

Understanding the Nurses Perspective of Citizen Science and Climate Action

by

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## Abstract

The issue of climate change is one that threatens the foundation of human health and existence. As health professionals and leaders, nurses have been trained to advocate for health, communicate risks, and manage complex systems. This makes nurses ideal candidates to raise awareness, educate and carry it out for climate change and climate action. Citizen science might be a way that fits for nurses to engage in climate action personally and/or within their communities. This qualitative descriptive study used semi-structured interviews to understand nurse's perspective on climate change, citizen science and climate action. Twelve nurses from the interior of British Columbia (BC) were interviewed using a semi structured interview guide. Thematic analysis was employed. Data analysis yielded four themes to describe nurses' perspective on citizen science and climate action: *health impacts; climate knowledge, beliefs, and language; climate action; and system influences*. Nurses explained their personal and professional experiences living through forest fires where the threat of evacuation was ever present. These experiences contributed to their beliefs about climate change and how to contribute both personally and in their workplace to be part of climate action. These findings provide an initial understanding about how nurses think about citizen science and how they might engage in climate action to support our first health system, our ecological system.

*Keywords:* climate action, health impact, nursing, citizen science, engagement.

## **Preface**

This thesis is an original work by Hannah Rempel, with no part of this thesis being previously published. I, Hannah Rempel, was responsible for the thesis study's research design, literature review, methodology, data collection, data analysis, and paper creation. The analysis and composition were led by Hannah Rempel, with supervision provided by Dr. Sherry Dahlke, Dr. Maya Kalogirou and Dr. Kathleen Hunter. Ethics approval was received from the University of Alberta Research Ethics Board, Project Name "Understanding the Nurses Perspective on Citizen Science and Climate Action," No. Pro00121602, on June 26, 2022 and from Interior Health Research Ethics Board No. ID 2022-23-029-E on August 18, 2022.

## **Dedication**

I have only accomplished this work due to my family and friends' foundational love and support. To my husband, Allen Rempel, thank you for being in my cheering section, committing to my goals and loving me in practical ways, like eating a lot of cereal for supper. Thanks to my family and friends who would ask about my thesis, listen, and engage. To my dogs who faithfully sat under my desk well into the nights to keep me company. Thank you to the University of Alberta, Faculty of Nursing, where I found my way to this passion through the core nursing courses, my leadership practicum, creating space to increase my learning about climate change, planetary health and from this work my own climate action response.

## **Acknowledgements**

I want to thank my supervisor, Dr. Sherry Dahlke, for her calm, engaging and thoughtful teaching approach to meet my learning needs, that kept me moving forward with this work. In addition, Dr. Maya Kalogirou and Dr. Kathleen Hunter for their shared enthusiasm and ongoing support in creating this thesis. I would also like to thank Dr. Maya Kalogirou, with whom I first saw your research in my previous workplace and heard about your academic learnings surrounding nurses' perspectives on this emerging health issue. I feel fortunate to have been surrounded by a committee with expertise and experience. The feedback and discussions were invaluable.

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## **Chapter 1: Thesis Overview**

This thesis is presented in a manuscript based format. This chapter provides a background to the problem, my interest and background in climate change and climate action as well as definitions of key terms. Chapter two provides the qualitative descriptive study I completed to answer the question: what is the nurse's perspective of citizen science and climate action? Chapter three discusses implications in greater depth and knowledge mobilization plans.

### **Climate Change**

According to the United Nations, climate change can be defined simply as long-term shifts in temperatures and weather patterns (United Nations, n.d). Scientists understand that climate change is due to a variety of factors and sufficient evidence exists identifying the main driver is human-related activity (Government of Canada, 2019). Put simply, humans burning fossil fuels leads to the emission of greenhouse gases, and ultimately, these emissions lead to increased global temperatures (Intergovernmental Panel on Climate Change [IPCC], 2014). In contrast, the premise of planetary health is that human well-being over the long-term depends on the well-being of the earth, including both its living and nonliving systems (Drake, 2021).

Climate change is only one manifestation of the capacity of human beings to fundamentally change natural and man-made systems. Humans have also had positive impacts by creating transformative innovations like internet communications, artificial intelligence, democracy (Dale et al., 2020), and the global response to the current COVID 19 pandemic. Given some of our successful historical events in moving our world and its inhabitants forward, we can respond to climate change with climate action. Nurses, who are educated to be concerned about health, are important players in responding to climate change.



## **Personal Background**

Care for the environment is an integrated part of my life as a place of restoration and healing, whether in the backcountry hiking or out on the water. The profession of nursing has been my goal since I was seven years old, influenced by my maternal grandfather who was a General Practitioner. In 2012, I was running along Lake Huron, Ontario and a sign captured my attention, it read, “thanks to the volunteers who replanted the local grasses to restore the dunes along the lake.” I phoned a biology professor friend and asked if he knew of any environmental missions he laughed and responded that he was currently writing a research proposal to protect the endangered Limber pine in southern Alberta and was going to be utilizing citizen science methodology in his work. Our family signed up and we along with other families planted 500 disease-resistant saplings as part of a larger research collaborative.

Within my master's studies there were a few academic opportunities that brought me to this thesis work. During my policy class, as part of our weekly classes, we had to bring media excerpts about the latest policy changes, with many students sharing about COVID-19. However, one nurse kept bringing policy changes about climate change. I started to save the articles she shared, and so began my formal learning about climate change. As a requirement of this course, I wrote a policy brief proposing a response to Vernon, BC's 215-page climate action plan and to integrate citizen science and climate action research funding for municipal level climate action. For the leadership practicum, my professor was instrumental in encouraging me to look for a preceptor outside of healthcare. During my policy class, I learned about the Executive Director for Okanagan Basin Waterboard, which is responsible for protecting the Okanagan watershed. The Executive Director accepted me as her leadership student. As a portion of my project work, I investigated locally involved organizations in environmental stewardship, specifically citizen

science opportunities. Thus I wondered, were other nurse professionals thinking about climate change and how to help? What were their thoughts about climate change, citizen science and climate action, would it resonate with them too?

### **Key terms**

**Environmental Stewardship:** Environmental stewardship is the responsible use and protection of the environment (Pawlowska-Mainville, 2020).

**Environmental Advocacy:** Environmental advocacy is presenting information on ecological issues as a way to encourage audiences to adopt more environmentally sensitive practices and biocentric worldviews (Bish, 2020).

**Citizen Science:** Citizen Science is when people share what they observe from the physical world to share that information to the scientific community, and includes things like formulating research questions, conducting scientific experiments, collecting and analyzing data, interpreting results, and even making new discoveries (Garcia, 2020).

**Planetary Health:** An individual combination of two words is common with the premise that human health over the long term depends on the earth's well-being, both its living and non-living systems. Human health and the planet's health are inextricably linked, and our civilization depends on human health, flourishing natural systems and the stewardship of its natural resources (Drake, 2021).

This thesis is the beginning of my personal and professional response towards climate action. The aim of this qualitative descriptive study was to explore and describe the nurse's perspective of citizen science and climate action.

## References

Bish, J., (2020, December 17). *Environmental advocacy come in many surprising outlets.*

<https://www.populationmedia.org/blog/environmental-advocacy-comes-in-many-surprising-outlets>

Dale, A., Robinson, J., King, L., Burch, S., Newell, R., Shaw, A., & Jost, F. (2020). Meeting the climate change challenge: Local government climate action in British Columbia, Canada.

*Climate Policy*, 20(7), 866-880. <https://doi.org/10.1080/14693062.2019.1651244>

Drake, J. (2021, April 22). *What is planetary health?*

<https://www.forbes.com/sites/johndrake/2021/04/22/what-is-planetary-health/?sh=4bece6892998>

Garcia, B. (2020, October 29). *What is citizen science and what is it important?*

<https://blog.temboo.com/what-is-citizen-science/>

Government of Canada. (2019, March 28). *Causes of climate change.*

<https://www.canada.ca/en/environment-climate-change/services/climate-change/causes.html>

Intergovernmental Panel on Climate Change. (2014). *Climate change 2014: Synthesis report.*

<https://archive.ipcc.ch/report/ar5/syr/>

Pawlowska-Mainville, A. (2020, October 22). Environmental stewardship in Canada. The

Canadian encyclopedia. <https://www.thecanadianencyclopedia.ca/en/article/environmental-stewardship-in-canada>

United Nations. (n.d.). *What is climate change?* [https://www.un.org/en/climatechange/what-is-](https://www.un.org/en/climatechange/what-is-climate-change)

[climate-change](https://www.un.org/en/climatechange/what-is-climate-change)

## Chapter 2: The Study

**Aim:** This study aimed to understand nurse' experiences, beliefs and perspectives of climate change, citizen science and climate action.

**Design:** This study was a naturalistic inquiry using qualitative description.

**Method:** Twelve nurses from the interior of British Columbia, Canada were interviewed using a semi structured interview guide. Thematic analysis was employed.

**Results:** Data analysis yielded four themes to describe nurses' perspective on citizen science and climate action: *health impacts; climate knowledge, beliefs, and language; climate action; and system influences*. Nurses explained their personal and professional experiences living through forest fires where the threat of evacuation was ever present. These experiences contributed to their beliefs about climate change and how to contribute both personally and in their workplace settings to be part of climate action.

**Conclusions:** These findings provide an initial understanding about how nurses could engage in climate action and the possibilities of citizen science as an action strategy.to improve our first health system, our ecological system.

**Impact:** To our knowledge this is the first study examining if citizen science was an engagement strategy that nurses would find fit with their health advocacy and science background. Nurses experiences with extreme weather events contributed to their interest in engaging in climate action personally and professionally. Citizen science has potential as an engagement strategy for nurses in their workplace, and communities.

**Key words:** climate action, health impact, nursing, citizen science, engagement.

**What does this add to our Global Community**

- This study offers an understanding of how nurses may experience extreme weather events personally as well as professionally.
- Citizen science is an engagement strategy that nurses may find appealing in climate action.

## **Understanding Nurses' Perspective of Citizen Science and Climate Action**

Planetary health affects human well-being over the long term and depends on the well-being of the Earth's living and non-living systems (Drake, 2021). Climate change threatens the essential ingredients of health, such as clean air, safe drinking water, nutritious foods and safe shelter (World Health Organization [WHO], n.d.). Climate change is impacting people's health and mortality due to increasingly frequent extreme weather events such as heatwaves, storms and floods (WHO, 2021). Social determinants of health, such as incomes, access to health care and social support structures are being undermined due to climate-sensitive health risks experienced unequally by women, children, ethnic minorities, poor communities, migrants, older people, and those with underlying health conditions (WHO, 2021). Nurses have an important role to play in caring for those suffering from climate change events. It is a professional obligation for nurses to understand climate change, its effect on human health, and how to take action (Nurses and Nurse Practitioners of BC, 2022). Nurses may find citizen science as an action strategy in climate action, due to their evidence-based education, critical thinking skills, and leadership. Citizen science, utilizes public lay people to be the labourers, data collectors in climate research, thereby empowering citizens to be co-researchers within their own local interests (Fischer et al., 2021). However, it is unknown how nurses envision their role in climate action, their understanding of citizen science, or if they might see citizen science as a potential engagement strategy for them.

### ***Background***

Climate change has created unprecedented times in the world, impacting individuals in their local, provincial, national, and global communities (Ebi et al., 2021). Increases in severe weather, including floods, droughts, and fires, constitute climate change emergencies (Ebi et al., 2021) that influences human health. As a Canadian example, the Okanagan area in British

Columbia (BC) experienced five extreme weather events in the last five years, with three in 2021. These extreme weather events include drought conditions (Okanagan Basin Water Board [OBWB], 2021), forests fires that burned more than 858,292 hectares of land in BC (Government of BC (GBC), 2021), and in June 2021 temperatures greater than 40 degrees. Researchers attributed the record-breaking heatwave due to human influence on the climate (Prévost-Manuel, 2021).

The United Nations General Assembly united many countries in collective action to tackle the global environmental emergency (Atwoli et al., 2021). Moreover, local governments and citizens have a crucial role in climate action as they have jurisdiction over a significant portion of greenhouse gas emissions, a key contributor to climate change (Dale et al., 2020). Local municipalities have a pivotal role in climate mitigation due to their direct control over critical resources (Dale et al., 2020). A tri-university collaborative research study suggests that some of BC's municipalities' climate change goals were more ambitious than those of the federal government (Dale et al., 2020). Understanding how professional and personal choices contribute to climate change is important as it is a professional responsibility for nurses and other health professionals (Kalogirou et al., 2020).

### **Climate Change and Nursing**

The environment that includes land, air and water is our first health system. Nurses must promote health system changes that support the environment and are ideal candidates to raise awareness of and educate about the importance of planetary health, climate change due to their education on health advocacy, communicators of potential risks and their ability to manage complex systems (Walpole et al., 2019). For example, nurse leaders articulate and comprehend the relationships that influence health systems performance (Phillips et al., 2016) and are experts

at making connections across occupational, departmental and organizational boundaries and government policy (Allen, 2016; Kurth, 2017). The articulating work of nurses brings a fragmented health system together in order to meet the needs of patients (Allen, 2016), making them ideal candidates for supporting planetary health.

Nursing organizations support the mitigation of climate change through nursing practice, policy, administration, education, and research (Canadian Nurses Association [CNA], 2017). Similarly, in England, the Royal College of Nursing (RCN) recognizes that nursing is uniquely placed to advocate, educate and lead action in the fight against the rising temperatures, creating climate change (RCN, 2019). The Canadian Association of Nurses for the Environment (CANE) represents nurses' dedication to improving planetary health, promoting both human health and the health of the natural world (CANE, 2022). As an example of a nurse's potential to lead climate action, a retired nurse became president of the Osoyoos Lake Water Quality Society (OLWQS). The OLWQS is a non-political, non-profit, charitable organization run entirely by volunteers with the mandate to protect the Osoyoos Lake through public education and monitoring the lake's water quality (OLWQS, 2021). The OLWQS uses citizen science to monitor and improve the health of the Osoyoos Lake and the local watershed surrounding this lake through testing the lake's pH, temperature, specific conductance, dissolved oxygen, and water clarity at varying depths, looking for veliger (larval forms of zebra mussels and quagga mussels) This data is shared with the BC Ministry of Environment and Climate Change, provincial decision makers in improving the environmental health system of the Okanagan.

Citizen science is an emerging field of science that has two streams of work: (1) utilizing lay people to be the data collectors for academic researchers and (2) local people being mini researchers in their area of interest with academic research support (Fischer et al., 2021). The



natural stream of citizen science could include sharing personal observations through bird watching or taking water measurements for the scientific community (Garcia, 2020). *Citizen social science* is an emerging engagement strategy that can bring science and communities together for environmental, sustainability and climate action (Fischer et al., 2021). Since healthcare contexts can challenge nurses' environmentally responsible practices (Kalogirou et al., 2021), this study aimed to understand nurses' experiences, beliefs and perspectives on climate change, citizen science and climate action.

## **Method**

### **Research Design**

This study was a naturalistic inquiry using qualitative description (QD) (Sandelowski, 2000). QD is a rich, straightforward description of an experience or an event and it is often used in healthcare environments to explore or describe a complex system and to generate clinically relevant findings (Neergaard et al., 2009; Sandelowski 2000). The analytical process of QD brings the researcher close to the data of a poorly understood phenomenon and describes the participant's experiences in their own words (Neergaard et al, 2009; Sandelowski, 2000).

### **Setting and Sample**

This setting was conducted in a healthcare region within the interior of BC, Canada, with three extreme weather events in 2021; heat dome, drought and forest fires. Registered Nurses (RNs) and Licensed Practical Nurses (LPNs) were recruited from the Vernon area. Purposeful and snowball sampling strategies were used to recruit nurses from the regional hospital and the community health centers (Merriam & Tisdell, 2016). The directors of the regional hospital sent emails about the study and an invitation to participate. Additionally, recruitment posters were placed around the regional site and in staff break rooms in public health departments. Nurses

volunteered to participate by emailing the first author a time for the interview was co-selected. They were then emailed more information about the study and the consent form and offered an in-person or an electronic interview via Zoom.

### **Data Collection**

Ethics approval was obtained by the Research and Ethics Board of the University of Alberta and the regional health authority. Interviews were conducted between August and September 2022 by the first author, a Master of Nursing student. In addition, two participants with an existing relationship with the first author expressed their interest in participating in the research and were directed to contact the second author to be interviewed.

At the beginning of the interview, participants were allowed to ask questions about the interview process, the consent form, data storage and confidentiality. All participants chose the electronic platform; interviews ranged from 38 to 78 minutes. The interview followed a semi-structured interview and was recorded digitally and transcribed verbatim. The interviews began by asking about participants' experiences with the 2021 extreme weather events, their beliefs about climate change, and their knowledge of climate language. Data collection and analysis occurred concurrently until data saturation (no new data emerged) was reached (Merriam & Tisdell, 2016). The researcher also collected demographic information and took field notes to capture reflections and observations during the interviews. Potential identifying data was removed from transcribed data, and participants were assigned pseudonyms.

### **Data Analysis**

Thematic analysis occurred systematically to make sense of the data and create meaning (Braun & Clarke, 2006). The first and second authors manually coded the first transcript using line-by-line coding. A coding framework was developed to record and define the codes and

provide an audit trail. Subsequent transcripts were coded independently by the first author. This process shaped and informed codes, adding to the depth and quality of data analysis (Hsieh & Shannon, 2005). When coding was complete, all data coded with like codes were grouped together. The first two authors read all the codes, met and grouped similar codes to form categories. This process is documented in table 1. Definitions and exemplar quotes were then attached to each category. The first two authors discussed the codes that comprised each category and the relationships between the categories. Agreement about the categories and the themes developed from grouping categories together was achieved through discussion and reflection (Graneheim & Lundman, 2004).

Table 1

*Theme, Category and Code*

<b>Theme</b>	<b>Category</b>	<b>Code</b>	
Health Impacts	States of health	Personal impact	
		Professional impact	
		Health impact	
		COVID-19	
		Environmental impact	
Climate Action	Professional activities	Professional suggestions	
		Professional action strategies	
		Engagement	Enablers to facilitate engagement
			Engagement strategies
	Personal engagement strategies		
	Local activities	Barriers to engagement	
		Personal barriers	
		Local environmental action	
			Climate action

Theme	Category	Code
Climate knowledge, beliefs and language	Climate language	Covid helped climate action
		Forest fire prevention
		Citizen science definition
		Response to citizen science
		Citizen science opportunities, conversations
	Climate knowledge	Environmental stewardship
		Environmental advocate definition
		Climate change knowledge
		Cause of extreme weather events
System Influences	Political	Political party
		Government policy
		Provincial consideration
	Societal	Media
		Religious consideration
		Societies actions to climate change
	Health	Public health strategies
	Workplace	Workplace barriers
		Workplace contribution to climate change
Barriers to nurse engagement		

### Rigor

Trustworthiness was ensured by maintaining an audit trail of coding decisions and researcher reflexivity, and independent data analysis of data by the research team (Graneheim & Lundman, 2004). Credibility was enhanced by supporting the findings with participant

quotations and identifying and analyzing negative cases (Lincoln & Guba, 1985). Data reduction and conclusion drawing were supported by detailed verification of the data, codes, categories and themes. Finally, dependability was assured through the in-depth methodological description and transferability through the thick description of the participant's quotes and, ultimately, the reader (Lincoln & Guba, 1985).

### Findings

Participants included 12 nurses, ten from the regional hospital and two from community programs. Four participants practiced on medical units, three on surgical units, one in primary care, one in community health and three were clinical educators. Eleven were RNs, and one was an LPN. All participants identified as female, aged 29 to 67 years old (mean 46 years). Their nursing experience ranged from 4.5 to 42 years (mean of 19). Seven participants held a nursing degree, one in Anthropology (LPN), and four had Master's in Nursing degrees. See Table 2. Although none had formal education in climate change, one nurse had previously been a card-carrying Greenpeace member. The four themes developed from the data were *health impacts; climate knowledge, beliefs, and language; climate action; and system influences*.

Table 2

#### *Demographic Information*

	Educator	RN	LPN	Total	Male	Female	Average Age	Average years of experience
Medicine	3	3	1	7	-	7	46	22
Surgery	1	2	-	3	-	3	40	16
Community Care	-	1	-	1	-	1	40	15
Primary Care	-	1	-	1	-	1	52	17
Total	4	7	1	12	0	0	45	18

## **Health Impacts**

Health impacts describe participants' personal and professional experiences of the three extreme weather events in BC during 2021. Weather events that occurred within the context of COVID-19 compounded the health impacts: "... and there was Covid on top of that [the extreme weather events]" (Mary).

### ***Personal***

Participants described how the extreme weather events affected their lives physically, emotionally and mentally. A heat dome of 48 degrees Celsius increased the risks of forest fires and forced participants to stay inside to escape the heat. Participants' voices quickened with a sense of urgency in their voice when discussing the extreme weather events. There were alerts during forest fires, which encouraged residents to be prepared, part of which was a packed "Go Bag" to be ready at all times. Brenda explained that the Go Bag could not include irreplaceable and precious belongings "like the bowtie my grandfather wore at our wedding." Participants described the mental impact of ash falling on their properties, contributing to "the lack of stability and safety ... in your own home ... home should be a haven, so if that is threatened ... [it] takes away your ability to cope...then you are not so tangibly solid at work" (Georgina). Similarly, Christie, a young mother, shared the intertwining of personal and professional impacts when she said goodbye to her two and four-year-old children as she went to work, wondering if they would be evacuated before she came home: "I do not know that might happen here [as I left to work] ... [it] was a little bit scary."

### ***Professional***

Most participants experienced evacuation alerts for their homes and the healthcare facilities they worked within. Since nurses are essential workers in states of emergency, staff

booked time off was cancelled. However, “we had a lot of sick calls ... during that time ... people are trying to manage their homes” (Nellie). Christie was conflicted between showing up to work and her family: “I still had to be responsible to be present at work ... even if we were evacuated from our home”. Participants found the tension between professional and personal responsibilities distressing: “it made me feel very ... very powerless through the experience; I understand my professional responsibility” (Heather).

With the whole city on evacuation alert, there was a massive influx of older adult patients who were not coping at home to the hospital. In addition, families and adult children often lived too far away to provide immediate care for their hospitalized older loved ones. Isabel worked with patients that said: “‘I cannot go home, or my kids cannot help me, or we have been evacuated,’ which made discharge planning quite interesting.” Similarly, Katie explained the discharge planning challenges at the hospital: “the older adult lives alone ... discharging people to an environment that was far from ideal ... potentially hazardous ... [knowing] that the solution was not just that they stay in the hospital.”

Chaos, stress, conflicting information, and diversion of services were experienced in preparation for admissions while planning for a possible evacuation order. Lucinda explained that “there were a number of diversion plans on the go, and from one night to the next, it felt like things were constantly changing.” Andy described her helplessness as she witnessed ambulance after ambulance with older adults coming through the emergency room doors: “... [there was] no plan for either the fire or the heat dome.... feeling helpless ... was really scary ... we were unequipped”.

Some participants also recognized the broader impacts on the community due to the extreme weather events in the context of COVID-19. Heather shared the impact on the

community: “tourism (industry was down) ... when the logging can’t happen (due to fires) ... pulp mills can’t (operate) ... grocery store (owners can’t make a living)... you see it’s all related”. Andy highlighted the ecological impact: “what about the crops? Did this kill the blossoms [on the fruit trees]?” Despite these concerns, many expressed gratitude for their safety and professional careers when some community members “lost their homes” (Heather).

### **Climate Beliefs, Knowledge, and Language**

Participants shared their knowledge and beliefs about climate change. They were also asked about three climate change terms: environmental stewardship, environmental advocacy, and citizen science.

#### ***Beliefs and Knowledge***

Mary summed up what many discussed about climate change: "I think this is totally man-made, we have been seeing it coming for decades, and we have not [responded] ... and now it is kind of hitting a crisis point". All participants believed the three extreme weather events resulted from climate change. Katie added, "... there is natural fluctuations in our weather... the extent of climate change from the human impact and the environment is just creating these extremes". Some, like Brenda, confessed: "I don't have a lot of information or education around ... climate change". Others like Emily saw human lifestyles and consumerism affected the environment: "I do not think we can continue our industrialized world ... and expect anything different ... I was not at all surprised [at the extreme weather events]".

#### ***Environmental Stewardship***

Participants’ definitions of environmental stewardship highlighted action and leadership to protect the environment. For example, Emily defined it as “being personally aware of your contribution in preserving the environment ... being conscious about your buying, [what] you eat



... not contributing to the problem". In contrast, Heather viewed being an environmental steward in broader leadership terms where "you take a project on and lead it ... you are actually invested, a leader". She gave an example of a friend's stewardship in youth education through educating "about [planting] more trees ... he gives free energy to educate people about the environment and trees".

### ***Environmental Advocate***

Participants considered an environmental advocate a higher level of engagement than an environmental steward. Christie viewed an advocate as: "somebody who is a little bit more outspoken, who is out there and trying to spread the ways that we can help save the environment." Emily extended this idea to "somebody who is willing to step up ... have a discussion about it, and be engaged at a policy ... local ... provincial ... national ... civic ... neighbourhood level ... being a knowledge translator."

### ***Citizen Science***

Citizen science was a new term for all the participants. Brenda guessed that it could mean "what the community is doing to make an impact on the environment." Andy thought it might be "what I know as a citizen that is happening with change in the scientific world." Emily explained citizen science as "a participant ... in a cultural and physical space, and science would be bringing scientific knowledge to that space ... It promotes a shared responsibility ... and then I can contribute something". Finally, Isabel explained the term as "the community performing ... not an experiment but a scientific event at a community level ... we count Herons ... volunteers watching, counting ... and that [data] goes to scientists."

After participants guessed at what they thought citizen science was, they were read a working definition and asked for their opinions. Most participants discussed the potential of

nurses' involvement in citizen science for climate action. Andy discovered she had been participating in citizen science without even knowing what it was:

I used to write down the day this flock of birds would show up ... it was in my own journals ... one year they never came back ... So I investigated a little bit, and ... they used to nest on the stream ... [developers] moved the stream ... So then I put the pieces of the puzzles altogether.

Some participants, like Christie, believed that citizen science could close the gap: "science belongs to scientists ... but if every person could do it ... I actually think they would pay more attention to it." She went on to explain that it offered "a collaborative approach to involvement. I think the more you involve people in the process, and just ordinary people ... they are probably going to care more about the outcome of it". In addition, citizen science allowed participants to see beyond their role to larger community organizations and governments' role in engaging citizens in climate action. Heather suggested that "if they started government environmental training ... that is a huge group of people, we could help the province to [take climate action]". Emily brought a practical perspective to citizen science:

The more you have involved, the more data you are going to collect ... [and the] more comprehensive data you are going to have ... I think that it is probably going to make citizens more aware of science ... more invested in it and the outcomes. I think it is going to make it more real for people, and ... it will promote ... being invested, not just today but in the future, because that is what science is about.

Mary saw potential in creating awareness of citizen science in the healthcare workplace: "maybe on the job...workshops or events ... on the staff room wall... the [health authority] could fund research." Similarly, Nellie saw opportunities through using phones to take pictures and upload

them to scientists, “on a bike ride ... saw four snakes ... I could take pictures ... [and] send to a database ... I wonder how they [health authority] could advertise things like that to get people out more and to participate?”

### **Climate Action**

Climate action describes what participants saw as possible activities for climate change in their community, both personally and professionally.

### ***Community Action***

Many participants spoke of a local store created by a colleague from the regional hospital that reduces the use of plastics. Community pride was apparent when they described how “we can take our previous hand soap bottles and dish soap bottles and refill ... with no waste” (Christie). Another community action initiative was the local provincial park and its respective society, creating events for volunteers to be environmental stewards, “dealing with invasive species [by uprooting plants]” (Isabel). Heather described another community society for a local lake that provided the area’s drinking water: “that group is very interested in monitoring the lake looking [for] those mussels and [measuring] the water temperature.”

Participants understood the power of climate action by creating awareness and leveraging local organizations and institutions, like nature and science centres, in partnerships with schools. Katie explained that her child’s school had a program in partnership with the local science centre and planting a local garden on the school grounds so that they understood “that [the food] does not just come from the grocery store...[and in our] hot lunch program...we use the community garden and local suppliers.” Additionally, Katie advocated for the decision to have the children walk to the science center for their class field trip, “there is no reason they cannot walk 3 km to

the science centre as opposed to taking the school bus ... hopefully raising our kids to be more thoughtful [about the environment].”

Isabel provided some examples of the community partnering with academia because she knew an academic that:

worked together with the mayor and other community members to get [municipally supported] composting [and a university student] took a street ... [and said] 'let's plant some plants or shrubs in the boulevard' ... in people's yards ... [teaching] them about the science of [the plants] ... all community outreach stuff.

Four participants shared a successful community project to protect some land between residential and a future development, to preserve a bird sanctuary for the Great Blue Herons. Isabel explained how the herons' habitat was protected by citizens “counting herons ... [and the data] goes to scientists.”

### ***Personal Action***

Participants explained how the pandemic had created a space to consider other ways of living that were more responsible for the climate. For example, Georgina explained:

we didn't go out as often ... made due because you didn't want to go out ... so as far as climate change, less waste because you would use less products, less gas ... less emissions ... less travel ... we stopped flying, less commercialism. Less eating out, so less waste.

Lucinda explained this shift had created space to bring the environment into everyday activities as “every day ... you are engaging small choices that make a difference and that feels a lot better.” Donna explained that during the pandemic they had “nowhere to go so we made our yard

more kid-friendly ... we thought outside the box of activities we could do within our own area, and we were surprised actually at places ... So it did open our minds”.

Others were inspired to take more action and were curious about what kind of initiatives were just outside their homes. Lucinda explains, “you do not have to overwhelm yourself by thinking that you have to do it all in one day ... all those little small changes ... add up and they do make a difference”. Donna believed climate action required "a mass change from a very personal ... to a higher sort of manufacturer level".

### ***Professional Action***

Professional climate action opportunities participants’ discussions revolved around their workplace. Emily highlighted the importance of strong nursing leadership and nurses having a: ... purposeful ... plan ... [it will] take someone to be passionate about it ... there are competing priorities at a hospital ... there is not enough time in the day to get everything done [for patient care]. If we have someone passionate about it ... it can even happen ... where they have [even] better recycling [than other units] ... just one person who has decided that they want to do things differently.

Donna pointed out, “the recycling ... in two recycling receptacles in each med room ... [are] not very practical for people.” Emily disclosed that the obstacles to climate action in the workplace contributed to her not feeling “very engaged with it at work ... or [it] has not been particularly encouraged, or addressed in the workplace.”

### **System Influences**

Participants identified major systems that influenced climate change and had the potential to contribute to climate action. These included politics, health, workplace, and society.

### ***Politics***

Politics has a significant influence on climate action, whether it is positive or negative. Andy explained that, “Climate change cannot be politicalized ... It has to be something we all agree on... [and] move forward with making great sound policies ... lowering the [earth’s] temperature.” Lucinda suggested that government incentives were needed, such as “biking, biking, walking initiatives ... incentives for clean energy, like electric cars, bikes, heat pumps”. Mary highlighted how policies to enhance climate change incentives could become political explaining that COVID-19, “has taught us that some will not follow, they will argue, and some politicians will seek to reverse mandates”. Similarly, Nellie explained that “unless the politicians will take it, run with this and make it a priority it seems to be on the back burner.” Andy offered that, “Consumers will drive [change] ... because ... what sells, then [producers] will figure out ways to do it ... consumers can drive [environmental] change.” Perhaps consumers could lead change in a political way as well.

### ***Healthcare***

Participants discussed how the pandemic public health strategies limited people's lifestyles for the health of all, and these same ideas could be applied to planetary health. When "Covid happened, we really united as a community ... everybody took ... [it] seriously... Why can't we do that with climate change?" (Andy). Moreover, Heather saw an opportunity to step up and be a voice to move the population towards climate action as nurses can: "influence 80% of the public". In order to enact public health strategies for the climate, Isabel identified the need for "strong leadership ... [and] power in numbers." Similar to the pandemic, Katie explained what would be needed for climate action would need to be similar to how COVID-19 health guidelines were presented: "a clear voice, the actions required were broken down, were actionable, and the message was reinforced."

### *Workplace*

Participants highlighted the paradox of the healthcare sector's contribution to health and yet excessive waste, buildings and infrastructure that were not contributing to planetary health. "The hospitals do a horrendous job being thoughtful about our environmental impact" (Katie). Many participants mentioned the waste of single-use items: "so many things are single use, and quite unnecessary ... a lot of packaging" (Donna). Lucinda explained that "it is heartbreaking, [to] throw things out ... do not have much influence over climate at work".

Participants discussed barriers to environmental action within healthcare. Georgina highlighted the time constraints of working in health: "nurses are burnt out and exhausted ... we are feeling over-worked, nurses are focused on patients, not about recycling or other climate action strategies." Katie explained that "we are focused on fixing [patients] ... feel that [climate action] has not particularly been encouraged ... they [nurses] are going to come up to obstacles."

### *Societal*

Participants shared how they believed societal values influenced awareness and conversation about climate change and were reflected in the media because "there is no glamour in environmental issues." (Mary). Many recognized that the media plays an essential role in creating awareness about climate change, but Mary cautioned that the media could be creating climate action inertia in the public:

now ... every month you ... hear something about climate change, big weather events, everybody is getting more interested, only because they are affected by these weather [events] ... but ... [there is] a lot of talk about weather events themselves, but not what we can do personally to help change this.

## **Discussion**

The findings from this study highlight how extreme weather events impacted nurses' beliefs and interest in climate action both personally and professionally. Moreover, participants articulated the health implications of these events, their understandings of climate language, their thoughts about citizen science as an engagement strategy, and climate action strategies from a personal, professional, workplace and societal level. Furthermore, participants relayed the challenges to a climate consciousness in healthcare systems that could contribute to climate action.

Like our participants' descriptions of the mental health impact due to climate change, the Intergovernmental Panel on Climate Change (IPCC) reports the impacts, adaptation and vulnerability to climate change and discusses how climate change can impact people's mental health (IPCC, 2022). Participants' experiences of climate change were compounded by the context of COVID-19, similar to other scholars' findings identifying how these two significant events can snowball effect on individuals (Aknin et al., 2022). Similar to our participants' experiences of stress and possible anxiety due to climate change, which was evident in their stories, Ergin et al. (2021) reported that nursing students experienced higher anxiety levels about climate change due to COVID-19. Hrabok et al. (2020) described the mental health impact of climate change and natural disasters leading to anxiety and depression.

Our participants all saw the extreme weather events affecting their community's health, workplace and neighbours' livelihoods. In contrast, Schenk et al. (2020) participants saw climate changes related to natural conditions in their geographical area. However, they did not speak of the health implications of those events on nurses or their workplaces. Our participants described the challenges of managing themselves and patient care amid the heat dome when the regional hospital went on evacuation alert. The nurses felt ill-prepared to respond to such a disaster. Loke



et al. (2021) systematic review identifies nurses' role in disaster management. It suggests that nurses require enhanced disaster nursing education and training, which is not offered in their basic education and may be insufficient in workplace training.

Schenk et al. (2020) suggest that awareness leads to positive health actions. Similarly, participants in this study had natural events highlighting climate change. Thus, they participated in climate action strategies in their personal lives, yet often, they felt discouraged from engaging in workplace strategies. This was likely due to having more control over their home life, with workplaces influenced by regulations, infection prevention guidelines, and energy use needs (Schenk et al., 2020). Similar to our study, Kalogirou et al. (2021) reported that hospital contexts often challenge nurses' environmentally responsible practices. Anåker et al. (2015) also identified that the immediate needs and demands of patient care in healthcare settings ranked higher than environmental concerns.

Although climate action opportunities at work were limited for our participants, they mentioned recycling and limiting single-use plastics, similar to Kalogirou et al. (2020) findings with hospital nurses. In contrast, Schenk et al. (2020) participants did not address climate change at their workplace because they did not know what to do and felt overwhelmed. Ironically, healthcare institutions may have patients negatively impacted by climate change while contributing to climate change (Law, 2021). Healthcare institutions globally contribute 4.4 % of greenhouse emissions, and if healthcare were a country, it would be the fifth largest emitter on the planet (Karliner & Slotterback, n.d.).

Once our participants expressed their understanding of citizen science, some considered it an opportunity to engage in climate action within their workplace by sharing local opportunities in staff breakrooms. The biological and social sciences have primarily reported citizen science as

making significant ecological contributions (McKinley et al., 2017). To our knowledge, this is the first study introducing the concept of citizen science to nursing. Bonney et al. (2016) findings are similar to some of our participant's perspectives of citizen science opportunities, that citizen science provides engagement in science and climate action.

The premise of planetary health is that human well-being over the long term depends on the earth's well-being, including both its living and nonliving systems (Drake, 2021). Although none of the participants used the term planetary health, they did express the principles of it through their suggestions for climate action. They were eager to see their healthcare organization become more environmentally responsible. Kalogirou et al. (2020) suggest that healthcare organizations could benefit from integrating a planetary health perspective into their policies to deliver healthcare that considers the health and safety of humans and the climate.

In sum, our participants thought it was important to do small things, help with climate engagement, and feel empowered with the idea that the everyday person can make a difference. Similarly, Schenk et al. (2020) found that action-orientated guidance with tangible opportunities for advocacy with some education could facilitate nurse engagement in addressing climate and health.

### **Limitations**

A limitation was as an exploratory study, and the sample size could have been too small to explore a wide range of issues. The participants were all directly impacted by the extreme weather events of 2021, which could have contributed to their strong connection to climate change and climate action. Given the extreme weather events in other areas, it could also be part of our global context. It is also possible that only nurses who were interested in environmental

issues volunteered for this study. Nurses with different experiences could have expressed different perspectives.

### **Implications**

The findings revealed that climate change had impacted nurses and will continue to be impacted. Living through the 2021 extreme weather events compounded the impact, personally and professionally compounded the impact. People do not live in silos; work is impacted when the home is threatened, and the inverse is also true. Given the likelihood of increasing extreme weather events, nurses may need more education about disaster planning and response. Due to nurses' education and professional experiences and the emerging research about climate change, academic, health institutions, and health authorities should take note. Nurses can be advocates for climate action in their workplaces, and citizen science may be one avenue for their engagement.

Improving and reporting on patient safety, quality improvement and clinical care pathways already exists in healthcare to improve patient outcomes and address waste and inefficiencies in healthcare (British Columbia Patient Safety & Quality Council [BCPSQC], 2023). This type of work is imperative in a public resource-restricted healthcare system, and nurses can be part of voicing waste and inefficiencies using quality improvement methodology. With the environmental impact of healthcare, now is the time to dovetail environmental performance metrics with quality improvement work (Sherman et al., 2020).

The findings from the study suggest that future research engaging nurses and healthcare professionals through citizen science methodology could be promising. A partnership between health authorities and academic partners could facilitate research about local environmental action within health institutions.

## **Conclusion**

This study describes nurses' perspectives on citizen science and climate action. Nurse leaders must mobilize systems, individual-level strategies and resources to support nurses and their populations (Hofmeyer & Taylor, 2021). This research describes nurses' perspectives on climate change, climate action and citizen science through compelling narratives about the health impacts of extreme weather events. The extreme weather events motivated participants to participate in climate action. Although a new term, participants could see the potential for using citizen science personally and professionally.

## References

- Aknin, L. B., De Neve, J.-E., Dunn, E. W., Fancourt, D. E., Goldberg, E., ... Ben Amor, Y. (2022). Mental health during the first year of the COVID-19 pandemic: A review and recommendations for moving forward. *Perspectives on Psychological Science*, 17(4), 915–936. <https://doi.org/10.1177/17456916211029964>
- Allen, D. (2016). *The invisible work of nurses: Hospitals, organisation and healthcare*. New York, NY: Routledge Palgrave.
- Anåker, A., Nilsson, M., Holmner, Å., & Elf, M. (2015). Nurses' perceptions of climate and environmental issues: A qualitative study. *Journal of Advanced Nursing*, 71(8), 1883-1891. <https://doi.org/10.1111/jan.12655>
- Atwoli, L., Baqui, A., Benfield, T., Bosurgi, R., Godlee, F., Hancock, S., Horton, R., Laybourn-Langton, L., Monteiro, C., Norman, I., Patrick, K., Praities, N., Rickkert, M., Rubin, E., Sahni, P., Smith, R., Talley, N., Turale, S., & Vazquez, D. (2021) Call for emergency action to limit global temperature increases, restore biodiversity, and protect health. *Cadernos de Saúde Pública*, 37(9) 1-5. <https://doi.org/10.1590/0102-311X00194721>
- British Columbia Patient Safety & Quality Council [BCPSQC]. (2023). *Our Vision and Values*. <https://bcpsqc.ca/about-the-council/our-vision-and-values/>
- Bonney, R., Phillips, T., Ballard, H., & Enck., J. (2016). Can citizen science enhance public understanding of science? *Public Understanding of Science*, 25(1), 2-16. <https://doi.org/10.1177/0963662515607406>
- Braun, V. & Clarke, V. (2006) Using thematic analysis in psychology. *Qualitative Research in Psychology*, 3, 77-101. <https://doi.org/10.1191/1478088706qp063oa>
- Canadian Association of Nurses for the Environment. (2022). *Who we are*. <https://cane-aiie.ca/>

- Canadian Nurses Association. (2017). *Climate change and health position statement*. [https://hl-prod-ca-oc-download.s3-ca-central-1.amazonaws.com/CNA/2f975e7e-4a40-45ca-863c-5ebf0a138d5e/UploadedImages/documents/Climate\\_change\\_and\\_health\\_position\\_statement.pdf](https://hl-prod-ca-oc-download.s3-ca-central-1.amazonaws.com/CNA/2f975e7e-4a40-45ca-863c-5ebf0a138d5e/UploadedImages/documents/Climate_change_and_health_position_statement.pdf)
- Dale, A., Robinson, J., King, L., Burch, S., Newell, R., Shaw, A., & Jost, F. (2020). Meeting the climate change challenge: local government climate action in British Columbia, Canada. *Climate Policy*, 20(7), 866-880. <https://doi.org/10.1080/14693062.2019.1651244>
- Drake, J. (2021, April 2021). *What is planetary health?* Forbes. <https://www.forbes.com/sites/johndrake/2021/04/22/what-is-planetary-health/?sh=4bece6892998>
- Ebi, K., Vanos, J., Baldwin, J., Hondula, D., Errett, N., Hayes, K., Reid, C., Saha, S., Spector, J., & Berry, P. (2021). [Extreme weather and climate change: Population health and health system implications](#). *Annual Reviews*, 42(1), 293-315. <https://doi.org/10.1146/annurev-publhealth-012420-105026>
- Ergin, E., Altinel, B., & Aktas, E. (2021). A mixed method study on global warming, climate change and the role of public health nurses from the perspective of nursing students. *Nurse Education Today*, 107, (105144). <https://doi.org/10.1016/j.nedt.2021.105144>.
- Fischer, A., Dinnie, E., Ellis, R., Eastwood, A., Carter, A. & Welsh, G. (2021). Exploring the potential of citizen social science for environmental and sustainability research: Experiences of and with community-based researchers. *Citizen Science: Theory and Practice*, 6(1), 1–12. <https://doi.org/10.5334/cstp.389>
- Garcia, B., (2020). What is citizen science and what is it important? <https://blog.temboo.com/what-is-citizen-science/>

- Graneheim, U. H., & Lundman, B. (2004). Qualitative content analysis in nursing research: concepts, procedures and measure to achieve trustworthiness. *Nurse Education Today*, 24, 105-112. <https://doi:10.1016/j.nedt.2003.10.001>
- Hrabok, M., Delorme, A., & Agyapong, V. I. O. (2020). Threats to mental health and well-being associated with climate change. *Journal of Anxiety Disorders*, 76, 102295. <https://doi.org/10.1016/j.janxdis.2020.102295>
- Hsieh, H., & Shannon, S. E. (2005). Three approaches to qualitative content analysis. *Qualitative Health Research*, 15(9), 1277-1288. <https://doi:10.1177/104973205276687>
- Hofmeyer, A., & Taylor, R. (2021). Strategies and resources for nurse leaders to use to lead with empathy and prudence so they understand and address sources of anxiety among nurses practising in the era of COVID-19. *Journal of Clinical Nursing*, 30(1), 298-305. <https://doi.org/10.1111/jocn.15520>
- Intergovernmental Panel on Climate Change. (2022). IPCC sixth assessment report. Impacts, adaptation and vulnerability. <https://www.ipcc.ch/report/ar6/wg2/>
- Kalogirou, M. R., Dahlke, S., Davidson, S., & Yamamoto, S., (2020). Nurses' perspective on climate change, health and nursing practice. *Journal of Clinical Nursing*, 29(23-24), 4759-4768. <https://doi-org.login.ezproxy.library.ualberta.ca/10.1111/jocn.15519>
- Kalogirou, M. R., Olson, J., & Davidson, S. (2020). Nursing's metaparadigm, climate change and planetary health. *Nursing Inquiry*, 27(3), 1-9. <https://doi.org/10.1111/nin.12356>
- Kalogirou, M. R., Dahlke, S., Davidson, S., & Yamamoto, S., (2021). How the hospital context influences nurses environmentally responsible practice: a focused ethnography. *Journal of Advanced Nursing*, 77, 3806-3819. <https://doi.org/10.1111/jan.14936>

- Karliner, J., & Slotterback, S. (n.d.). *Healthcare's climate action footprint*. [https://noharm-global.org/sites/default/files/documents-files/5961/HealthCaresClimateFootprint\\_092319.pdf](https://noharm-global.org/sites/default/files/documents-files/5961/HealthCaresClimateFootprint_092319.pdf)
- Kurth, A. E. (2017). Planetary health and the role of nursing: a call to action. *Journal of Nursing Scholarship*, 49(6), 598-605. <https://doi.org/10.1111/jnu.12343>
- Law, J., Kalogirou, M. R., & Dahlke, S. (2021). Nurses as boundary actors in sustainable health care: A discussion paper. *Witness: The Canadian Journal of Critical Nursing Discourse*, 3(2), 36-46. <https://doi.org.10.25071/2291-5796.105>
- Lincoln, Y., & Guba, E. G. (1985). *Naturalistic Inquiry*. Sage
- Loke, A. Y., & Molassiotis, A. (2021). Development of disaster nursing education and training programs in the past 20 years (2000-2019): a systematic review. *Nurse Education Today*, 99, 104809, 1-19. <https://doi.org/10.1016/j.nedt.2021.104809>
- McKinley, D.C., Miller-Rushing, A.J., Ballard, H.L., Bonney, R., Brown, H., Cook-Patton, S.C., Evans, D.M., French, R.A., Parrish, J.K., Phillips, T.B., Ryan, S.F., Shanley, L.A., Shirk, J.L., Stepenuck, K.F., Weltzin, J.F., Wiggins, A., Boyle, O.D., Briggs, R.D., Chapin III, Soukup, M.A. (2017). Citizen science can improve conservation science, natural resource management, and environmental protection. *Biological Conservation*, 208, 15-28. <https://doi-org.login.ezproxy.library.ualberta.ca/10.1016/j.biocon.2016.05.015>
- Merriam, S. B., & Tisdell, E. J. (2016). *Qualitative research*. Jossey-Bass.
- Neergaard, M.A., Olesen, F., Anderson, R.S., & Sondergaard, J. (2009) Qualitative Description – the poor cousin of health research? *BMC Medical Research Methodology*, 9(52), 1-5. <https://doi:1186/1471-2288-9-52>



- Nurses and Nurse Practitioners of British Columbia. (2022). *The role of nursing in climate change: Action for nurses in a changing world*. <https://www.nnpbc.com/pdfs/policy-and-advocacy/issues/Role-of-Nursing-in-Climate-Change-Guide.pdf>
- Okanagan Basin Water Board (2021). *Waves of change. 2021 annual report*.  
[https://www.obwb.ca/newsite/wp-content/uploads/2021\\_obwb\\_annual\\_report.pdf](https://www.obwb.ca/newsite/wp-content/uploads/2021_obwb_annual_report.pdf)
- Osoyoos Lake Water Quality Society (2021). *About*. <https://www.osoyooslake.ca/about/>
- Phillips, J.M., Stalter, A.M., Dolansky, M.A., & Lopez, G. (2016). Fostering future leadership in quality and safety in healthcare through systems thinking. *Journal of Professional Nursing*, 42(1), 15-25. <https://doi.org/10.1016/j.profnurs.2015.06.003>
- Prévost-Manuel, J. (2021, July 12). *Heat wave. Climate change. Canadian Broadcast Corporation*. <https://www.cbc.ca/news/science/heat-wave-climate-change-1.6093730>
- Sandelowski, M. (2000). Whatever happened to qualitative description? *Research in Nursing & Health*, 23(4), 334-340. [http://onlinelibrary.wiley.com/journal/10.1002/\(ISSN\)1098-240X](http://onlinelibrary.wiley.com/journal/10.1002/(ISSN)1098-240X)
- Schenk, E.C., Cook, C., Demorest, S., & Burduli, E. (2020). Climate, health and nursing tool (CHANT): Initial survey results. *Public Health Nursing*, 38(2). 152-159.  
<https://doi.org/10.1111/phn.12864>
- Sherman, J.D., Thiel, C., MacNeill, A., Eckelman, M. J., Dubrow, R., Hopf, H., Lagasse, R., Bialowitz, J., Costello, A., Forbes, M., Stancliff, R., Anastas. P., Anderko, L., Baratz, M., Barna, S., Bhatnagar, U., Burnham, J., Cai, Y., Cassels-Brown, A., ... Bilec, M. (2020). The green print: advancement of environmental sustainability in healthcare. *Resources, Conservation & Recycling*, 161(2020), 1-11.  
<https://doi.org/10.1016/j.resconrec.2020.104882>

Walpole, S. C., Barna, S., Richardson, J., & Rother, H. A. (2019). Sustainable healthcare education: integrating planetary health into clinical education. *The Lancet Planetary Health*, 3(1), 6-7. [https://doi.org/10.1016/S2542-5196\(18\)30246-8](https://doi.org/10.1016/S2542-5196(18)30246-8)

World Health Organization. (2021). *Climate change and health*. <https://www.who.int/news-room/fact-sheets/detail/climate-change-and-health>

World Health Organization. (n.d.). *Climate change*. [https://www.who.int/health-topics/climate-change#tab=tab\\_1](https://www.who.int/health-topics/climate-change#tab=tab_1)

### **Chapter 3: Implications**

I will now expand on the implications of this study by using the five domains of nursing: leadership, clinical care, education, policy and research (CNA, 2022). These domains are all underpinned by nurse leadership as they are creating, utilizing research to shape, analyze, and create policy, changing the educational landscape as they act as innovators and visionaries through all levels of the profession for planetary health. As nurses promote health and wellness, they have a professional responsibility to educate themselves, inform patients and clients, get involved in reputable organizations already supporting planetary health. Nurses could advocate for changes in their clinical environments, their education programs, as well as join a local government climate action committee, to advocate both personally and professionally. For the sake of planetary health, nurses as a profession and as individuals need to find their passion and potential influence in sustainable policy and practices. The following are the implications for nurse leadership expressed within clinical nursing, education, research and policy.

#### **Clinical Nursing**

As trusted health experts, nurses are leaders in helping to build healthy communities through adapting to climate change and advocating on behalf of patients and the environment for a more sustainable future (Nurses and Nurse Practitioners of British Columbia [NNPBC], 2019). In healthcare settings, nurses could critically examine their workplaces that produce toxic emissions that undermines the health of the very communities that they serve (WHO, 2009) and advocate for changes such as a moving away from single use items and promotion of recycling. Nurses could be advocates for better continence care and reduce the waste of disposable absorbent incontinence products (Brewster et al., 2022). Another option could be to create Green Teams or Sustainability committees to help advocate and administrate planetary health within the work

community. Green teams are multidisciplinary groups of people who work towards creating changes to support sustainability through education, awareness and starting and supporting green initiatives (Law et al., 2021). This could include partnerships with community organizations to healthcare organizations on ways to be green, such as planting biodiverse gardens and trees to offset the CO<sub>2</sub> emissions that are the current cost of doing care. Moreover, nurses through green teams and sustainability groups could reach out to organizations for financial incentives and structures to support sustainability opportunities. Nurses could mentor other nurses by sharing existing planetary health webinars that have already been created by organizations like Canadian Association of Schools of Nursing (CASN) and the Canadian Association of Nurses for the Environment (CANE). Furthermore, nurses could collaborate with workplace administrators to create a disaster preparedness committee that would support education about disasters, have simulations to practice procedures like evacuation and communication systems. Such steps would improve emergency responses and make frontline staff feel confident should they need to execute them.

### **Nursing Education**

Since health promotion and prevention of illness at a population health level is a dwindling opportunity for nurses (Domm & Urban, 2020), nursing education institutions need to have a critical review of their current curriculum to be teaching planetary health. The creation of the Planetary Health Education Framework was commissioned by the Planetary Health Alliance (Planetary Health Alliance [PHA] 2021) and CASN has responded within a Canadian the context within the schools of nursing to provide a way for a change in the curriculum as it pertains to planetary health (CASN, 2022). Graduate level nursing education could promote interprofessional planetary health courses that could include nursing, health sciences, ecology,

engineering and political science. These students could collectively create a climate action for their own academic institution or their local healthcare facility.

### **Nursing Research**

Future research could follow the transdisciplinary partnerships demonstrated by PHA (2021) and CASN (2022) in their outline of their planetary health framework. Research collaboratives should be interdisciplinary with varied healthcare professionals, biologists, ecologists, and environmental scientists (CASN, 2022) and in partnerships with Indigenous communities. Research examining the potential of nurses promoting and participating in citizen science could increase community-level engagement, education and generate a greater volume of data to drive science driven decisions as a response to climate change. Future nurses' research around planetary health must include our Indigenous People. Sanderson et al. (2020) focuses the importance of partnering with Indigenous Peoples as they can improve the environment due to their strong historical and spiritual relationship with the water and land. Future nursing research should consider community-based participatory action research because it has the potential to support community participation and engagement simultaneously and, if appropriately done, can address power imbalances (McClymont-Peace & Myers, 2012). This could be a way of including Indigenous peoples in climate action research, perhaps through a citizen science lens. Murphy et al. (2021) supports engaging with the Indigenous communities to understand their long traditional and cultural ways of caring for their land and living with the land so the planet can benefit from this co-research. Given the planet's current state, we are wise to learn from those who were here before us.

## **Nursing Policy**

Nursing leadership is expressed through policy. Climate change is an urgent, profound problem as time is running out and tackling the problem of climate change from a policy level can end in tragedy if the right policy interventions are not followed (Levin et al., 2012). Institutions, interest groups, healthcare providers and government bodies require reorientation to respond to climate change with policies that reflect long-term thinking and attention given to lower-order policy levels as this will support municipal policies as they can be a starting point for incremental increases in progress (Levin et al., 2012). Nurses could partner and be involved in developing a climate action plan policy for their local area. Local governments and citizens are crucial in creating climate action policies and implementing climate innovations. Nurses are essential in helping communities adapt to climate change and contribute valuable insight into developing strategic action plans. Nurses and local governments are on the front lines of identifying indicators of climate change, and their policy innovations affect the necessary changes to transform carbon-neutral economies. Although healthcare funding and strategic plans primarily come from national and provincial level sources, there is a substantial opportunity for local communities and municipalities to partner with nurses and their local healthcare institutions, with both having a pivotal role in climate mitigation and adaptation. Collaboratively, government and nursing can focus on the importance of both horizontal and vertical policymaking. As governments local and national have direct control over some critical resources and can operate at the scale at which many of the potentially catastrophic impacts of climate change would be felt (Dale et al., 2020). Municipal governments could be the most responsive and thus that could be a good place for nurses to target.

### **Disseminations Strategies**

Using the domains of nursing as a guide for dissemination strategies, I will seek opportunities to share this work, engage others, and network with those who have a similar desire to improve planetary health. I plan to attend and present at nursing conferences, such as the International Council of Nurses (ICN) and the Canadian Nurses Association in Montreal, the CASN Biennial Canadian Nursing Education conference or the Quality Forum in British Columbia and organizations already supporting planetary health, like CANE and the BC and Alberta chapters. I also plan to contribute to the emerging literature about nurses and climate action with the planetary health lens through publishing chapter two. Since the City of Vernon supported sustainability grants and I was awarded one of those grants, I want to share the results of this research as well as the policy brief I wrote in response to the city's climate action plan. I also plan to apply to the city's climate action committee where this work can be shared, facilitating dissemination and encouraging opportunities for future climate action municipal-level work. I also plan to ask to present this research to the society that protects the local, provincial park and request more citizen science opportunities and partnership with nurses and other hospital staff. I plan to start a sustainability committee at the regional hospital, and create a co-champion partnership so there will be strength and sustainability within the work itself. I will seek an invitation to the executive or board level tables to share this research and leverage this work for future research and programs that could build on sustainability activities.

On an academic level, I will give back to the University of Alberta, Faculty of Nursing, as an expression of my gratitude and to inspire others to increase their nursing climate knowledge and climate action understanding. I would like to share my findings at relevant undergraduate and graduate level courses, to not only share this knowledge but as an example of

the education journey that the Faculty of Nursing provided me. I would like the opportunity to dialogue with professors of the master's level courses, to ensure there is a planetary health lens within the curriculum and opportunities for nurses to learn more about such through the course assignments.

### **Conclusion**

The nursing profession has such a tremendous breadth of influence due to its trusted voice in public healthcare. This research has made a contribution towards planetary health through exploration of nurses' perspectives on climate change, climate action and citizen science. As a result of nurses' experiences with severe weather events, participants developed a determination to climate action in their personal lives. Although nurses had never heard of citizen science, they indeed engaged in the dialogue, and if citizen science opportunities were presented, nurses would likely participate and bring others to join them in the fight to support planetary health.



## References

- Brewster, E. T., Roundsefell, B., Fangzhou, L., Clarke, W., O'Brien, R. (2022). Adult incontinence products are a larger and faster growing waste issue than disposable infant nappies (diapers) in Australia. *Waste Management*, 152, 30-37.  
<https://doi.org/10.1016/j.wasman.2022.07.038>
- Canadian Association of Schools of Nursing (2022, October 19). *Introduction to Planetary Health Education Framework* [Video] YouTube.  
<https://www.youtube.com/watch?v=tHCj41Qcoa0&list=PLbL0o2SLlgLFIYF15WVRv35mV8kM40-W1&index=21>
- Canadian Nurses Association. (2022). *RN Practice Framework*. [https://www.cna-aiic.ca/en/nursing/regulated-nursing-in-canada/rn-practice-framework2#:~:text=Registered%20nurses%20\(RNs\)%20practise%20in,%2C%20education%2C%20policy%20and%20research](https://www.cna-aiic.ca/en/nursing/regulated-nursing-in-canada/rn-practice-framework2#:~:text=Registered%20nurses%20(RNs)%20practise%20in,%2C%20education%2C%20policy%20and%20research)
- Dale, A., Robinson, J., King, L., Burch, S., Newell, R., Shaw, A., & Jost, F. (2020). Meeting the climate change challenge: local government climate action in British Columbia, Canada. *Climate Policy*, 20(7), 866-880. <https://doi.org/10.1080/14693062.2019.1651244>
- Domm, E., & Urban, A. (2020). Public health nurse perceptions of evolving work and how work is managed; a qualitative study. *Journal of Nursing Management*, 28(8), 2017-2024.  
<https://doi.org/10.1111/jonm.13058>
- Law, J., Kalogirou, M. R., & Dahlke, S. (2021). Nurses as boundary actors in sustainable health care: A discussion paper. *Witness: The Canadian Journal of Critical Nursing Discourse*, 3(2), 36-46. <https://doi.org.10.25071/2291-5796.105>

- Levin, K., Cashore, B., Bernstein, S., & Auld, G. (2012). Overcoming the tragedy of super wicked problems: constraining our future selves to ameliorate global climate change. *Policy Sciences*, 45(2), 123-152. <https://doi.org/10.1007/s11077-012-9151-0>
- McClymont-Peace, D., & Myers, D. (2012). Community-based participatory process – Climate change and health adaptation program for northern First Nations and Inuit in Canada. *International Journal of Circumpolar Health*, 71(1), 18412. <https://doi.org/10.3402/ijch.v71i0.18412>
- Murphy, K., Branje, K., White, T., Cunsolo, A., Latimer, M., McMillan, J., & Martin, D. (2021). Are we walking the talk of participatory Indigenous health research? A scoping review of the literature in Atlantic Canada. *PLoS ONE*, 16(7), <https://doi.org/10.1371/journal.pone.0255265>
- Nurses and Nurse Practitioners of British Columbia. (2019). *The role of nursing in climate change: Action for nurses in a changing world* [PDF]. <https://www.nnpbc.com/pdfs/policy-and-advocacy/issues/Role-of-Nursing-in-Climate-Change-Guide.pdf>
- Planetary Health Alliance. (2021). *Planetary health education framework*. <https://www.planetaryhealthalliance.org/education-framework>
- World Health Organization & Health Care Without Harm (2009). Healthy hospitals, healthy planet, and healthy people: Addressing climate change in healthcare settings. <https://www.who.int/publications/m/item/healthy-hospitals-healthy-planet-healthy-people>

## References

- Aknin, L. B., De Neve, J.-E., Dunn, E. W., Fancourt, D. E., Goldberg, E., ... Ben Amor, Y. (2022). Mental health during the first year of the COVID-19 pandemic: A review and recommendations for moving forward. *Perspectives on Psychological Science*, 17(4), 915–936. <https://doi.org/10.1177/17456916211029964>
- Allen, D. (2016). *The invisible work of nurses: Hospitals, organisation and healthcare*. New York, NY: Routledge Palgrave.
- Anåker, A., Nilsson, M., Holmner, Å., & Elf, M. (2015). Nurses' perceptions of climate and environmental issues: A qualitative study. *Journal of Advanced Nursing*, 71(8), 1883-1891. <https://doi.org/10.1111/jan.12655>
- Atwoli, L., Baqui, A., Benfield, T., Bosurgi, R., Godlee, F., Hancock, S., Horton, R., Laybourn-Langton, L., Monteiro, C., Norman, I., Patrick, K., Praities, N., Rickkert, M., Rubin, E., Sahni, P., Smith, R., Talley, N., Turale, S., & Vazquez, D. (2021) Call for emergency action to limit global temperature increases, restore biodiversity, and protect health. *Cadernos de Saúde Pública*, 37(9) 1-5. <https://doi.org/10.1590/0102-311X00194721>
- Bish, J., (2020, December 17). *Environmental advocacy come in many surprising outlets*. <https://www.populationmedia.org/blog/environmental-advocacy-comes-in-many-surprising-outlets>
- Brewster, E. T., Roundsefell, B., Fangzhou, L., Clarke, W., O'Brien, R. (2022). Adult incontinence products are a larger and faster growing waste issue than disposable infant nappies (diapers) in Australia. *Waste Management*, 152, 30-37. <https://doi.org/10.1016/j.wasman.2022.07.038>

- Bonney, R., Phillips, T., Ballard, H., & Enck., J. (2016). Can citizen science enhance public understanding of science? *Public Understanding of Science*, 25(1), 2-16.  
<https://doi.org/10.1177/0963662515607406>
- British Columbia Patient Safety & Quality Council [BCPSQC]. (2023). *Our Vision and Values*.  
<https://bcpsqc.ca/about-the-council/our-vision-and-values/>
- Braun, V. & Clarke, V. (2006) Using thematic analysis in psychology. *Qualitative Research in Psychology*, 3, 77-101. <https://doi.org/10.1191/1478088706qp063oa>
- Canadian Association of Nurses for the Environment. (2022). *Who we are*. <https://cane-aiie.ca/>
- Canadian Association of Schools of Nursing (2022, October 19). *Introduction to Planetary Health Education Framework* [Video] YouTube.  
<https://www.youtube.com/watch?v=tHCj41Qcoa0&list=PLbL0o2SLlgLFIYF15WVRv35mV8kM40-W1&index=21>
- Canadian Nurses Association. (2017). *Climate change and health position statement*. [https://hl-prod-ca-oc-download.s3-ca-central-1.amazonaws.com/CNA/2f975e7e-4a40-45ca-863c-5ebf0a138d5e/UploadedImages/documents/Climate\\_change\\_and\\_health\\_position\\_statement.pdf](https://hl-prod-ca-oc-download.s3-ca-central-1.amazonaws.com/CNA/2f975e7e-4a40-45ca-863c-5ebf0a138d5e/UploadedImages/documents/Climate_change_and_health_position_statement.pdf)
- Canadian Nurses Association. (2022). *RN Practice Framework*. [https://www.cna-aiic.ca/en/nursing/regulated-nursing-in-canada/rn-practice-framework2#:~:text=Registered%20nurses%20\(RNs\)%20practise%20in,%2C%20education%2C%20policy%20and%20research](https://www.cna-aiic.ca/en/nursing/regulated-nursing-in-canada/rn-practice-framework2#:~:text=Registered%20nurses%20(RNs)%20practise%20in,%2C%20education%2C%20policy%20and%20research)
- Dale, A., Robinson, J., King, L., Burch, S., Newell, R., Shaw, A., & Jost, F. (2020). Meeting the climate change challenge: local government climate action in British Columbia, Canada. *Climate Policy*, 20(7), 866-880. <https://doi.org/10.1080/14693062.2019.1651244>

Domm, E., & Urban, A. (2020). Public health nurse perceptions of evolving work and how work is managed; a qualitative study. *Journal of Nursing Management*, 28(8), 2017-2024.

<https://doi.org/10.1111/jonm.13058>

Drake, J. (2021, April 2021). *What is planetary health?* Forbes.

<https://www.forbes.com/sites/johndrake/2021/04/22/what-is-planetary-health/?sh=4bece6892998>

Ebi, K., Vanos, J., Baldwin, J., Hondula, D., Errett, N., Hayes, K., Reid, C., Saha, S., Spector, J., & Berry, P. (2021). [Extreme weather and climate change: Population health and health system implications](#). *Annual Reviews*, 42(1), 293-315. [https://doi.org/10.1146/annurev-](https://doi.org/10.1146/annurev-publhealth-012420-105026)

[publhealth-012420-105026](https://doi.org/10.1146/annurev-publhealth-012420-105026)

Ergin, E., Altinel, B., & Aktas, E. (2021). A mixed method study on global warming, climate change and the role of public health nurses from the perspective of nursing students.

*Nurse Education Today*, 107, (105144). <https://doi.org/10.1016/j.nedt.2021.105144>.

Fischer, A., Dinnie, E., Ellis, R., Eastwood, A., Carter, A. & Welsh, G. (2021). Exploring the potential of citizen social science for environmental and sustainability research:

Experiences of and with community-based researchers. *Citizen Science: Theory and Practice*, 6(1), 1–12. <https://doi.org/10.5334/cstp.389>

Garcia, B. (2020, October 29). *What is citizen science and what is it important?*

<https://blog.temboo.com/what-is-citizen-science/>

Government of Canada. (2019, March 28). *Causes of climate change*.

<https://www.canada.ca/en/environment-climate-change/services/climate-change/causes.html>

- Graneheim, U. H., & Lundman, B. (2004). Qualitative content analysis in nursing research: concepts, procedures and measure to achieve trustworthiness. *Nurse Education Today*, 24, 105-112. <https://doi:10.1016/j.nedt.2003.10.001>
- Hofmeyer, A., & Taylor, R. (2021). Strategies and resources for nurse leaders to use to lead with empathy and prudence so they understand and address sources of anxiety among nurses practising in the era of COVID-19. *Journal of Clinical Nursing*, 30(1), 298-305. <https://doi.org/10.1111/jocn.15520>
- Hrabok, M., Delorme, A., & Agyapong, V. I. O. (2020). Threats to mental health and well-being associated with climate change. *Journal of Anxiety Disorders*, 76, 102295. <https://doi.org/10.1016/j.janxdis.2020.102295>
- Hsieh, H., & Shannon, S. E. (2005). Three approaches to qualitative content analysis. *Qualitative Health Research*, 15(9), 1277-1288. <https://doi:10.1177/104973205276687>
- Intergovernmental Panel on Climate Change. (2014). *Climate change 2014: Synthesis report*. <https://archive.ipcc.ch/report/ar5/syr/>
- Intergovernmental Panel on Climate Change. (2022). IPCC sixth assessment report. Impacts, adaptation and vulnerability. <https://www.ipcc.ch/report/ar6/wg2/>
- Kalogirou, M. R., Dahlke, S., Davidson, S., & Yamamoto, S., (2020). Nurses' perspective on climate change, health and nursing practice. *Journal of Clinical Nursing*, 29(23-24), 4759-4768. <https://doi-org.login.ezproxy.library.ualberta.ca/10.1111/jocn.15519>
- Kalogirou, M. R., Olson, J., & Davidson, S. (2020). Nursing's metaparadigm, climate change and planetary health. *Nursing Inquiry*, 27(3), 1-9. <https://doi.org/10.1111/nin.12356>

- Kalogirou, M. R., Dahlke, S., Davidson, S., & Yamamoto, S., (2021). How the hospital context influences nurses environmentally responsible practice: a focused ethnography. *Journal of Advanced Nursing*, 77, 3806-3819. <https://doi.org/10.1111/jan.14936>
- Karliner, J., & Slotterback, S. (n.d.). *Healthcare's climate action footprint*. [https://noharm-global.org/sites/default/files/documents-files/5961/HealthCaresClimateFootprint\\_092319.pdf](https://noharm-global.org/sites/default/files/documents-files/5961/HealthCaresClimateFootprint_092319.pdf)
- Kurth, A. E. (2017). Planetary health and the role of nursing: a call to action. *Journal of Nursing Scholarship*, 49(6), 598-605. <https://doi.org/10.1111/jnu.12343>
- Law, J., Kalogirou, M. R., & Dahlke, S. (2021). Nurses as boundary actors in sustainable health care: A discussion paper. *Witness: The Canadian Journal of Critical Nursing Discourse*, 3(2), 36-46. <https://doi.org.10.25071/2291-5796.105>
- Levin, K., Cashore, B., Bernstein, S., & Auld, G. (2012). Overcoming the tragedy of super wicked problems: constraining our future selves to ameliorate global climate change. *Policy Sciences*, 45(2), 123-152. <https://doi.org/10.1007/s11077-012-9151-0>
- Lincoln, Y., & Guba, E. G. (1985). *Naturalistic Inquiry*. Sage
- Loke, A. Y., & Molassiotis, A. (2021). Development of disaster nursing education and training programs in the past 20 years (2000-2019): a systematic review. *Nurse Education Today*, 99, 104809, 1-19. <https://doi.org/10.1016/j.nedt.2021.104809>
- McClymont-Peace, D., & Myers, D. (2012). Community-based participatory process – Climate change and health adaptation program for northern First Nations and Inuit in Canada. *International Journal of Circumpolar Health*, 71(1), 18412.
- McKinley, D.C., Miller-Rushing, A.J., Ballard, H.L., Bonney, R., Brown, H., Cook-Patton, S.C., Evans, D.M., French, R.A., Parrish, J.K., Phillips, T.B., Ryan, S.F., Shanley, L.A., Shirk,

- J.L., Stepenuck, K.F., Weltzin, J.F., Wiggins, A., Boyle, O.D., Briggs, R.D., Chapin III, Soukup, M.A. (2017). Citizen science can improve conservation science, natural resource management, and environmental protection. *Biological Conservation*, 208, 15-28.  
<https://doi-org.login.ezproxy.library.ualberta.ca/10.1016/j.biocon.2016.05.015>
- Merriam, S. B., & Tisdell, E. J. (2016). *Qualitative research*. Jossey-Bass.
- Murphy, K., Branje, K., White, T., Cunsolo, A., Latimer, M., McMillan, J., & Martin, D. (2021). Are we walking the talk of participatory Indigenous health research? A scoping review of the literature in Atlantic Canada. *PLoS ONE*, 16(7),  
<https://doi.org/10.1371/journal.pone.0255265>
- Neergaard, M.A., Olesen, F., Anderson, R.S., & Sondergaard, J. (2009) Qualitative Description – the poor cousin of health research? *BMC Medical Research Methodology*, 9(52), 1-5.  
<https://doi:1186/1471-2288-9-52>
- Nurses and Nurse Practitioners of British Columbia. (2019). *The role of nursing in climate change: Action for nurses in a changing world* [PDF].  
<https://www.nnpbc.com/pdfs/policy-and-advocacy/issues/Role-of-Nursing-in-Climate-Change-Guide.pdf>
- Nurses and Nurse Practitioners of British Columbia. (2022). *The role of nursing in climate change: Action for nurses in a changing world*. <https://www.nnpbc.com/pdfs/policy-and-advocacy/issues/Role-of-Nursing-in-Climate-Change-Guide.pdf>
- Okanagan Basin Water Board (2021). *Waves of change. 2021 annual report*.  
[https://www.obwb.ca/newsite/wp-content/uploads/2021\\_obwb\\_annual\\_report.pdf](https://www.obwb.ca/newsite/wp-content/uploads/2021_obwb_annual_report.pdf)
- Osoyoos Lake Water Quality Society (2021). *About*. <https://www.osoyooslake.ca/about/>



Pawlowska-Mainville, A. (2020, October 22). Environmental stewardship in Canada. The Canadian encyclopedia.

<https://www.thecanadianencyclopedia.ca/en/article/environmental-stewardship-in-canada>

Phillips, J.M., Stalter, A.M., Dolansky, M.A., & Lopez, G. (2016). Fostering future leadership in quality and safety in healthcare through systems thinking. *Journal of Professional Nursing*, 42(1), 15-25. <https://doi.org/10.1016/j.profnurs.2015.06.003>

Planetary Health Alliance. (2021). *Planetary health education framework*.

<https://www.planetaryhealthalliance.org/education-framework>

Prévost-Manuel, J. (2021, July 12). *Heat wave. Climate change. Canadian Broadcast Corporation*. <https://www.cbc.ca/news/science/heat-wave-climate-change-1.6093730>

Sandelowski, M. (2000). Whatever happened to qualitative description? *Research in Nursing & Health*, 23(4), 334-340. [http://onlinelibrary.wiley.com/journal/10.1002/\(ISSN\)1098-240X](http://onlinelibrary.wiley.com/journal/10.1002/(ISSN)1098-240X)

Sanderson, D., Mirza, N., Polacca, M., Kennedy, A. & Bourque Bearskin, R.L. (2020). Nursing, Indigenous Health, Water, and Climate Change. *Witness: The Canadian Journal of Critical Nursing Discourse*, 2(1), 66-83. <https://doi-org.login.ezproxy.library.ualberta.ca/10.25071/2291-5796.55>

Schenk, E.C., Cook, C., Demorest, S., & Burduli, E. (2020). Climate, health and nursing tool (CHANT): Initial survey results. *Public Health Nursing*, 38(2). 152-159.

<https://doi.org/10.1111/phn.12864>

Sherman, J.D., Thiel, C., MacNeill, A., Eckelman, M. J., Dubrow, R., Hopf, H., Lagasse, R., Bialowitz, J., Costello, A., Forbes, M., Stancliff, R., Anastas. P., Anderko, L., Baratz, M., Barna, S., Bhatnagar, U., Burnham, J., Cai, Y., Cassels-Brown, A., ... Bilec, M. (2020).

The green print: advancement of environmental sustainability in healthcare. *Resources, Conservation & Recycling*, 161(2020), 1-11.

<https://doi.org/10.1016/j.resconrec.2020.104882>

United Nations. (n.d.). *What is climate change?* <https://www.un.org/en/climatechange/what-is-climate-change>

Walpole, S. C., Barna, S., Richardson, J., & Rother, H. A. (2019). Sustainable healthcare education: integrating planetary health into clinical education. *The Lancet Planetary Health*, 3(1), 6-7. [https://doi.org/10.1016/S2542-5196\(18\)30246-8](https://doi.org/10.1016/S2542-5196(18)30246-8)

World Health Organization. (n.d.). *Climate change*. [https://www.who.int/health-topics/climate-change#tab=tab\\_1](https://www.who.int/health-topics/climate-change#tab=tab_1)

World Health Organization & Health Care Without Harm (2009). Healthy hospitals, healthy planet, and healthy people: Addressing climate change in healthcare settings. <https://www.who.int/publications/m/item/healthy-hospitals-healthy-planet-healthy-people>

World Health Organization. (2021). *Climate change and health*. <https://www.who.int/news-room/fact-sheets/detail/climate-change-and-health>

## Appendix A

### Email correspondence for recruitment

*Sent on behalf of Hannah Rempel and VJH Clinical Operations Directors*

You have been contacted because you are a nurse (RN/LPN/RPN) working at the Vernon Jubilee Hospital or a community public health nurse (RN/LPN/RPN) in the Vernon area or a retired nurse in the Vernon area. **You are being invited to participate in a research study seeking to understand the Nurses perspective of Citizen Science and Climate action.** The director will not know if you participating or not in this research study and no negative consequences to your employment status or employment relationships, regardless if you participate or not.

**Please do not reply to this email,** instead contact the primary investigator, **Hannah Rempel** at [hrempe1@ualberta.ca](mailto:hrempe1@ualberta.ca)

## Appendix B

### Recruitment Poster

Edmonton Clinic  
Health Academy  
11405 87 Ave  
Edmonton, Alberta  
T6G 1C9



# NURSING, CITIZEN SCIENCE, & CLIMATE ACTION



**Nurses:  
You are  
invited to  
participate in  
a research  
study!**



We want to interview nurses retired or practicing (RN, LPN, RPN) and learn more about what they think regarding climate change, citizen science and nursing.



Want more info?  
Interested in  
participating?  
Email us!

Hannah (Student  
Investigator):

[hrempel@ualberta.ca](mailto:hrempel@ualberta.ca)

**Understanding the Nurses' Perspective on Citizen Science and Climate Action**

**UofA Ethics ID: Pro00121602 IH Ethics ID 2022-23-029-E**

**Appendix C**  
**INFORMATION LETTER and CONSENT FORM**  
**PARTICIPANT CONSENT FOR**

**Title of Study:** Nurses Perspective of Citizen Science as an engagement methodology for  
Climate Action

Contact Information

Principal Investigator: Hannah Rempel, RN., BScN. MN student

Name & Affiliation: University of Alberta, Faculty of Nursing

Mailing Address: 5-293 Edmonton Clinic Health Academy

11405 - 87 Ave NW

Edmonton, AB

T6G 1C9

Email: [hrempel@ualberta.ca](mailto:hrempel@ualberta.ca)

Research/Study Coordinator: Hannah Rempel, RN, BScN, MN student

5-293 Edmonton Clinic Health Academy

11405 - 87 Ave NW Edmonton, AB

T6G 1C9

Supervisor: Dr. Sherry Dahlke PhD, RN, GNC(C).

Name & Affiliation: Associate Professor, Faculty of Nursing, University of Alberta

Mailing Address: 5-293 Edmonton Clinic Health Academy

11405 - 87 Ave NW Edmonton, AB

T6G 1C9

Phone: 780-492-8232

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Email: [sherry.dahlke@ualberta.ca](mailto:sherry.dahlke@ualberta.ca)

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You are being invited to take part in a research study. Before you take part, a member of the study team is available to explain the project and you are free to ask any questions about anything you do not understand. You will be given a copy of this form for your records.

**Why am I being asked to take part in this research study?** You are invited to participate if you are a nurse (RN, LPN, RPN) employed or retired, and live in the Vernon and surrounding areas. The goal of this study is to explore the nurse's perspective regarding citizen science to support climate action. This will include talking to you about personal experiences and understanding of citizen science and climate change.

**What is the reason for doing the study?** The goal of this study is to understand nurse's perspective about citizen science as a way to engage in climate action.

**What will I be asked to do?** Should you choose to participate in the interview to understand the nurse's perspective of citizen science and climate action, and it is estimated that the one interview will take 45-60 minutes. You can participate in person, over the telephone or Zoom. The interview is semi structured and we will ask your name, profession (active or retired), year of birth and gender. Should you choose Zoom, audio and video recording will take place, you can choose to turn off your camera off. However, only the audio recording will be used in this study and just have the audio portion recorded. A professional transcriptionist, who has signed a confidentiality agreement will transcribe the interviews. Audio files will be encrypted and stored on a password-protected computer for five years. The transcribed documents will be encrypted and stored on a password-protected computer for five years. This de-identified and encrypted data may be used in another study.

**What are the risks and discomforts?** There is a minimal risk associated with participating in this study. If reflection on experiences with climate change cause you some discomfort or distress, you are encouraged to only answer questions that you feel comfortable answering and you could access mental health services through your employer or through community agencies. The researcher will have a list of contact information should you require further support. It is not possible to know all of the risks that may happen in a study, but we have taken all reasonable safeguards to minimize any known risks to you.

If you choose to meet with the researcher in person, adherence to all current public health, University of Alberta policies and guidelines.

There will be no risk to the participant's employment with Interior Health.

**What are the benefits to me?** There are no direct benefits to participating in this study. Your participation will contribute to our understanding of citizen science in the context of climate change.

**Do I have to take part in the study?** If you wish to participate in this study, you are welcome to contact Hannah Rempel by email [hrempel@ualberta.ca](mailto:hrempel@ualberta.ca). This study is voluntary. During the interview, you are free not to answer any questions that they are not comfortable with. If you wish to withdraw from the study completely or some of your response to the questions, you can do so, up to two weeks after the interview. After that point your interview will have been transcribed, de-identified and part of the data set. Should you choose to remove yourself from the research, please contact Hannah Rempel by email at [hrempel@ualberta.ca](mailto:hrempel@ualberta.ca).

**Will I be paid to be in the research?** Participants will not be compensated monetarily for participating in the study. The interview will not take place during work hours.

**Will my information be kept private?** Data will be encrypted and stored on a secure electronic research environment that is firewall and password protected. Only those on the research team will be able to access data. Data will be kept for a minimum of 5 years following completion of the study, and when appropriate data will be destroyed while maintaining privacy and confidentiality. Both the research ethics board and University of Alberta auditors may have access to the study data for audit purposes.

During this study we will do everything we can to make sure that all information you provide is kept private. No information relating to this study that includes your name will be released outside of the researcher's office or published by the researchers unless you give us your expressed permission. Sometimes, by law, we may have to release your information with your name so we cannot guarantee absolute privacy. However, we will make every legal effort to make sure that your information is kept private

Upon transcribing your interview, we will assign a pseudonym (fake name) to protect your identity. If you would like to choose your own fake-name, please say so in the interview. If you would like us to use your real name, please indicate this on the signed consent form on the last page of this document.

If your interview is conducted via Zoom, your interview will be downloaded from the Zoom platform immediately, encrypted and secured on a password-protected device.

If you chose to participate in a dyad interview, we will strive to protect confidentiality of the data but cannot guarantee that others from the dyad will do the same.

The information from this study will be seen only by members of the research group. On occasion, this data will need to be checked for accuracy. For this reason, your data, including your name, may also be looked at by people from the Research Ethics Board or by the University of Alberta auditors.

**What will happen to the information or data that I provide?** Your data will inform the thesis of understanding nurse perspective of citizen science and climate action. The data will help inform an emerging body of literature around nurses and climate change. Your data may be used for presentations, publications, or teaching purposes.

The information you provide will for part of Hannah Rempel's Master's thesis at the University of Alberta. It may also be used as part of public or academic presentations, in news or academic publications, as well as for examples during teaching. At no point will you (your community) be identified in this work.

While the data is being analyzed, data will be stored and encrypted on a secure electronic research environment that is firewall and password protected. Data will only be accessed by those on the research team.

After the study is done, your data will be stored in a de-identified format for a minimum of five years following the completion of the study. When appropriate, data will be destroyed while

maintaining privacy and confidentiality. Both the research ethics board and University of Alberta auditors may have access to the study data for audit purposes.

**What if I have questions?** If you have any questions about the research now or later, please contact Hannah Rempel [hrempe1@ualberta](mailto:hrempe1@ualberta) or Dr. Sherry Dahlke at a [sherry.dahlke@ualberta.ca](mailto:sherry.dahlke@ualberta.ca) or 780-492-8232.

If you have any questions regarding your rights as a research participant, you may contact the University of Alberta Research Ethics Office at [reoffice@ualberta.ca](mailto:reoffice@ualberta.ca) and quote Ethics ID Pro00121602. This office is independent of the study investigators. Alternatively, you may contact the Chair of the Interior Health Research Ethics Board via telephone at 250.870.4602 or via email to [researchethics@interiorhealth.ca](mailto:researchethics@interiorhealth.ca)

The study is being partially funded by the City of Vernon, British Columbia, climate sustainability grant sponsorship. The Principal Investigator is getting money to cover partial costs of doing this study. You are entitled to request any details concerning this compensation from the Principal Investigator

There are no conflicts of interest to declare with this research.

### **How do I indicate my agreement to be in this study?**

By signing below, you understand:

- That you have read the above information and have had anything that you do not understand explained to you to your satisfaction.
- That you will be taking part in a research study.
- That you may freely leave the research study at any time.
- That you do not waive your legal rights by being in the study
- That the legal and professional obligations of the investigators and involved institutions are not changed by your taking part in this study.
- That you agree to the data being stored as part of a data repository
- You have agreed that the interview will be audio recorded as described above.
- A copy of this information and consent form has been given to you to keep for your records and reference.

### **SIGNATURE OF STUDY PARTICIPANT**

\_\_\_\_\_ Pseudonym (if necessary) \_\_\_\_\_



Name of Participant

\_\_\_\_\_

Signature of Participant

\_\_\_\_\_

Date

**SIGNATURE OF PERSON OBTAINING CONSENT**

\_\_\_\_\_

Name of Person Obtaining Consent

Contact Number

**SIGNATURE OF THE WITNESS**

\_\_\_\_\_

Name of Witness

\_\_\_\_\_

Signature of Witness

\_\_\_\_\_

Date

Under the International Conference on Harmonization, Good Clinical Practice (ICH GCP 4.8.9), where it is known that the participant cannot read (e.g., visually impaired or illiterate), the signature of an impartial witness independent of the trial must be obtained. The witness must be present for the consent process. The witness signature reflects that they believe the participant was presented with sufficient information to assure a truly informed consent.

**Appendix D**

**Guiding Interview Questions**

Demographics: age, years as a nurse, preferred gender identity, facility service type

1. Tell me about your experiences with the extreme weather events of 2021 here in the Okanagan (heat dome, droughts and fires) personally and professionally.
2. What are your thoughts as to the cause of these extreme weather events?
3. In your opinion what were some of the health implications of these extreme weather events you saw and/or experienced as staff and patients? Physical, mental?
4. Help me understand your opinions about climate change?
5. If they do not believe in climate change, what are your thoughts about the state of the environment? What can we do, how can we help the environment? (substitute climate change with environment)
6. If we were to take the learnings of the last 2 years of Covid 19, what public health strategies would help climate change (*environment*) and help people to take action?
7. What can you do or have you done about climate change (*environment*) – personally?  
Professionally?
8. Do you have some examples of where you made choices to help the climate (*environment*) and/or environment, locally?
  - a. Personally
  - b. Professionally?
9. I have three terms I would like you to do your best to explain what they mean to you:
  - a. In your own words, can you describe:
    - i. Environmental stewardship

- ii. Environmental advocacy
- iii. Citizen science - Citizen Science occurs when people share what they observe from the physical world to provide information to the scientific community. Participating in citizen science means you are pro-actively engaging in the process of collecting and sharing observations in the name of science. It is about discovering and observing things—everything from bird watching, to taking water measurements, or simply collaborating with others to create a shared network of data. <https://blog.temboo.com/what-is-citizen-science/>

b. Share the citizen science definition and then ask the following questions

10. Now that I have given you a working definition of what citizen science is, does that resonate with you, tell me your thoughts about citizen science.
11. I am interested in the nurse's perspective on if you see citizen science as a potential way to be involved in action related to climate change (*helping the environment*)? If so how would nurses get involved?
12. Can you share any examples of where you have been involved in environmental stewardship/advocacy, citizen science for climate (*environmental*) action ?
13. Let me share a story within the Okanagan about a retired nurse leading citizen science.
  - a. OWQLS (see below)

*A nurse who graduated from the Vancouver General Hospital in 1969 and in her retirement, became president of the water quality society (OLWQS, 2021) and now leads citizen science*

*work within the Osoyoos Lake Water Quality Society Community members. The OLOWQS was established in 1991 consisting of community members to help promote public awareness of the lake, conservation issues, pollution and lake management. It is a non-political, non-profit charitable organization run entirely by volunteers with the mandate to protect Osoyoos Lake through various public education initiatives and monitoring the quality of the lake's water. This is an example of citizen science in action. As a nurse participating in local citizen science, she recognizes the importance of collaboration, partnerships and bringing together other professionals to use citizen science to monitor and improve the health of the Osoyoos Lake, which helps improve the environmental health system in Osoyoos. She supports, organizes, participates, and uses citizen science to address lake concerns by testing the lake for pH, temperature, specific conductance, dissolved oxygen, and water clarity at varying degrees depths in five areas of the lake. Additionally, the group utilizes citizen science to test the lake's calcium levels and collect water samples to look for veligers (larval forms of zebra and quagga mussels). This data is shared with the BC Ministry of Environment and Climate Change, to help inform and give scientific data to provincial decision makers to help improve the environmental health system, the Okanagan watershed which Osoyoos Lake is a part of.*

b. Do you know of any others in your community?

c. Have you known nurses to be involved in any?

d. How can we get nurses to be more engaged in citizen science, especially as it relates to climate (*environmental*) action?

14. How could Interior Health increase citizen science uptake of climate (*environment*) action initiatives within IH?

15. Any other perspectives you want to offer about citizen science and/or climate  
*(environmental)* action

Thank you so much for sharing your time and thoughts with me, I am encouraged by your participation.

**Appendix E****Field Notes**

Date: \_\_\_\_\_ Time: \_\_\_\_\_

Location: \_\_\_\_\_ Interviewer: \_\_\_\_\_

**Participant Data**ID: \_\_\_\_\_ Position (circle): RN/LPN/RPN Unit type \_\_\_\_\_

Age: \_\_\_\_\_ Preferred gender: \_\_\_\_\_ Cultural/ethnic background: \_\_\_\_\_

Nursing experience \_\_\_\_\_ (years): \_\_\_\_\_ Highest education \_\_\_\_\_

Volunteer work for the environment (circle): Yes/No if yes (circle)- formal or informal**Descriptive Notes:** *(note things like: tone of voice, congruence between what they're saying and how they're saying it, non-verbal's and mannerisms)***Reflective Notes:****Summary/Other:**

Table 1

*Theme, Category and Code*

<b>Theme</b>	<b>Category</b>	<b>Code</b>
Health Impacts	States of health	Personal impact
		Professional impact
		Health impact
		COVID-19
		Environmental impact
Climate Action	Professional activities	Professional suggestions
		Professional action strategies
	Engagement	Enablers to facilitate engagement
		Engagement strategies
		Personal engagement strategies
		Barriers to engagement
		Personal barriers
	Local activities	Local environmental action
		Climate action
		Covid helped climate action
		Forest fire prevention
Climate knowledge, beliefs and language	Climate language	Citizen science definition
		Response to citizen science
		Citizen science opportunities, conversations
		Environmental stewardship
		Environmental advocate definition
	Climate knowledge	Climate change knowledge
		Cause of extreme weather events

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<b>Theme</b>	<b>Category</b>	<b>Code</b>
System Influences	Political	Political party
		Government policy
		Provincial consideration
	Societal	Media
		Religious consideration
		Societies actions to climate change
	Health	Public health strategies
	Workplace	Workplace barriers
		Workplace contribution to climate change
		Barriers to nurse engagement



Table 2  
*Demographic Information*

	Educator	RN	LPN	Total	Male	Female	Average Age	Average years of experience
Medicine	3	3	1	7	-	7	46	22
Surgery	1	2	-	3	-	3	40	16
Community Care	-	1	-	1	-	1	40	15
Primary Care	-	1	-	1	-	1	52	17
Total	4	7	1	12	0	0	45	18