in Metro Vancouver particularly those aged between 65 and 75)
- Those who are chronically ill
- Those who are socially isolated
- Infants
- New residents to Canada

In an extreme heat event, BC Housing will utilize trained staff to take actions to protect their tenants from risks. These activities include and are not limited to identifying tenants most at risk, providing cooling rooms and areas for refuge as well as the distribution of communication materials to educate tenants.

City of Surrey

The following actions can be taken by the City of Surrey in support of a heat event.

Preseason

- Update Surrey's Extreme Heat Response Guideline
- Update Surrey's Extreme Heat website
- Participate in regional exercises and forums to discuss and improve a heat event response
- Prepare heat messages and identify communication channels
- Publicly promote subscription to Alertable, Surrey's public emergency notification system
- Conduct contingency planning for a/c and power supply in city owned facilities
- Assess and validate a list of facilities which can be used by the public to escape the heat
- Ensure adequate supplies are procured, such as extra water for public distribution and staff needs
- Recognize those more vulnerable to the health impacts of extreme heat. Studies show certain groups of people are more vulnerable to hot weather mortality and morbidity.[2] Of the following groups, there is an overwhelming base of evidence suggesting that older adults are at greater risk for mortality during hot weather. More so for persons over the age of 70. ECCC identifies additional individual factors resulting in increased vulnerability:
 - no air conditioning
 - poor health status
 - social isolation
 - low income
 - dangerous behaviours during extreme heat events (strenuous physical activity, inadequate hydration, inappropriate clothing)

- type and location of place of work and/or residence (people in occupations with exposure to high temperatures or those living on higher residential floors without air conditioning)

Special weather statement issued by ECCC

- Monitor forecasted temperatures to ensure a state of readiness.
- Distribute updates accordingly to appropriate city staff.
- Be prepared to amplify messaging as provided by the health authority to provide further reach into the community if necessary.

Level 1: Heat Warning Alert Issued

- Advertise city owned facilities of which the public can use to escape the heat
- Consider staffing requirements needed to distribute water, conduct check-ins to those identified as more vulnerable to a heat event (Appendix II), operate public facilities used for heat relief and increase medical responses.
- Employ a multi-modal communication strategy to disseminate relevant information to the public such as:
- Utilizing a public notification system called “Alertable” to send messages to those in the community who have signed up. This system can alert citizens and provide instruction to mitigate risks through the contact medium of their choice including a landline. This provides a better opportunity to reach seniors in their homes using their landlines or preferred device.
- Leverage City webpage, social media, digital billboards, newsletters, and any other opportunity to reach the public to educate on mitigative actions they can take such as:
 - It’s not outdoor temperatures that matter – it’s indoor
 - Use awnings, shutters, blinds, window films
 - Indoor temperatures can peak far later in the day than outdoor temperatures
 - Close windows approximately between 10 am to 8 pm (check outdoor and indoor temp)
 - Use fans to move cooler air in
 - Fans do not lower body temp for vulnerable people – do not rely on as a primary cooling method
 - Need to spend a long time in a cooling centre to benefit

Level 2: Heat Emergency Alert Issued

Once ECCC issues a Heat Emergency Alert, all actions at lower tier will continue with the addition of the following:

- The Surrey Emergency Coordinator will participate in the EMBC facilitated coordination call for a situation update.
- Undertake community outreach focusing on high-risk populations and groups that support them.
- Consider extending hours and/or opening additional areas for heat relief.
- Distribute resources to the public, such as water for those experiencing heat-related conditions.
- Increase the available on-duty first responders to build capacity into the emergency response system.
- Increase the number of staff to operate facilities used for refuge to support the public
- Increase the number of staff to distribute water to at-risk individuals
- Continue to communicate to the public including messaging done during the Heat Warning plus:
 - Indoor environments without air conditioning may become dangerously hot
 - Monitor indoor temperatures (26 and below is safe, 26-31 may pose a risk to the most susceptible people, sustained exposure over 31 should be avoided for most susceptible populations, if it is 31 degrees at home, go somewhere else that is cooler)
 - Indoor temperatures peak around 8 pm and maybe dangerous overnight
 - Check on others multiple times a day, especially in the evening
 - Escape the heat by going to cool places such as the mall, rec centre or library

Stand Down Process

Once the heat event no longer poses a threat to public safety, ECCC will issue a cancellation alert.

This is the trigger by which the city can scale down all heat event-related activities as deemed appropriate. Following this, an after-action report will be conducted to analyze the effectiveness of the response to inform adaptations to Surrey's Extreme Heat Response Guideline.

APPENDIX I

Effective Date: May 25, 2022

Eligibility Assessment for Heat Emergency			
<p><i>The best way to ensure the eligibility of your expense is to submit an Expense Authorization Form (EAF) to EMBC for approval. The EAF provides the details of the expenditure, its rationale, and an estimate of the total expense for the response activity. Incremental costs will be considered for an extreme heat emergency, a forecasted extreme heat emergency or heat warning where actions are taken as outlined in the BC Provincial Heat Alert and Response System (HARS).</i></p>			
Expense Item	Response Item	Eligible	Not Eligible
Bottled Water	Materials	<ul style="list-style-type: none"> Bottled water made available at community cooling centre facilities Bottled water distributed during health and wellness checks where water is not readily available 	<ul style="list-style-type: none"> Bottled water purchased for distribution to private residences or locations that have water readily available
Staff Overtime	Wages and Overtime	<ul style="list-style-type: none"> Incremental overtime for current staff to keep civic facilities open as cooling centres outside of normal operating hours Incremental costs for the wages of temporary auxiliary staff hired under contract to specifically to support a designated cooling centre facility 	<ul style="list-style-type: none"> Regular salaries or straight time for current staff; benefits and taxes; and the incremental payroll expenses (when working outside of the deployment shift length guidelines are ineligible. For example: <ul style="list-style-type: none"> The regular salary or hourly wage expense associated with response activities Benefits, taxes and overhead or loading costs for current staff Payroll expenditures not directly related to response activities (i.e., the backlog of regular work due to time spent working on the event)
Day and night facility for use as Cooling Centre	Facility Rental	<ul style="list-style-type: none"> Rental of a non-local authority or First Nation facility for the provision of a cooling centre Incremental janitorial and utilities Incremental security costs 	<ul style="list-style-type: none"> Rental of community-owned facility or loss of use charges
Transportation to and from Cooling Centre	Emergency Response Measures	<ul style="list-style-type: none"> Commercial transportation of community members to and from cooling centers as needed in communities where no scheduled public or reasonable transportation exists Mileage reimbursement at Provincial government rates for vehicles operated by a First Nation and local authorities for the transportation of community to and from cooling centers where no scheduled public or reasonable transportation exists 	<ul style="list-style-type: none"> Transportation costs where other reasonable alternatives exist
Emergency Services	Fire Services	<ul style="list-style-type: none"> Incremental costs to fire services responding to increased heat related medical calls, specifically, operational response to assist 	<ul style="list-style-type: none"> Routine operations supporting medical response.

		with supporting medical emergencies	
Messaging	Emergency Response Measures	<ul style="list-style-type: none"> Print, radio, social media messages to local population amplifying ECCC and/or HEMBC messaging 	<ul style="list-style-type: none"> Messaging unrelated to heat wave response and/or unapproved by ECCC and/or HEMBC
Volunteer support for wellness checks	Materials Wages or overtime	<ul style="list-style-type: none"> Incremental overtime for Local and First Nations Government staff to provide "Just in Time" training for volunteers on wellness checks Incremental costs for Local and First Nations Governments to provide additional materials, additional transport costs, or tools to do wellness checks (e.g., thermometer, and bottles of water) 	<ul style="list-style-type: none"> Training that can be planned for in advance of a heatwave.
Partner organization support to operate cooling centers	Wages or overtime for organizations contracted by First Nations and Local Governments *Costs should be run through contracting Local Government or First Nation	<ul style="list-style-type: none"> Incremental overtime for organizational staff keeping facilities open as cooling centres outside of normal operating hours Incremental janitorial and utilities 	<ul style="list-style-type: none"> Regular salaries or straight time for current staff; benefits and taxes; and the incremental payroll expenses
First Nations Supports	Community Navigator	<ul style="list-style-type: none"> Incremental costs for First Nations Community Navigator(s) connecting public with supports provided by First Nations Health Authority (FNHA), First Nations Emergency Services Society (FNESS) and/or Indigenous Services Canada (ISC). 	
First Nations Supports	Cultural Activity Locations Support (CALs)	<ul style="list-style-type: none"> Incremental costs for activities aimed at providing culturally appropriate services at cooling centres Incremental costs associated with a dedicated space within or close to a cooling centre, or when requested by a FN community, a separate designated gathering space where culturally appropriate services can be provided 	<ul style="list-style-type: none"> Rental of a community-owned facility or loss of use charges
Cooling device rental for Provincial government partner organizations		<ul style="list-style-type: none"> Cost of cooling device rentals Incremental utility expenses 	<ul style="list-style-type: none"> Cooling device costs submitted in the absence of a prior approved EAF
Basic snacks and bottled water at day and night facilities	Materials	<ul style="list-style-type: none"> Snacks to be available for the general public at community cooling centre facilities 	<ul style="list-style-type: none"> Food purchased for distribution to private residences Meals provided at day and night facilities

References

1. BC Corners Report. Extreme Heat and Human Mortality: A Review of Heat-Related Deaths in B.C. in Summer 2021. Available from chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://www2.gov.bc.ca/assets/gov/birth-adoption-death-marriage-and-divorce/deaths/coroners-service/death-review-panel/extreme_heat_death_review_panel_report.pdf
2. Henderson, S., McLean, K., Lee, M. and Kosatsky, T. (2021) Analysis of community deaths during the catastrophic 2021 heat dome. *Environmental Health Services*, 6(1) 1-8. Available from https://journals.lww.com/environepidem/Fulltext/2022/02000/Analysis_of_community_deaths_during_the.8.aspx
3. National Collaborating Centre for Environmental Health [Internet]. Vancouver, Canada: Public Health Agency of Canada. 2010 Oct. Available from <https://ncceh.ca/content/vulnerable-populations>

Summer Cooling

Extreme Heat & Smoke Relief Locations

The following City of Surrey civic facilities are available to anyone seeking relief from extreme heat or wildfire smoke during the summer months.

CLOVERDALE

Cloverdale Recreation Centre

6188 176 Street **604-598-7960**

Clayton Community Centre

7155 187A Street **604-502-6300**

Cloverdale Library

5642 176A Street **604-598-7320**

Museum of Surrey

17710 56A Avenue **604-592-6956**

FLEETWOOD

Surrey Sport & Leisure Complex

#100 - 16555 Fraser Hwy **604-501-5950**

Fleetwood Library

15996 84 Avenue **604-598-7340**

GUILDFORD

Fraser Heights Recreation Centre

10588 160 Street **604-592-6920**

Guildford Recreation Centre

15105 105 Avenue **604-502-6360**

Guildford Library

15105 105 Avenue **604-598-7360**

NEWTON

Newton Recreation Centre

13730 72 Avenue **604-501-5540**

Newton Library

13795 70 Avenue **604-598-7400**

Strawberry Hill Library

7399 122 Street **604-501-5836**

SOUTH SURREY

South Surrey Recreation & Arts Centre

14601 20 Avenue **604-592-6970**

Grandview Heights Aquatic Centre

16855 24 Avenue **604-590-7800**

Ocean Park Library

12854 17 Avenue **604-502-6304**

Semiahmoo Library

1815 152 Street **604-592-6900**

WHALLEY

Chuck Bailey Recreation Centre

13458 107A Ave **604-598-5898**

City Centre Library

10350 University Drive **604-598-7420**