Protecting Older Adults During Extreme Heat

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Disclaimer

This report was produced as part of the UBC Sustainability Scholars Program, a partnership between the University of British Columbia and various local governments and organisations in support of providing graduate students with opportunities to do applied research on projects that advance sustainability and climate action across the region.

This project was conducted under the mentorship of Raluca Radu and Agnes Black at Providence Health Care. The opinions and recommendations in this report and any errors are those of the author and do not necessarily reflect the views of Raluca Radu, Agnes Black, Providence Health Care or the University of British Columbia.

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I would like to express my deepest gratitude to my supervisors and mentors, Raluca Radu and Agnes (Aggie) Black, whose guidance, encouragement, and thoughtful feedback were invaluable throughout this work. Their expertise not only strengthened the research process but also supported my growth as a scholar committed to climate justice and health policy. I am also grateful for the support of the entire team of the Canadian Coalition for Green Health Care. Lastly, I would like to extend my sincere gratitude to the staff, residents, and substitute decision-makers who generously shared their time, perspectives, and experiences with us for the project.

Cover Photo by *Salina Dolmo Lama*

Locating Myself

My name is Salina Dolmo Lama, and I was born and raised in the mountainous lands of Nepal. I belong to the Tamang Janajati, an Indigenous group in Nepal. I also acknowledge my position as a newcomer and guest on these lands, and the ways I continue to participate in and benefit from Canadian settler-colonial structures. My position carries responsibilities: to listen, to learn, and to act in ways that support Indigenous sovereignty, self-determination, and justice.

I come to this project as a Master of Public Policy and Global Affairs student at the University of British Columbia. My academic and professional background has been shaped by a deep commitment to climate resiliency and sustainability with a focus on how policy can strengthen the ability of communities and institutions to adapt to environmental change. I bring a perspective rooted in curiosity, humility, and critical policy analysis. These lenses allow me to examine how institutional structures, equity considerations, and systemic preparedness intersect in shaping healthcare responses to extreme heat events.

Throughout this work, I remain committed to a stance of reflexivity and openness. I recognize both the limits of my positionality and the necessity of ongoing learning, especially in research that involves vulnerable populations, such as seniors and frontline healthcare workers, who experience the direct impacts of extreme heat. It is with respect and responsibility that I contribute to this project, understanding that advancing climate resilience in healthcare is not only a technical challenge but also a collective responsibility. I am deeply grateful for the unwavering guidance of my supervisors Raluca and Aggie, and the collaboration and insights of everyone at Youville who shared their time and experiences during this study.

Table of Contents

Executive Summary

Background

Extreme heat is emerging as one of the most serious health threats associated with climate change, disproportionately impacting vulnerable populations such as older adults, individuals with chronic illnesses, young children, and those living in institutional care settings. Between 2000 and 2020, more than 670 excess deaths were attributed to extreme heat in Canada's 12 largest cities during multi-day events. The 2021 heat wave in British Columbia was the deadliest climate disaster in the province's history, claiming 619 lives and highlighting severe gaps in healthcare preparedness.

This national research project *Collaborative Transformation: Decreasing Heat-Health Impacts in Vulnerable Populations Using Health Delivery Lens*, is led by the Canadian Coalition for Green Health Care with Providence Health Care and other partners, funded by Health Canada. The study aims to identify low-cost practical interventions to reduce indoor heat risks, strengthen healthcare system readiness, and support climate-resilient care delivery.

Research in British Columbia focused on two Providence Health Care facilities: Youville Residence, a long-term care home, and Parkview, a geriatric psychiatry unit. Data were collected through a mixed-methods approach, combining environmental monitoring with data loggers tracking indoor temperature, humidity, and air pressure, surveys with healthcare workers (HCWs), residents, and substitute decision makers (SDMs), and semi-structured interviews with a subset of participants to capture lived experiences and adaptation challenges.

Participation included 26 HCW surveys and 26 interviews (6 via Zoom), 9 resident surveys and 7 interviews, and 2 SDM surveys and 2 interviews.

Key Findings and Reflections

- Despite posters and electronic outreach, many HCWs were unaware of the study or the invitation to complete a survey and/or interview. Navigating survey links to register interest for interviews posed additional barriers. In-person outreach proved far more effective.
- HCWs had limited availability due to heavy workloads. Interviews often had to be shortened or conducted during brief breaks from work. Some staff suggested focus group discussions as a more feasible format, although focus groups pose scheduling challenges as well.
- While audio recordings improved accuracy, some participants declined being recorded, requiring reliance on notetaking. Technical issues such as faulty devices and background noise further affected data quality.
- There was a lack of recognition of heat as a pressing health and care issue among staff and residents. While climate change is often viewed as abstract, the study helped participants recognize its immediate and local impacts within healthcare. Staff expressed a strong interest in learning more about heat response plans and practical guidelines.
- Providing gift cards was highly effective in acknowledging participant contributions and building goodwill.

Recommendations for Future Research

1. Improve Survey Design: Ensure online tools are user-friendly, accessible, and tested in advance to prevent navigation issues.
2. Prioritize In-Person Outreach: Posters and emails alone are insufficient. Direct engagement through supervisors, team leaders, or peer-to-peer communication significantly improves participation.

3. Flexible Data Collection Approaches: Combine audio recording with detailed field notes, supported by a dedicated notetaker to strengthen reliability.
4. Offer Group-Based Methods: Provide focus group discussions as another option to accommodate staff time pressures.
5. Language Accessibility: Simplify survey language or offer translation support to include non-English speaking staff.

Conclusion

This research demonstrates the urgent need for strategic, inclusive, and context-sensitive approaches to studying extreme heat impacts in healthcare settings. Strengthening recruitment methods, diversifying data collection strategies, and providing accessible tools and resources will be critical for ensuring robust participation and actionable outcomes in the next phase of this national project.

The forthcoming phase (2026) will test low-cost interventions to reduce indoor heat impacts and generate practical resources such as training tools, infographics, and policy guidance that can be scaled across Canada's healthcare systems to advance climate resilience and protect vulnerable populations.

1. Introduction to the project

Extreme heat is rapidly becoming one of the most serious health risks linked to climate change, affecting populations worldwide. In Canada, this threat is particularly pronounced for vulnerable groups such adults older than 65 years, people with chronic illnesses, young children, and people living in institutional or indoor care settings. Between 2000 to 2020, extreme heat events lasting two or more days in Canada's 12 largest cities were linked to roughly 670 additional non-accidental deaths, including 115 excess cardiovascular deaths and 115 excess respiratory mortalities. Notably, the health impacts were more severe in cities with higher proportions of renter households and fewer prior heat events. Despite the severity of this issue, Canada's health sector remains underprepared to meet the rising demands of heat-related health impacts (Beugin, et al., 2023; Quick, 2024; Radu, 2025)

Older adults experience increased sensitivity to heat due to age-related declines in thermoregulation and immunity. Patients in long-term care homes, acute care facilities, and home care settings are often unable to independently adjust their environments or leave overheated spaces. Simultaneously, healthcare workers face mounting occupational challenges under extreme heat conditions, including fatigue, stress, and decision-making difficulties. During the 2021 heat wave in British Columbia (BC), healthcare workers reported being unsure of how to protect patients from heat or manage symptoms, revealing significant gaps in training, infrastructure, and system-wide readiness (Beugin, et al., 2023; Radu, 2025)

This national research project titled *Collaborative Transformation: Decreasing Heat-Health Impacts in Vulnerable Populations Using Health Delivery Lenses* led by the Canadian Coalition for Green Health Care in collaboration with Providence Health Care and other national partners, seeks to address these challenges through a multi-site, collaborative initiative. The study is funded by Health

Canada's Climate Change and Health Capacity Building program. The project aims to identify low-cost, practical interventions to reduce indoor heat impacts and strengthen the ability of healthcare workers and systems to provide safe care during extreme heat events. It is grounded in the principles of health equity, climate resilience, and systems transformation (Radu, 2025).

The study is taking place across several healthcare settings in Canada, including long-term care, acute care home care and primary care. In BC, the research is focusing on one building which houses two specific facilities operated by Providence Health Care: Youville Residence, a long-term care home, and Parkview, a geriatric psychiatry unit. Data is collected from residents, healthcare workers (HCWs), and substitute decision makers (SDMs) to understand both clinical and lived experiences related to indoor heat (Radu, 2025).

The research team will implement low-cost heat adaptation interventions that will be evaluated during the second phase of the study (in 2026), to measure their effectiveness in improving indoor conditions and care delivery. This project seeks to develop actionable recommendations and resources that promote climate resilience within healthcare. These include policy guidance, training tools, infographics, and videos that can be shared across healthcare systems to support a coordinated and equitable response to extreme indoor heat (Radu, 2025).

2. Background

Extreme heat, driven by climate change, poses escalating risks to both individuals and healthcare systems, with profound implications for vulnerable populations, healthcare delivery, and workforce safety. This section outlines climate change and extreme heat, their impacts on individual health, and the resulting challenges for healthcare delivery and workforce safety.

2.1. Overview of Climate Change and Extreme Heat

Climate change represents one of the most pressing and far-reaching public health challenges of the 21st century. The increasing frequency, intensity, and duration of extreme weather events, particularly heat waves, are placing unprecedented pressures on health systems and exacerbating existing social inequities. The World Health Organization (WHO) has recognized climate change as the greatest health threat of this century, reflecting the disproportionate burden it places on marginalized populations, older adults, and those with chronic illnesses (Radu, 2025; Sack, et al., 2025; Weinstein, Thiel, & Sorensen, 2025)

Globally, heat-related morbidity and mortality are on the rise. According to the 2023 Lancet Countdown report, the number of heat-related deaths among individuals over the age of 65 increased by 53.7% from 2000 to 2018, resulting in approximately 296,000 deaths worldwide in 2018 alone. These numbers are particularly alarming given the rapidly aging population in many countries, including Canada, where older adults are increasingly exposed to indoor and outdoor heat stress (Sack, et al., 2025).

Extreme heat occurs when temperatures are already very hot and the daytime and nighttime temperatures get even hotter every day and are well above seasonal norms (BC Centre for Disease Control, 2025). Environment and Climate Change Canada (ECCC) defines extreme heat depending on the region and its typical weather condition. A heat warning is issued when the daytime maximum temperature reaches 28˚C or higher and nighttime temperature falls to a low of 13 ˚C for two or more consecutive days in Yukon. While in the southern interior region of BC, if the daytime temperature reaches 35 ˚C or higher and does not go lower than 18 ˚C, a heat warning is issued (Canadian Medical Association , 2024).

2.2. Notable Heat-Related Events in BC and Forecast

In Canada, British Columbia faced an extreme heat event in July 2009 and a heat wave in June 2021 which remain the most catastrophic climate disasters in BC's history. In 2009, coastal Vancouver temperatures exceeded 31˚C, while inland Abbotsford reached 36˚C. Compounding the danger, a lack of sea breeze allowed land surface temperatures in downtown Vancouver to approach 40˚C. Nighttime temperatures and humidity were also high with minimum temperatures on July 30 being ~24 ˚C at both locations (Stewart, et al., 2017).

The 2021 heat wave led to record-breaking temperatures in several BC communities, with Lytton reaching 49.6˚C on June 29, 2021, the highest temperature ever recorded in Canada. BC has been experiencing higher summer temperatures and more extremely hot days where average temperatures are already 1˚C to 2˚C warmer than they were in the 1940s. (BC Centre for Disease Control, 2025; Henderson, McLean, Lee, & Kosatsky, 2022). Between June 25 and 30, 2021, according to BC Coroners Services (2022), the heat wave claimed 619 lives directly attributed to heat exposure. The lives lost were those who were elderly (adults over 65) socially isolated, or living in housing without adequate cooling (Beugin, et al., 2023; Canadian Medical Association , 2024; Tsakonas, Badyal, Takaro, & Buse, 2025; Canadian Climate Institute, 2023). A month after the 2021 heat wave, the BC Centre for Disease Control identified 740 excess deaths above the historical average between June 25 and July 2 (Beugin, et al., 2023).

The provincial advisory groups such as the 2022 Extreme Heat Death Review Panel emphasized that many heat-related deaths occurred in neighborhoods characterized by large roads, dense buildings, high population, and low greenness. The panel warned that urban areas across

BC are steadily losing vegetation and permeable surfaces which are vital for cooling. This will result in urban heat-island effects leaving communities more exposed and vulnerable to extreme heat (Ricker, Quigg, & Lem, 2025).

Climate projections suggest that the province could see a temperature increase of 3˚C to 6˚C by the 2080s. Such shifts raise the baseline temperatures, making extreme heat events more likely and more severe (BC Centre for Disease Control, 2025; Stewart, et al., 2017). Current modelling suggests that there is one-in-ten chance of experiencing a 2021-scale heat wave in the next two decades. Under high-emissions scenarios, such events could occur three years out of every ten by mid-century. Furthermore, without adaptation interventions, there could be an average of 1370 heat-related deaths and nearly 6,000 heat-related hospitalizations per year by 2030 with estimated costs of at least $100 million per year by 2030 (Beugin, et al., 2023; Canadian Climate Institute, 2023).

2.3. Health Impacts of Heat on Individuals

Extreme heat poses a serious threat to human health. These risks are particularly severe for older adults and individuals with underlying health conditions, people living in hazardous areas or where adaptation planning and supportive infrastructure and services are lagging, making heat a pressing public health issue in the context of climate change. However, a major challenge is that heat-related symptoms are often present in diverse and inconsistent ways, making them difficult to recognize and diagnose. As a result, only the most severe cases tend to be formally identified and recorded, while many milder or moderate cases go unnoticed, leaving medical records unable to capture the full extent of those affected (Stewart, et al., 2017).

2.3.1. Direct Health Impacts

Prolonged exposure to high temperatures can lead to a spectrum of heat-related illnesses. Heat-related disease is categorized in terms of its progress in severity: heat stress, heat exhaustion, and heat stroke (Stewart, et al., 2017; Vancouver Coastal Health, 2024). Initial symptoms often include heavy sweating, dizziness, nausea, headache, rapid breathing, and muscle cramps which are signs typically associated with heat exhaustion. If left untreated, this can progress to heat stroke, a medical emergency characterized by a core body temperature above 39˚C, confusion, fainting, and hot, dry, or flushed skin. Without rapid cooling and medical intervention, heat stroke can cause permanent organ damage or death (BC Centre for Disease Control, 2025; Canadian Medical Association , 2024; Stewart, et al., 2017; Vancouver Coastal Health, 2024).

Older adults are particularly vulnerable due to age-related physiological changes such as reduced cognitive function and mobility, diminished thirst perception, variable fitness levels, impaired sweating, and increased susceptibility to dehydration. As people age, their bodies lose the ability to effectively regulate temperature, leading to reduced sweating and slower cardiovascular responses (Canadian Medical Association , 2024; Ebi, et al., 2021; Stewart, et al., 2017). In addition, many older adults live with chronic health conditions such as cardiovascular disease, diabetes, or Parkinson's disease, which further impair their ability to respond to heat stress. For example, diabetes can affect hydration status and nerve function, complicating the body's natural cooling mechanisms (Gagnon, 2025; Stewart, et al., 2017).

Indoor environments can become more dangerous than outdoor settings during prolonged heat events. Buildings without air

conditioning can trap heat like greenhouses, especially at night when temperatures typically peak indoors between 9 p.m. and 10 p.m. (BC Centre for Disease Control, 2025). According to health authorities, indoor temperatures above 26°C can pose health risks, and temperatures above 31°C are considered dangerous for vulnerable individuals. In homes with limited ventilation or cooling options, heat can accumulate over days, increasing the risk of heat-related illness and death (BC Centre for Disease Control, 2025; Stewart, et al., 2017).

2.3.2. Medication Risks and Health Complications

Medication use is another critical factor that increases vulnerability to heat among older adults. Certain medications interfere with the body's ability to thermoregulate, maintain hydration, or respond to heat (Ebi, et al., 2021; Gagnon, 2025). For instance, Beta-blockers, some antidepressants, and anticholinergic drugs reduce the body's ability to produce sweat, limiting natural cooling (Gagnon, 2025).Additionally, diuretics, laxatives, and some diabetes medications increase fluid loss, while antidepressants like fluoxetine and venlafaxine may cause excessive sweating elevating the risk of dehydration (Gagnon, 2025). Antipsychotics and stimulants can raise body temperature, increasing the likelihood of heat stroke, while benzodiazepines and opioids impair cognitive function, reaction time, and decision-making, which may reduce a person's ability to take protective actions during heat events. Anti-inflammatory drugs and certain diabetes medications may become harmful to the kidneys if dehydration occurs. Thus, the combination of aging physiology and polypharmacy (the use of multiple medications) creates a layered vulnerability that significantly elevates heat-related health risks among older populations (Gagnon, 2025).

2.3.3. Indirect and Compounding Risks

Beyond direct physiological effects, extreme heat contributes to worsening pre-existing conditions. It has been associated with increased hospital admissions and mortality due to cardiorespiratory illnesses, mental health exacerbations, and adverse pregnancy outcomes. Heat exposure redirects blood flow to the skin to facilitate cooling, which puts additional strain on the heart and can be dangerous for those with cardiovascular conditions (Canadian Medical Association , 2024; Ebi, et al., 2021).

Social and environmental factors further compound risk. Older adults living alone, those confined to bed, or individuals with limited mobility may be unable to relocate to cooler spaces or access help during extreme heat events. Mental illness and social isolation also reduce the behavioral capacity to recognize and respond to heat risks (BC Centre for Disease Control, 2025; Ebi, et al., 2021). During the 2021 heat wave in British Columbia, the highest mortality rates occurred among seniors who were socially isolated and living in inadequately cooled homes (Canadian Medical Association , 2024). Of the total heat-wave related deaths, 47 people died in community living, assisted living, or long-term care facilities which reflects higher incidence rate than average for people over 65 years old (Beugin, et al., 2023).

Beugin et al., (2023) emphasize that extreme heat can worsen air quality, particularly when concurrently combined with wildfire smoke, thereby exacerbating respiratory illnesses such as asthma and chronic obstructive pulmonary diseases. Higher temperatures and stagnant air can increase ozone and particulate pollution, especially in big cities and dense urban centers (Canadian Medical Association , 2024; Henderson, McLean, Lee, & Kosatsky, 2022).

Another significant factor is the surrounding environment: survivors of fatal heat exposure tended to reside in areas with less tree canopy, higher building density, closer proximity to major roads, and greater distance from large water bodies. These environmental deficiencies reduce natural cooling and magnify ambient heat, particularly in densely built, vegetation-poor neighborhoods (Henderson, McLean, Lee, & Kosatsky, 2022).

2.4. Impacts on the Delivery of Health Care Services

Climate change is increasingly recognized as a health systems crisis, not only through its effects on morbidity and mortality, but also due to its disruption of essential healthcare infrastructure and delivery. The World Health Organization (2024) reports that heat waves can overload emergency departments, strain energy-intensive cooling systems and compromise water and electricity supplies critical for facility operations. In BC, these impacts were tragically exemplified during the 2021 heat wave, which exposed widespread weaknesses in health system preparedness and response (Tsakonas, Badyal, Takaro, & Buse, 2025; Weinstein, Thiel, & Sorensen, 2025).

2.4.1. Disruption of Health Services and Infrastructure

Many of Canada's healthcare facilities, particularly in BC, are aging and ill-equipped to withstand extreme climate conditions. Nearly half of Canada's healthcare facilities were built over 50 years ago and lack modern ventilation or cooling systems (Canadian Medical Association , 2024; World Health Organization, 2024). During the Pacific Northwest 2021 heat wave most homes in the Greater Vancouver area had no air conditioning, and indoor temperatures in some long-term care facilities exceeded 30˚C. The majority of heat-related deaths (98%) occurred indoors, including in

publicly funded or licensed buildings such as long-term care and assisted living residences. (Beugin, et al., 2023).

Compounding the crisis, extreme temperatures strained essential infrastructure. Power failures and overheating affected critical diagnostic equipment in hospitals, impairing the ability to treat time-sensitive conditions such as strokes or traumas. In some locations, the capacity to provide emergency and acute care was directly compromised by heat-related equipment failures and unsafe working conditions (Beugin, et al., 2023; BC Centre for Disease Control, 2025; Tsakonas, Badyal, Takaro, & Buse, 2025; World Health Organization, 2024).

During the 2021 heat wave, hospitals, long-term care facilities, and emergency departments experienced surges in demand at precisely the moment when infrastructure and staff capacity were most strained. According to the Beugin et al., (2023) and the Canadian Climate Institute (2023), there were 530 excess hospitalizations across the province during the 3-week heat wave, and imposed approximately $12 million in additional direct healthcare costs, reflecting both emergency interventions and the longer-term treatment of heat-exacerbated conditions.

2.4.2. Strain on Emergency and Prehospital Services

The healthcare system in BC experienced a surge in demand for emergency medical services during the 2021 heat wave. Ambulance services received a record number of calls, emergency rooms were overwhelmed, and bottlenecks in care delivery emerged across the system. Paramedics were forced to wait hours with deceased patients for a coroner to arrive, while critically ill patients crowded overextended emergency departments (Beugin, et al., 2023; Canadian Medical Association , 2024). Paramedics and first responders faced not only logistical challenges in attending to

patients but also occupational risks from prolonged exposure to extreme heat during their response to outdoor calls (Tsakonas, Badyal, Takaro, & Buse, 2025).

This surge in utilization occurred within the context of already limited access to primary care and record-long emergency room wait times in BC. When health systems are not prepared for heat-related mass casualty events, delays in care can lead to increased complications or death for patients unrelated to heat illness. Indeed, emergency medicine capacity during the 2021 heat wave was severely constrained, with cascading consequences on overall healthcare delivery (Weinstein, Thiel, & Sorensen, 2025).

2.4.3. Economic and Social Costs

The 2021 heat wave led to 740 excess deaths above the historical average, with 619 officially identified as heat-related deaths by the BC Coroners Service. Healthcare-related costs for patients who died suddenly during the event were estimated at approximately $4 million, with an average of $7,029 spent per individual. In total, heat-related hospitalizations during the heat wave resulted in over $8 million in direct healthcare expenditures. Without action on adaptation, these heat related hospitalizations could cost at least $100 million per year by 2030, an increase of 140% from average costs early in the century (Beugin, et al., 2023; Canadian Climate Institute, 2023).

2.4.4. Health Workforce Challenges

Healthcare workers are also severely affected by extreme heat. During the 2021 heat wave, many reported uncertainties about how to cool patients due to a lack of clinical procedures or protocols for heat-related

emergencies. This contributed to moral distress, burnout, and mental health challenges among healthcare providers (Beugin, et al., 2023; Canadian Medical Association , 2024; Weinstein, Thiel, & Sorensen, 2025). Compounding these stressors, the heat wave struck at a time when BC's health system was already grappling with staffing shortages and burnout from the COVID-19 pandemic, forcing healthcare workers to respond to overlapping emergencies with strained capacity (Buse, Smiley, & Takaro, 2025). The psychological toll of caring for critically ill patients in an unprepared system contributed to long-term staff retention issues and workplace dissatisfaction (Beugin, et al., 2023; Buse, Smiley, & Takaro, 2025; Canadian Medical Association , 2024; Weinstein, Thiel, & Sorensen, 2025).

The BC Centre for Disease Control (2025) emphasizes that heat-related emergencies demand proactive planning and response at the organizational and community levels. The absence of clear guidelines for staff and insufficient access to cooling interventions at the time of the event revealed major gaps in the health system's climate resilience. Even though healthcare workers are often on the frontlines of climate-related disasters, many were left without tools, training, or support to manage the crisis.

Sack et al., (2025) note that healthcare providers such as nurses and doctors are among the most trusted professionals, ranking higher than clergy, journalists, and elected officials. Many healthcare providers view climate change as a serious threat and believe that they have a responsibility both to communicate risks and to advocate publicly. However, despite this trust and growing professional awareness, there is still a considerable gap in climate education in healthcare settings.

2.5 Occupational Health and Safety Considerations for Staff Providing Care

Health care workers are among the most exposed groups during extreme heat emergencies, as they must continue to deliver care under hazardous conditions. Occupational health impacts include heat exhaustion, dehydration, fatigue, and exacerbation of existing medical conditions among staff. These risks are compounded by the high psychological stress of working during crisis events, where workers often must make rapid, high-stakes decisions under pressure (Tsakonas, Badyal, Takaro, & Buse, 2025).

During extreme heat events, staff in hospitals, long-term care facilities, and emergency services are required to work extended hours in environments that may lack adequate cooling. This exposes them to risks of dehydration, fatigue, and heat exhaustion, which can compromise both their own health and the quality of care they provide. The 2021 heat wave showed how front-line staff were placed in untenable situations, balancing overwhelming patient needs with personal safety challenges (Beugin, et al., 2023).

Similarly, the 2023 evacuation of Yellowknife, Northwest Territories, during unprecedented wildfires offers another example of how healthcare professionals are impacted by immense physical, emotional and ethical burdens when they have to make urgent and often heart-wrenching decisions due to external threats. Stanton Territorial Hospital and long-term care facilities were forced to evacuate approximately 55 patients and residents, many requiring critical care by air to facilities in Alberta and BC (MxSheffrey, 2023). Over 30,000 people of Northwest Territories were displaced, creating ripple effects that strained health systems in receiving communities and disrupted continuity of care (Knutson, 2023). These scenarios reveal the vulnerability of healthcare infrastructure during climate-exacerbated events and highlight the importance of prioritizing caregiver safety, preparedness, and cross-jurisdictional coordination as central components of health system resilience (Weinstein, Thiel, & Sorensen, 2025).

Moving forward, adaptation must include not only protecting vulnerable patients but also ensuring safe working environments for the health workforce. This includes implementing workplace cooling measures, adjusting scheduling shift patterns, and preparing occupational health guidelines that specifically account for extreme heat (Beugin, et al., 2023). Ensuring staff safety requires both structural and procedural interventions, such as retrofitting facilities with effective cooling, implementing occupational safety guidelines for heat events, and ensuring adequate staffing to reduce overwork. Without these measures, the health workforce remains vulnerable, threatening both worker wellbeing and patient care during future climate emergencies (Tsakonas, Badyal, Takaro, & Buse, 2025).

WHO (2024) recommends that facilities adopt occupational health standards that address hydration, rest cycles, protective clothing, and mental health support for staff working under extreme climate conditions. Additionally, strengthening resilience involves integrating health worker safety into facility planning ensuring staff areas are adequately cooled, supported with rest spaces, and supplied with protective infrastructure. The recent World Health Organization (WHO) - World Meteorological Organization (WMO) joint guidance also notes that over 2.4 billion workers worldwide are exposed to extreme heat, which can reduce worker productivity by 2-3% for every degree Celsius above 20˚C. The guidance calls for tailored occupational heat-health plans which should be co-developed with workers, unions, employers, and health experts. It should be supplemented with education and awareness among first responders, health professionals, employers, and workers to address heat stress, and practical solutions that are environmentally sustainable (World Health Organizaztion, 2025), Without these measures, the very workforce tasked with responding to health crises may become incapacitated, undermining the system's ability to deliver critical services.

3. Research Approach

This study was designed to capture both the physical conditions of care environments and the lived experiences of those who work and reside within them. At Providence Health Care there are 9,000 staff, 1,500 medical staff/physicians, 200 researchers and 1600 volunteers working at 17 sites. Among the 17 sites, 5 are long term care homes, and 1 is an Assisted Living care home for seniors providing 24-hour nursing care. Youville Residence is a multi-level care facility located across from Queen Elizabeth Park in Vancouver and is home to 42 senior residents, and 32 older adults needing specialized mental health services (specialized mental health patients are on separate floors, called Parkview Tertiary Geriatric Psychiatry Unit (Providence Health Care, 2025). At Parkview, patients are 65 years of age and older, having complex functional, mental, social and psychiatric issues that are connected to their dementia (Providence Health Care, 2024).

3.1. Methodology

Ethics approval was received from the UBC-Providence Health Care Research Ethics Board. A mixed method approach was used combining environmental monitoring, surveys and interviews.

i. Data loggers were placed in patient and resident rooms to continuously track temperature, humidity and air pressure during the summer months of 2025 and 2026. These devices are discreet and non-invasive, ensuring privacy and minimal disruption to care routines. This data will allow the research team to assess how indoor heat conditions vary across different facility types and how they affect health outcomes and comfort levels.

ii. Three tailored surveys are administered to HCWs, residents, and SDMs which assessed experiences of heat exposure, perceived health risks, and knowledge or preparedness related to heat-health impacts. HCWs were also asked about their training, workplace protocols and the availability of tools or support during extreme heat events.

iii. Semi-structured interviews were conducted with a subset of HCWs, residents and SDMs following the survey phase. These interviews provide deeper insights into personal experiences, perceived challenges, ideas for improvement to inform development of knowledge translation materials tailored to healthcare workers and operational leaders.

All surveys were conducted via Qualtrics XM survey software. Participants were invited to take part in in-depth interviews, which were conducted through Zoom and in-person. Questions were preceded by a general introduction to study purpose and goals. Most of the interviews were audio recorded, while others were documented through detailed notetaking, depending on participant preference and context. All audio files and verbatim notes were saved to Dropbox and shared with the team.

3.2. Findings and Reflections

Across the study, participation varied among residents, staff, and substitute decision makers (SDMs). A total of 9 resident surveys and 7 in-depth interviews were completed, while staff contributed 26 surveys and 26 interviews, among which 6 were conducted via Zoom. SDMs provided a smaller but meaningful contribution with 2 surveys and 2 interviews.

Recruitment and participation presented ongoing challenge. Identifying and engaging willing respondents required significant time and effort, which slowed

the pace of data collection. Despite posters placed around the facility, many health care workers (HCWs) were unaware of the study. In addition, navigating survey links to express interest for in-depth interviews proved difficult for many staff. In-person outreach helped ease these difficulties.

Staff time constraints also proved to be a barrier, since many participants were managing heavy workloads and competing priorities. In several cases, interviews had to be conducted during brief windows of availability, limiting depth and detail. Some HCWs expressed interest in participating in group conversations rather than individual interviews, as this would better fit their schedules and allow for shared reflections. Administrative and desk-based staff were generally more able to engage in surveys and interviews, while health care aides faced greater difficulty.

Language barriers further complicated participation for some staff. For HCWs whose first language was not English, long or complex survey questions were difficult to interpret.

Another important observation was the variation in comfort with data collection methods: while audio recording was valuable for accuracy, several participants preferred not to be recorded, requiring last-minute reliance on notetaking to ensure responses were captured. Additionally, with recordings, there was the risk of technical issues such as poor sound quality, background noise, or device malfunction, which resulted in occasional partial or unusable data. Furthermore, virtual interviews could not always capture the non-verbal cues, immediate reflections, or contextual observations that are often important in qualitative research.

A recurring theme across both staff and residents was their lack of recognition of heat as a pressing health and care issue. Many respondents noted that climate change often feels abstract or distant, and that extreme heat is not widely

recognized as an urgent concern. This reflects the critical gap in awareness among healthcare workers. Several expressed that the research helped them realize how real and immediate the impacts of climate change are, particularly within healthcare settings. Following the interviews, many staff expressed curiosity and interest in seeing existing heat response plans and guidelines, reflecting both a gap in awareness and a strong demand for practical, accessible tools to support preparedness.

Despite these challenges, the use of gift cards as tokens of appreciation for interview participation was highly effective. The gesture was well received, acknowledged participants' time and effort, and helped build goodwill throughout the study.

4. Recommendations

Based on the findings and challenges observed during this study, several strategies can improve future research and practice.

- Improving Survey Navigation: Future studies should ensure that online survey tools are user-friendly and accessible. Technical difficulties, such as navigating links to indicate interest in interviews, discouraged participation.
- Strategic Recruitment Approaches: Recruitment strategies should go beyond posters or passive outreach. Future studies should prioritize in-person outreach, as it proved most effective, especially since many staff and substitute decision makers do not regularly check email. It should also incorporate direct communication from supervisors, team leaders, or department heads, as well as peer-to-peer word of mouth.
- Data Collection Methods: Future research should combine audio recording with detailed field notes. Having a dedicated research assistant in notetaking could further enhance data quality and reliability. Ensuring

notetaking-quality recording devices could also strengthen the reliability of the data collected.

- Given healthcare workers' limited time and heavy workloads, individual interviews were sometimes difficult to arrange. Several respondents expressed preference for group discussions, which allowed them to share perspectives collectively and efficiently. Future studies should consider offering focus group discussions and/or hybrid approaches (mix of individual and group formats) to maximize engagement while respecting participants' time constraints.

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