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INNOVATIONS IN POLICY AND PRACTICE

Development and implementation of a Heat Alert and Response System in rural British Columbia

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Abstract

Setting In 2018, a regional health authority in British Columbia (BC) initiated a multi-year project to support planning and response to extreme heat. Climate projections indicate that temperatures in the southern interior of BC will continue to increase, with concomitant negative impacts on human health. Successful climate change adaptation must include cross-sectoral action, inclusive of the health sector, to plan for and respond to climate-related events, including extreme heat.

Intervention The objective of this project was to support the development and implementation of a Heat Alert and Response System (HARS) in a small, rural community. The health authority facilitated collaboration among provincial and local governments, community organizations, and First Nations partners to assess community assets, draft a plan for extreme heat, and prepare for a community-supported response during heat events.

Outcomes Stakeholders expressed the importance of utilizing existing partnerships and community resources, such as physical and procedural infrastructure, in which to embed the HARS. It was imperative that the plan be simple, concise, and considerate of the community's unique context. Educational materials and a tailored method of dissemination were important for collective and individual risk mitigation.

Implications A community-driven approach that utilized existing assets allowed for integration of HARS within municipal response plans and established infrastructure. The result is a sustainable public health intervention that has the potential to mitigate the negative health effects of extreme heat. Knowledge acquired through this initiative is informing similar HARS planning processes in other rural BC communities.

Résumé

Lieu En 2018, une régie régionale de la santé de la Colombie-Britannique a lancé un projet pluriannuel de soutien de la planification et des interventions face à la chaleur extrême. Selon les projections climatiques, les températures dans l'intérieur méridional de la province continueront d'augmenter, ce qui aura des effets nuisibles sur la santé humaine. Pour se préparer aux phénomènes climatiques comme la chaleur extrême et pour intervenir efficacement, les mesures d'adaptation doivent être intersectorielles et englober le secteur de la santé.

Intervention Le projet visait à soutenir la création et la mise en œuvre d'un système d'alerte et d'intervention à la chaleur (SAIC) dans une petite communauté rurale. La régie de la santé a facilité la collaboration entre le gouvernement provincial, l'administration locale, les organismes associatifs et les partenaires des Premières Nations pour évaluer les actifs communautaires, dresser un plan en cas de chaleur extrême et se préparer à intervenir avec l'aide de la communauté durant les épisodes de chaleur.

Résultats Les acteurs ont souligné l'importance d'utiliser les partenariats et les ressources communautaires existants, comme les infrastructures matérielles et administratives, et d'y intégrer le SAIC. Il fallait absolument que le plan soit simple et concis et qu'il

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tienne compte du contexte particulier de la communauté. Il a été jugé important d'avoir du matériel pédagogique et une méthode de diffusion créés sur mesure pour atténuer les risques individuels et collectifs.
Conséquences Une approche communautaire utilisant les actifs existants a permis d'intégrer le SAIC dans les plans d'intervention municipaux et les infrastructures établies. Il en est résulté une intervention sanitaire durable qui peut potentiellement atténuer les effets néfastes de la chaleur extrême sur la santé. Les connaissances acquises grâce à cette initiative éclairent aujourd'hui des processus de planification de SAIC similaires dans d'autres communautés rurales de la Colombie-Britannique.

Keywords Extreme heat · Heat Alert and Response Systems · Public health practice · Cross-sectoral partnership · Community engagement · British Columbia

Mots-clés Chaleur extrême · systèmes d'alerte et d'intervention à la chaleur · pratiques en santé publique · partenariat intersectoriel · participation de la communauté · Colombie-Britannique

Introduction

In 2018, a regional health authority (hereafter, "the health authority") in the southern interior region of British Columbia (BC) embarked on a multi-year project to support planning and response to extreme heat in rural and remote communities. The health authority is one of five geographically defined health authorities in BC with a population over 800,000 and covering 215 km^2. The region includes 59 municipalities (n=53 < 20,000 population), 10 regional districts, 16 school districts, 54 First Nations, and 15 Métis chartered communities. Approximately 8.8% of the total population identify as Aboriginal (Interior Health 2021).

Wildfires, floods, and extreme heat events are common in this region and expected to worsen in frequency and severity over time. An average warming of 3.2°C and increase in precipitation of 1.2% is expected annually in the 2050s compared with a 1961–1990 baseline (data are publicly available: https://services.pacificclimate.org/plan2adapt/app/). The health impacts of climate change are well described in the literature (Costello et al. 2009). While the impacts of wildfire smoke on health are apparent during poor air quality events, the effects of heat on health are more insidious. The continuum of heat-related illness ranges from heat rash to heat stroke, a medical emergency. In the province of BC, heat waves have been linked to excess mortality (British Columbia Coroners Service 2021; Kosatsky et al. 2012). Infants, young children, and older adults are at highest risk. Additional risk exists for people who work or exercise outdoors, use substances, have poor access to stable housing, and have select underlying chronic diseases. Fortunately, heat-related illness is entirely preventable through individual, community, and policy interventions.

Climate change adaptation ideally includes efforts across multiple sectors to plan for and respond to events, including extreme heat. Because of impacts on human health, the health sector plays an important role. This paper provides an overview of an ongoing cross-sectoral partnership with one rural BC community to develop and implement a Heat Alert and Response System (HARS).

Intervention

Heat Alert and Response Systems alert the public of risk through an organized communication system that helps individuals and communities to prepare and protect themselves, both before and during extreme heat events (Health Canada 2012). These systems have been implemented in multiple urban jurisdictions in Canada. However, urban and rural communities have distinct differences which should be reflected in a HARS plan. For example, rural residents are more likely to know and trust their neighbours, provide unpaid volunteer work, and have a strong sense of belonging to their community (Statistics Canada 2005). In recognition of these differences, the health authority identified the need to pilot HARS development and implementation in a rural setting with the intent to develop a framework for HARS in similar sized communities.

In order to identify communities for potential participation, temperature data for the 59 municipalities within the health authority catchment were reviewed. The Health and Air Quality Forecast Services at Environment and Climate Change Canada (ECCC) provided temperature data and information on past heat advisories and alerts (ECCC 2018). Communities that had existing strong relationships with the health authority were prioritized, recognizing that the partnership aspect of the work would be integral to success.

The health authority subsequently identified one community to invite into the HARS initiative, the Village of Ashcroft (hereafter, "Ashcroft"). In addition to historically high temperatures, Ashcroft also had a high proportion of the population over 60 years of age (47.5% per Statistics Canada 2017),

a demographic that is particularly vulnerable to heat (Health Canada 2011). Ashcroft also met the criteria for small and rural. As per the 2016 Census, the population of Ashcroft is 1558 people and the closest large urban municipality is Kamloops with a population of 90,280 and 94 km driving distance (Statistics Canada 2017).

Initial engagement

The health authority extended an invitation to Ashcroft to work together to prevent and minimize heat health impacts on the local population. The project leads travelled several times to the community, first to meet with municipal staff and then to deliver a formal presentation to Mayor and Council during a public council meeting, outlining the initiative and the opportunity to collaborate. The presentation included information about historical and projected heat in the region, the health impacts of heat, the core elements of HARS, and benefits to the community, including financial and in-kind supports.

Once the proposed partnership was supported by the municipality, key community stakeholders were invited to develop and implement a HARS. The Ashcroft HARS Stakeholder Committee (hereafter, "the committee") was formed and comprised individuals from the municipal government and regional district, Emergency Management BC, the local school district, public health, community organizations including non-profits, first responders, a volunteer coordinator, First Nation Band members, and members of the public. The committee provided input into the five core elements of HARS, depicted in Figure 1 and described as follows.

Five core elements of HARS

1. Community mobilization and engagement

A participatory approach was used in the development of the HARS for Ashcroft. Engagement activity was purposeful and used the International Association for Public Participation (IAP2) spectrum of public participation techniques: inform, consult, involve, collaborate, and empower (International Association for Public Participation 2018). There was ongoing consultation with partners, relying on expertise from the community for knowledge and contextual considerations, plus expertise from health authority staff for technical aspects of HARS, including best practices from elsewhere.

Stakeholder engagement included several dynamic and interactive workshops and meetings with the committee, conducted in-person and virtually. The first engagement session was an opportunity to assess strengths, vulnerabilities, assets, and needs. The project team shared information about extreme heat and health impacts, as well as community preparation. The committee developed asset maps of physical infrastructure and social and communication hubs in both Ashcroft and in the local First Nations community. The committee also identified which local populations would be most vulnerable to extreme heat and discussed which agencies and service providers had connections with these populations.

Subsequent engagement sessions were held to create the HARS, which included identifying each stakeholder's heat response actions and preferred communication methods. The committee reviewed the overall processes and community response plan, including communication materials and dissemination methods. The in-person sessions created opportunities for the committee to strengthen social connections, provide locally relevant input, and work together to address challenges and concerns.

2. Alert protocol

The BC Centre for Disease Control (BCCDC), in collaboration with ECCC and Health Canada, previously developed heat alert thresholds for the province of BC and its varied climatic regions (McLean et al. 2018). This involved identifying day and night temperature combinations that were correlated with pronounced negative health outcomes in the regions. Based on these thresholds, ECCC generates extreme heat event alerts for BC, using highly conservative meteorological models. An alert issued by ECCC triggers the activation of the community response plan within Ashcroft. The health authority also monitors these alerts for surveillance purposes, as well as for any informational support Ashcroft may need.

3. Communication plan

Communication methods and activities are embedded in the community response plan and are activated prior to and during heat events. Ashcroft's plan outlines communication activities that are implemented by the municipality, such as education for staff, as well as materials that are disseminated to community stakeholders and the public about preparedness for extreme heat. Examples include the pre-heat and advisory notifications, the use of social media, and Web-based messages.

Community stakeholders identified the need to include the language "take the time to talk to your neighbours and identify residents who may require assistance during lengthy extreme heat events." This message is included in the pamphlets distributed by Ashcroft. Additional messages were more specific and provided guidance for neighbours to watch for "people who do not have air conditioning, have limited or no form of transportation and no supply of bottled water on hand." Broader community support for information dissemination at the neighbourhood level was explored with a local grassroots volunteer group that mobilized after the 2017 wildfires; this

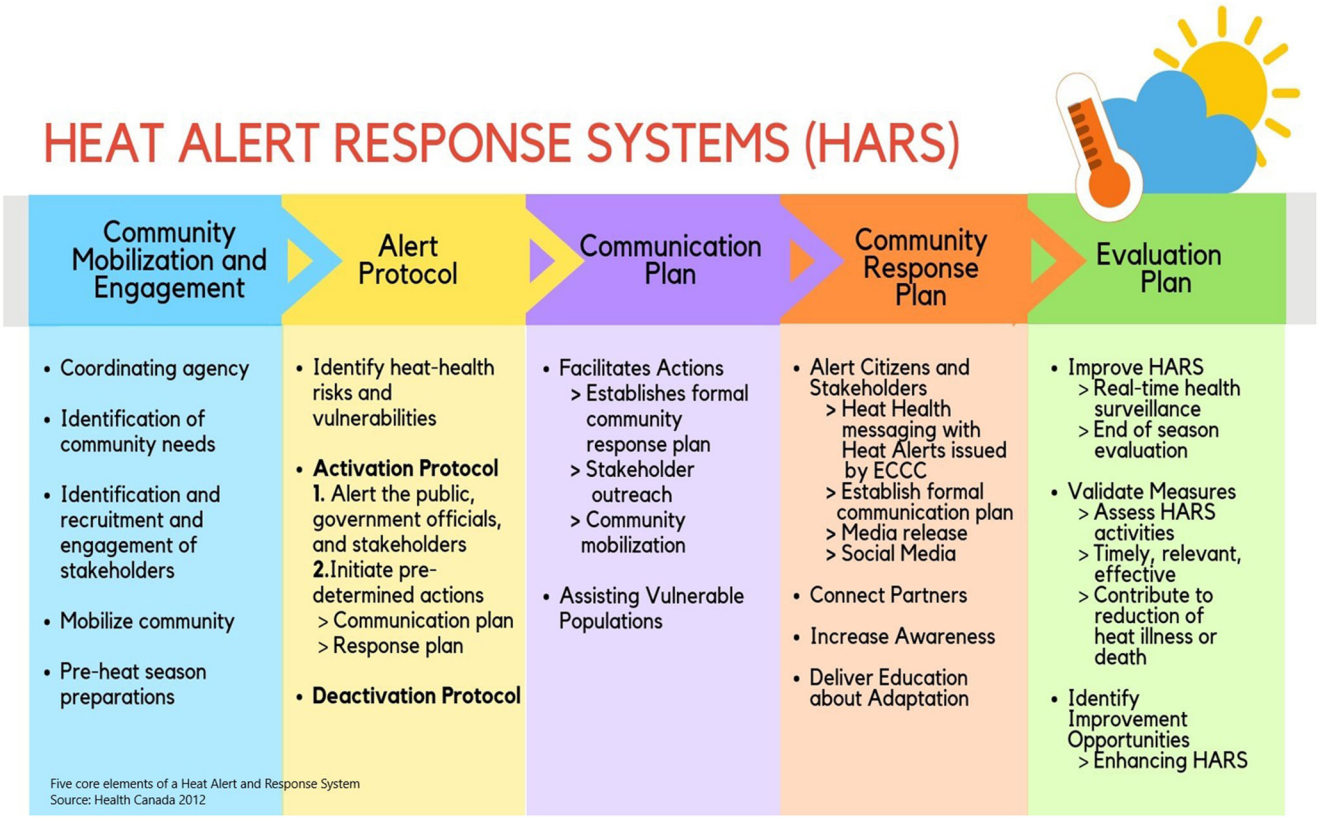

Fig. 1 Five core elements of HARS

group was willing to offer their pre-existing network and mobilize during a heat event as necessary.

4. Community response plan

The community response plan utilizes existing partnerships, and physical and communications infrastructure to support the community and individuals to take protective actions against extreme heat. The plan includes a list of community stakeholders (e.g., community agencies, service providers and businesses) as well as roles and responsibilities of each. Each stakeholder has the responsibility to take action during a heat event, for example dissemination of information among their networks. The level of response from the community depends on the anticipated length of the heat event. Increased length of the event results in higher risk to the population. As such, HARS can be tiered by creating different response levels. In Ashcroft, the plan is tiered into three stages based on level of activation.

In the *Pre-Heat Notification* stage, there is action to raise awareness that Ashcroft is expected to get hot temperatures and the community should anticipate subsequent heat advisories. In this stage, pamphlets are mailed, updated heat information is placed on the Ashcroft website, stakeholders receive email notices, and municipal staff are provided with education to build awareness of the HARS protocols and plan.

The response to the initial ECCC alert in Ashcroft is considered *Level 1 Heat Advisory*. In this stage, the community is notified that Ashcroft will experience hot temperatures ($\geq$ 35°C for 2 consecutive days AND overnight temperature $\geq$ 18°C). Public messaging related to the prevention of heat-related illness is also disseminated. Figure 2 provides details on the flow of information and actions taken by the community.

In the *Level 2 Heat Advisory* stage, the community is notified that Ashcroft will experience extremely hot temperatures for three consecutive days and that the health of the population is at higher risk. Messaging and actions aim to protect those who are more susceptible to heat-related health problems by placing signage in parks to encourage the reduction of outdoor activity, preparing cooling centres for people to attend and get relief from heat, and reviewing operating hours at the public pool.

5. Evaluation plan

Evaluation is a key component of HARS to ensure the plan is working effectively for the community. In Ashcroft, the actions taken during the 2020 heat season were evaluated during a virtual engagement session with the committee. The session included a presentation delivered by Ashcroft that described the implementation of the community response plan and how COVID-19 restrictions resulted in modifications to the plan. A

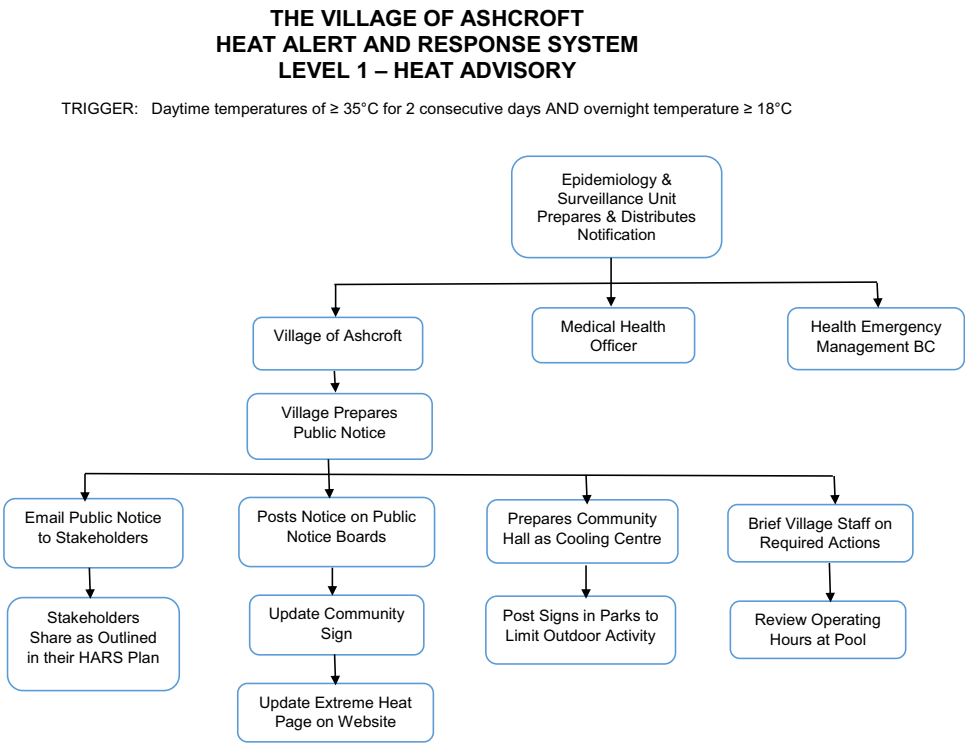

Fig. 2 Flow of information and community actions during a Level 1 Heat Advisory

presentation was given by the health authority describing the background and process of the Heat Alert Protocols established by ECCC and BCCDC. Stakeholder feedback was collected during the session to identify areas for improvement of communication methods and activities. A questionnaire, adapted from Health Canada (Health Canada 2012), was completed by Village of Ashcroft staff at the end of the 2020 heat season. The purposes of the questionnaire were to assess whether the HARS design and delivery was implemented as planned and whether the target population was reached, and to identify perceived challenges and successes.

A formal and comprehensive evaluation plan is in development to assess the timeliness, relevance, and effectiveness of the intervention to date and to help stakeholders understand how the measures are reducing the negative health impacts of extreme heat. Community stakeholders should be included from all sectors, including public health, local government, First Nation Band members, first responders, community agencies, schools, and community members (Interior Health 2020). Ideally, future evaluation methods will include in-person focus groups with vulnerable sub-populations, including groups that meet regularly such as the seniors' group.

Outcomes

The Ashcroft HARS is simple, concise, and relevant to the community's context. Although Ashcroft was ready to implement HARS in the summer of 2019, temperature thresholds for activation were not met and the plan was not implemented. In the summer of 2020, temperature thresholds were met twice. Although the HARS plan was activated in 2020, the planned actions were modified due to the COVID-19 pandemic. For example, public congregation was not supported and community cooling centres could not be opened.

A unique aspect of the Ashcroft HARS included the tiered response levels and associated risk-related heat mitigation activities, including community notice boards, designated locations for cooling centres, mail outs of paper notices, signs posted in visible places, and outreach to vulnerable populations. An output of this project is a framework that could be used in smaller communities in BC and Canada to develop similar plans. Protocol checklists were developed for Ashcroft staff to support implementation of activities at each response level. Printed and digital notification templates included public health messages targeted to each response level, with a focus on education for individuals on how to prepare for and manage extreme heat.

One important outcome of this project is understanding how to best communicate heat messages in a small rural community, where there might be a lack of traditional media such as a dedicated radio station or newspaper. The committee carefully reviewed materials and tools and chose communication methods and language that would best suit their community; it was recommended that the word "alert" should be avoided, as it was flagged as a potential trigger in creating anxiety within the community due to recent threats from wildfires (Government of British Columbia 2019). As a result, the

term "advisory" was chosen. Educational materials that encourage individuals to take action against extreme heat were identified as the most effective means to mitigate risk in a community with limited resources. Paper flyers were seen as preferable for disseminating messaging, in part to ensure that vulnerable populations such as seniors were reached. During heat events, informational materials such as brochures and posters are now distributed through the local post office and through household mail boxes, and posted on bulletin boards at high-traffic sites throughout the community, including the community hall, the museum, and the Village Office. Additional methods of communication about extreme heat include lawn signs, the Village of Ashcroft website (Village of Ashcroft 2021), Facebook, and Twitter. Figure 3 depicts the key messaging provided to the community via social media during a Level 2 Heat Advisory. It is essential to find a balance between not enough and too much information, in order to avoid message fatigue.

Rural-based HARS planning must take into account resource availability and allocation. Ashcroft had only one full-time and one part-time employee in the municipal office who could dedicate some time to the project. The Chief Administrative Officer was the primary contact for the HARS initiative and she was preparing for an election year and had many other demands on her time. To minimize the burden on a limited resource base, the HARS plan was based on or embedded into existing physical and procedural infrastructure, e.g., the tiered response levels in the HARS plan were adapted from the local water system emergency response plan. Several sites within the community were considered as possible cooling centres, including the community swimming pool, library, and local businesses. Ultimately, the Ashcroft Community Hall was identified as the best place for people to seek cool shelter. The committee also played an integral role in the development of the community response plan as well as the promotion and implementation of the plan. Establishment of the committee enabled commitment, diversity of perspective, and efficient communication. While Ashcroft is the lead agency and initiates the plan, each committee member has responsibility for their respective actions during an extreme heat event.

The community response plan can now be updated as necessary when circumstances change within participating organizations and the broader community. The adaptability of Ashcroft's plan was demonstrated during the COVID-19 pandemic. Regular review of the plan is encouraged to identify what is working well and what can be improved to protect the health of the public and reduce risk of illness and death.

Implications

This initiative demonstrates development and implementation of HARS in one rural community. Heat-related morbidity and mortality data helped establish the urgent need to plan for heat-related emergencies amid competing priorities. One benefit of HARS is that it can be tailored to a community's needs and resources; the stakeholder committee was critical in ensuring that this intervention was directly relevant to the unique context of this small community. The importance of health sector involvement is described in the Ottawa Charter for Health Promotion (World Health Organization 1986). Within this HARS intervention, the health authority endeavoured to create supportive environments and strengthen community action. While it is important for the health sector to be involved, HARS should be community-driven and community-led to ensure successful implementation and ongoing sustainability. Achieving consensus on roles and responsibilities of stakeholders was key during the planning process.

Although it will take more than one heat season to measure positive impacts on the health of the community, specifically a reduction in heat-related illness or death, there are other indications of early success. Notably, the community response plan was activated during the summer of 2020 in the midst of the COVID-19 pandemic, including the initiation of pre-heat notifications in anticipation of hot temperatures. Based on feedback from stakeholders, these actions led to higher awareness of heat risk and available supports in the community, as well as engagement with clients and the public.

Anticipated future challenges for this community include planning for extreme heat that may occur concomitantly with other natural events like wildfires, and the potential consequent service disruptions (i.e., water, power, transportation) that could impede HARS implementation. In the event of both extreme heat and poor air quality events happening simultaneously, cooling shelters could potentially function as clean air shelters. Collaboration between the community of Ashcroft and the health authority is ongoing.

The findings from this project are informing expansion of HARS to other rural BC communities. There is strong potential for Ashcroft's action plan to serve as a guiding document for similar places across Canada in their efforts to prepare for heat events. A Heat Alert and Response Planning Toolkit has been developed by the health authority to support other communities (Interior Health 2020). The toolkit incorporates learnings from the HARS development in Ashcroft and describes the roles of federal, provincial, and local governments, the health authority, and community partners. Long-term strategies and preventive actions that target local governments and communities are also included.

Conclusion

Heat-related illness and death are preventable when risk is understood and there is a combination of individual, community, and policy efforts to prepare for and respond to extreme heat. The time has come to accept that climate-

EXTREME HEAT ADVISORY: LEVEL 2

ADVISORY 2

The Village of Ashcroft and Interior Health advise residents that the immediate forecast for 3+ consecutive days is with daytime temperatures of 35°C or more and not cooling off to below 18°C at night.

It is important that residents are aware of the impacts extreme heat events have, especially for the very young, the elderly, those with chronic illness or those taking certain medications. People working outdoors or participating in outdoor activities, face greater heat exposure and are encouraged to modify their hours of work, if possible, and reduce or limit their outdoor activities.

PLEASE SPREAD WORD TO YOUR NEIGHBOURS

Please take the time to talk to your neighbours and identify residents who require assistance during lengthy extreme heat events. These may be people who do not have air conditioning, have limited or no form of transportation, and no form of water supply on hand. It is important that everyone understands the need to cool off during extreme heat events.

VOYENT ALERT!

Please register with Voyent Alert notification system to stay informed in events of extreme heat alerts, fire alerts, water conservation measures and other important notifications. Need help registering? Call (250) 453-9161 for assistance.

COVID-19

Due to Covid-19 restrictions the Village will not have cooling centres available for the 2021 season. Please take extra precautions and find an air conditioned environment to allow your body to cool off.

If you have any questions, please contact The Village of Ashcroft, check our website at www.ashcroftbc.ca, or check the Interior Health Extreme Heat website at www.interiorhealth.ca

HEALTH SAFETY TIPS AND REMINDERS

SYMPTOMS OF HEAT ILLNESS

Mild symptoms:

- Pale, cool, moist skin
- Heavy sweating
- Muscle cramps
- Rash
- Swelling, especially hands and feet
- Fatigue and weakness
- Light headedness and/or fainting
- Headache
- Nausea and/or vomiting

More Severe Symptoms: (Requires urgent medical attention)

- High Fever and/or high body temperature (103°F or higher)
- Hallucinations
- Seizures
- Unconsciousness

STEPS TO AVOID HEAT RELATED ILLNESS

- Plan your outdoor activities before 11 AM or after 5 PM, to avoid the most intense sun.
- Drink plenty of non-alcoholic fluids - Avoid caffeine, water is the best choice.
- If you must work or exercise outside in the heat of the day, drink two to four cups of water every hour, even before you feel thirsty.
- Rest and/or stay in the shade, or create your own shade with an umbrella and/or a wide brimmed hat. Wear light colored clothing.
- If you're struggling to keep cool, move indoors to an air-conditioned building or take a cool shower. At temperatures above 30°C, fans alone may not be able to prevent heat-related illness.
- Never leave children or pets alone inside a parked car. Temperatures can rise to 52°C (125°F) within 20 minutes inside a vehicle when the outside temperature is 34°C. Leaving the car windows open slightly will not keep the inside of the car at a safe temperature.

Fig. 3 Social media key messages during a Level 2 Heat Advisory

related events will become more frequent and when they occur in rapid succession they have an intensifying impact on communities. Through partnership, connection, and coordination, sectors can come together and make a profound positive impact on community health and well-being.

Implications for policy and practice

What are the innovations in this policy or program?

- The development of HARS in rural BC was community-driven and community-led, informed by the intersectoral stakeholder committee.
- The purposeful and collaborative investment by the health authority in this small rural community facilitated buy-in and engagement to seek out local approaches to HARS planning and implementation.
- The HARS was simple, concise and relevant to the community's context, utilizing existing physical and communications infrastructure.

What are the burning research questions for this innovation?

- What does the community consider as success in developing and implementing a response to extreme heat?
- How do we measure behaviour change at individual and community levels?
- How can a promising practice that is developed and implemented in one rural community be adopted and modified by another, considering each individual and unique community context?

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Code availability N/A

Author contributions All the authors whose names appear on this submission made substantial contributions to the conception of design of the work and/or the acquisition, analysis, or interpretation of the data; drafted the work or revised it critically for important intellectual content; approved the version to be published; and agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy and integrity of any part of the work are appropriately investigated and resolved.

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Declarations

Conflict of interest The authors declare no competing interests.

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Consent to participate N/A

Consent for publication N/A

References

British Columbia Coroners Service. (2021). *Heat-realted deaths in B.C. knowledge update.* Available from: https://www2.gov.bc.ca/assets/gov/birth-adoption-death-marriage-and-divorce/deaths/coroners-service/statistical/heat_related_deaths_in_bc_knowledge_update.pdf Accessed 3 December, 2021.

Costello, A., Abbas, M., Allen, A., et al. (2009). Managing the health effects of climate change. *Lancet, 373*, 1693–1733. https://doi.org/10.1016/S0140-6736(09)60935-1

Environment and Climate Change Canada (ECCC). (2018). *Number of heat warnings for select communities in BC (2013-2017) [data file].* Available from: the Environment and Climate Change Canada Health and Air Quality Forecast Services Unit.

Government of British Columbia. (2019). *Wildfire season summary - 2017 fire season summary.* Available from: https://www2.gov.bc.ca/gov/content/safety/wildfire-status/about-ecbcws/wildfire-history/wildfire-season-summary Accessed 7 May, 2021.

Health Canada. (2012). *Heat Alert and Response Systems to protect health: Best practices guidebook.* Ottawa, ON: Health Canada. Available from: https://www.canada.ca/content/dam/hc-sc/migration/hc-sc/ewh-semt/alt_formats/pdf/pubs/climat/response-intervention/response-intervention-eng.pdf Accessed 7 May, 2021.

Health Canada. (2011). *Communicating the health risks of extreme heat events: Toolkit for public health and emergency management officials.* Ottawa, ON: Health Canada. Available from: https://www.canada.ca/content/dam/hc-sc/migration/hc-sc/ewh-semt/alt_formats/hecs-sesc/pdf/pubs/climat/heat-chaleur/heat-chaleur-eng.pdf Accessed 5 May, 2021.

Interior Health. (2020). *Heat alert & response planning for interior BC communities: A toolkit.* Available from: https://www.interiorhealth.ca/YourEnvironment/Emergency/ExtremeHeat/Documents/Heat%20Alert%20and%20Response%20Planning%20Toolkit%20for%20Interior%20BC%20Communities.pdf Accessed 7 May, 2021.

Interior Health. (2021). *Aboriginal health: Nations & communities*. Available from: https://www.interiorhealth.ca/YourHealth/AboriginalHealth/Pages/default.aspx. Accessed 7 May 2021.

International Association for Public Participation. (2018). *iap2 spectrum of public participation.* Available from: https://www.iap2.org/page/pillar. Accessed 7 May, 2021.

Kosatsky, T., Henderson, S. B., & Pollock, S. L. (2012). Shifts in mortality during a hot weather event in Vancouver, British Columbia: Rapid assessment with case-only analysis. *American Journal of Public Health, 102*(12), 2367–2371. https://doi.org/10.2105/AJPH.2012.300670

McLean, K. E., Stranberg, R., MacDonald, M., Richardson, G., Kosatsky, T., & Henderson, S. B. (2018). Establishing heat alert thresholds for the varied climatic regions of British Columbia, Canada. *International Journal of Environmental Research and Public Health, 15*(9), 2048. https://doi.org/10.3390/ijerph15092048

Statistics Canada. (2005). *Social engagement and civic participation: Are rural and small town populations really at an advantage?* Rural and Small Town Canada Analysis Bulletin. Available from: Microsoft Word - vol.6_No.4_e.doc https://www12.statcan.gc.ca/census-recensement/2016/dp-pd/prof/index.cfm?Lang=E Accessed 3 December, 2021.

Statistics Canada. (2017). Ashcroft [population centre], British Columbia and British Columbia [province] (table). Census profile. 2016 census. Statistics Canada catalogue no. 98-316-X2016001. Available from: https://www12.statcan.gc.ca/census-recensement/2016/dp-pd/prof/index.cfm?Lang=E. Accessed 7 May 2021.

Village of Ashcroft. (2021). *Emergency services-extreme heat.* Available from: https://ashcroftbc.ca/extreme-heat/. Accessed 3 Dec 2021.

World Health Organization. (1986). *Ottawa Charter for Health Promotion*. Available from: https://www.who.int/teams/health-promotion/enhanced-wellbeing/first-global-conference Accessed 3 December, 2021.