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Energy Access and Extreme Heat Events: A case study of seniors in Ottawa, Ontario

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A thesis submitted in partial fulfillment of the requirements for the Master of Arts degree in Geography

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Abstract

Energy poverty, or not having access to sufficient energy to meet one's needs, is a serious problem in Canada and around the world. While the current literature on energy poverty largely focuses on the experiences of people utilizing energy services to stay warm during cold winter temperatures, little is known about experiences of energy poverty during summertime heat. This gap is especially urgent since current climate models suggest that cities are likely to experience extreme heat conditions more frequently in the future. This research investigates how people use energy services, such as air conditioning and fans, among other strategies to keep cool during hot summer temperatures. As seniors are considered a vulnerable population to health risks associated with extreme heat, the study focused on individuals over the age of 65. The intention of this research was to examine what constraints or enabling factors help explain variations in seniors' use of energy services to keep cool. 27 semi-structured, qualitative interviews conducted in Ottawa, Ontario, explored how seniors cope with extreme heat during the summer and their ability to access the energy services they desire. A central conclusion is that seniors have varying perceptions of the threat of extreme heat events and its associated risks, primarily due to differences in personal health status and concern for others, privilege and socioeconomic status. Further, findings indicate that senior's use of energy services intersected with issues of pre-existing health conditions, social isolation, and concerns about costs. This research recommends that specific strategies are created to improve communication on heat and health-related risks as well as initiatives and programs aimed at providing support to seniors during extreme heat events.

Key Words: Energy Justice; Energy Poverty; Energy Access; Extreme Heat; Climate Change; Aging; Heat Vulnerability; Heat Health; Resilience; Cooling Strategies; Ottawa, Ontario

Summary for Lay Audience

As our climate changes, extreme heat events are becoming more frequent and intense, especially in urban landscapes where heat is often intensified. Extreme heat events, also referred to as heat waves, are periods when the air temperature is excessively hot, caused by changes in weather systems. These events can cause severe health problems and even death for humans. Certain groups of people are more vulnerable to these risks, especially senior citizens as they may have trouble regulating their body temperature because of pre-existing health conditions, and may face challenges in accessing preventative cooling strategies, such as air conditioning and electric fans. Not being able to access and afford energy that powers these cooling strategies is a reality that many people are familiar with. The experience of energy poverty, also referred to as precarious energy access, involves households struggling to meet their energy needs. In the context of extreme heat events, precarious energy access may lead to people not being able to keep their indoor living environment adequately cool, which may be dangerous. This thesis explores the relationship between extreme heat events and the experience of precarious energy access in Canada, and how this affects seniors' (at least 65 years of age) ability to cope with the heat in an urban centre. From June to August of 2019 I conducted 27 in-depth interviews with seniors in Ottawa, Ontario to understand how seniors experience extreme heat events, to identify key differences in their ability to access energy, and to gather new insights that could potentially help protect communities from future extreme heat events. Key findings indicate that senior's experiences with energy services are connected with issues of pre-existing health conditions, social isolation, and concerns about costs. This

thesis provides recommendations to help improve communication on heat and health-related risks as well as for initiatives and programs that are aimed at providing specific support to seniors during extreme heat events.

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Chapter 1: Introduction

1.1. Energy Justice

Energy, or the capacity to do work, has been widely recognized as an essential component for societies to develop and thrive (International Energy Agency, 2017).

Although the topic of energy is much more than this physics-based definition, it can be viewed not only as the “basis for the material evolution of human societies” (p. 193), but also as the most important global resource system, a political-economic nexus, a main mediator in socio-spatial relationships, and a necessity in the practices of everyday life (The Dictionary of Human Geography, 2009; Zimmerer, 2011, Calvert, 2016).

Understanding the complexities of the energy-society-environment relationship is critical when thinking about energy issues from a geographic perspective (Calvert, 2016).

This research explores differences in energy access that people experience – based on the themes of affordability, mobility, autonomy, and vulnerability – and the consequences for their well-being. We know that energy access has a lot of influence on social relations and how people perceive their surroundings. For instance, having access to electricity to power things such as air conditioners has changed the way many people perceive thermal comfort and what they believe is necessary to have to stay comfortable in a given environment (Nicholls & Strengers, 2014; Calvert, 2016). The complexities of our energy system are further emphasized by the reality that not everyone has equal access to energy services.

This research investigated the problem of energy poverty, or not having access to sufficient energy to meet one’s needs (Rezaei, 2017, p.7-8). While the current literature on energy poverty in the context of the Global North primarily focuses on the experiences

of people utilizing energy services to stay warm during cold winter temperatures, there is little information about experiences of energy poverty during summertime heat. This research aimed to investigate how senior citizens (age ≥ 65 years) cope with hot summer conditions, including whether and how they access energy services, such as air conditioning and fans, that are commonly utilized to keep cool. Exploring people's experiences with these services could help inform strategies to improve seniors' well-being during extreme heat conditions.

1.2. Overview of Energy Access and Energy Poverty

Energy access, or the provision of energy that is affordable, reliable, sustainable, and modern to all people, is one of the world's most pressing issues (International Energy Agency, 2017). Ensuring energy access for all people, which includes access to clean electricity as well as clean fuels and technology for cooking, has been recognized as one of the Sustainable Development Goals (International Energy Agency, 2017; United Nations, 2018a). Energy access is also considered fundamental to addressing other global development challenges, including economic growth, food security, global health equity, and environmental sustainability (Nussbaumer, Bazilian, & Modi, 2012; International Energy Agency, 2017).

In developed economies, such as in Canada, energy poverty often takes on the form of being unable to reliably access modern energy services even when they exist because of affordability concerns (International Energy Agency, 2017). This topic of energy poverty, and energy access more broadly, is of utmost importance for numerous reasons: its link to distributional, procedural, and recognition justice; its connections to climate change; and its impacts on people's health and wellbeing (Ormandy & Ezratty,

2012; Tirado Herrero & Ürge-Vorsatz, 2012; Jenkins et al., 2016a; Rezaei, 2017; United Nations, 2018b).

1.3. The Energy - Climate Nexus

When considering the production, distribution, and consumption of energy, a central issue is the adverse effects our energy systems have on the planet. The energy sector is a significant contributor to global greenhouse gas emissions (International Energy Agency, 2018). The demand for energy and the amount of energy consumed have increased in recent years, primarily due to the rapidly changing global economy (International Energy Agency, 2019). However, a report published by the International Energy Agency (2019) stated that weather conditions are also causing a significant increase in global energy demand as hot summer temperatures have increased the demand for cooling.

With climate change at the forefront of many global conversations, continuing to analyze the energy-climate nexus and think of solutions to decrease emissions is undoubtedly very important. Although ensuring access to air conditioning is one strategy for coping with extreme heat events, researchers and policymakers must also position the use and popularity (in some places) of air conditioning within a framework of climate justice. The environmental impacts of air conditioning must be considered when recommending its usage as a cooling strategy. While perceived as a solution for those who can afford it, air conditioning can worsen the very problem it seeks to address when emissions from the electricity sector contribute to climate change. Although, this consideration is also inherently problematic, as recommendations to limit one's air conditioning usage may be interpreted as encouraging people to sacrifice their health and

wellbeing during extreme heat events (Buranyi, 2019). It is also important to acknowledge this issue within the context of Canada, a rich country that has high greenhouse gas emissions as well as the capacity to adapt and substantially reduce our emissions (Bush & Lemmen, 2019). It is clear that countries such as Canada need to act aggressively towards fighting climate change and act carefully when making decisions and policies regarding energy consuming technologies such as air conditioning.

1.4. Urban Areas, Climate Change, and Heat Extremes

The effects of climate change continue to be seen worldwide and have vast impacts on different ecosystems, food security, water supply, human health, and economic growth (IPCC, 2014; Hoegh-Guldberg et al., 2018; Xu et al., 2019). It is estimated that with global warming of 2°C, several hundred million people will be exposed to climate-related risks by 2050 (Xu et al., 2019). One study has suggested that over the next 50 years, without adequate climate mitigation or substantial human migration out of highly populated areas, 1 to 3 billion people are projected to be exposed to temperatures that have never been experienced by humanity and may be unliveable (Xu et al., 2019).

In the Canadian context, extreme warm temperatures are expected to continue to increase, although there are different patterns of warming across different scales and regions (Figure 1 and Figure 2) (Zhang et al., 2019; Bush & Lemmen, 2019). Research suggests that urban landscapes, including large amounts of pavement, have a substantial effect on the local climate. This effect of heat being exacerbated in urban landscapes is referred to as the “urban heat island” effect (Santamouris & Kolokotsa, 2015; Guilbault & Kovacs, 2016). Due to the large amount of impermeable materials that tend to absorb

heat during the day and slowly release heat at night, urban landscapes tend to be on average 1°C to 3°C higher than surrounding areas (Guilbault & Kovacs, 2016). This effect is worsened when the amount of natural land cover, especially mature trees that offer shade, is low. The significance of urban heat islands is clearly seen when considering how our changing climate is affecting air temperatures, as it is expected that extreme warm temperatures will become more frequent in Canadian cities (Hoegh-Guldberg et al., 2018; Bush & Lemmen, 2019).

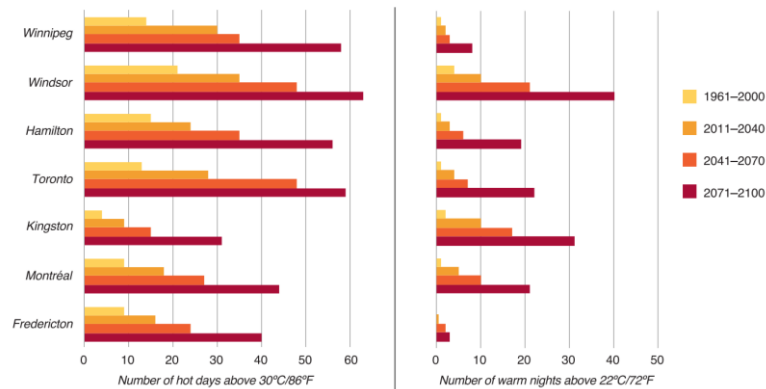


Figure 1: Historical and projected number of hot days and warm nights for selected cities in Canada (Source: Health Canada, 2011; Casati, Yagouti, Chaumont, 2013).

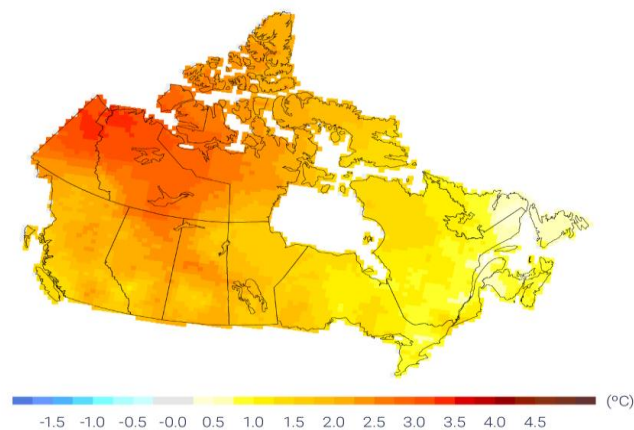


Figure 2: Observed changes (°C) in annual temperature across Canada between 1948 and 2016, based on linear trend. (Source: Canada's Changing Climate Report, 2019).

1.5. Health Risks of Extreme Heat

Extreme heat is a public health issue for all, as everyone can be at risk to serious health impacts (Science Media Centre of Canada, 2017; Government of Canada, 2020a). During extreme heat events, people are at risk of severe illnesses such as heat stroke and heat exhaustion that could result in death. However, certain groups, including senior citizens, children, those with a chronic illness, and those who are socially disadvantaged (experiencing homelessness or living in shelters) are deemed particularly vulnerable to the health effects associated with extreme heat (Health Canada, 2011; Santamouris & Kolokotsa, 2015; Science Media Centre of Canada, 2017). Research indicates that seniors, the demographic of focus in this study, are especially at risk to the health impacts of these events because of challenges they may face in adapting to extreme heat. These challenges may include individual factors such as health status and the need for medications, certain physiological characteristics, such as a reduced sweating ability, mobility challenges, visual, cognitive, and hearing impairments, and reduced literacy (Health Canada, 2011; Science Media Centre of Canada, 2017). Ensuring populations are protected from over-exposure to extreme heat events is especially important as the negative health impacts associated are preventable.

1.6. Motivations and Research Question

This study explores the relationship between two overarching concepts: energy access and extreme heat. A number of relevant themes provide a starting point, including energy vulnerability and barriers to energy access, factors that increase one's vulnerability to extreme heat, how extreme heat affect's health and quality of life, and what strategies individuals, as well as communities, use during extreme heat conditions.

Understanding the complexities of energy justice as well as the relationship between energy access and extreme heat provided motivation for this research. As a human geographer, I was also motivated to pursue this research because the central problem is not experienced the same way across different groups of people. With key social issues, including privilege and injustice, being so closely tied to the research topic, I intended to provide a geographic examination of the complexities of energy access and extreme heat in a Canadian urban centre. These motivations led me to ask the following main research question:

- How do differences in energy access affect the experiences of senior citizens coping with extreme summer heat in Ottawa, Ontario?

This primary question prompted me to follow a qualitative case study methodology examining senior citizens' lived experiences with accessing energy to keep cool during summertime heat. As a major urban centre prone to the urban heat island effect and with a history of extreme heat events, Ottawa, Ontario served as my case study site. By selecting senior citizens as my research demographic, I focused attention on the particular vulnerabilities of ageing populations. This research followed an inductive approach and aimed to gather qualitative information from a wide range of voices, analyze the findings for patterns, and produce recommendations and suggestions that could lead to further discussion or potentially influence policy changes.

1.6. Thesis Outline

Chapter 2 introduces energy justice, the theoretical starting point for the study, and defines the related concepts of “energy poverty”, “precarious energy access” and “energy vulnerability”. It reviews the current literature on energy poverty and how it is

specifically understood in Canadian contexts. The chapter then turns its attention to our changing global climate system and extreme weather. “Extreme heat” is discussed, first alongside an overview of historical changes in temperature across Canada, and then in relation to urban centres. Next, the chapter underlines key connections between the experiences of extreme heat, associated human health risks, and the importance of energy access during these emergencies. Lastly, Chapter 2 details the analytical framework used to guide the empirical analysis, demonstrating how vulnerability and resilience will be used to understand the lived experiences of seniors during extreme heat conditions.

Chapter 3 presents my qualitative case study methodology, including the use of semi-structured interviews, followed by a description of the criteria used to select the case study location. Next, this chapter explains the self-reflexive narrative used throughout my fieldwork as well as in the analysis and writing of this thesis. This is followed by a discussion of the case study and the study population, as well as my approach to participant selection using a combination of criterion sampling, convenience sampling, and snowball sampling. I explain the decision to involve gatekeeper organizations and the role they played during the recruitment process. The discussion of my field methods describes my data collection activities. This chapter concludes with a discussion of how I analyzed the data, including the use of transcription, how the data was organized using a coding system, and the use of NVivo software.

Chapter 4 analyzes and discusses the key findings focused on heat vulnerability and energy vulnerability, organized around three sub-themes: perceptions of vulnerability, factors that contribute to vulnerability, and factors that contribute to energy vulnerability. Each sub-theme presents an analysis of the data by incorporating the voices

of the participants alongside a discussion of my interpretation and its significance within the broader research problem. This chapter concludes with an overview of each sub-theme and what the findings say about senior's vulnerability to extreme heat and precarious energy access.

Chapter 5 analyzes and discusses the key findings related pathways to resilience, again organized into sub-themes: coping strategies, resources and cooling centres, support systems and social isolation. By combining the analysis of the data with a discussion of existing literature as well as my interpretation, this chapter provides insights into how participants experience resiliency in Ottawa and suggestions for increasing community resiliency based on the evidence.

Chapter 6 discusses my thoughts on the research process and the significance of qualitative research as a way to gather unique tones, attitudes, emotions, and voices that may otherwise be missed using a solely quantitative approach. I then discuss the relevancy of this research topic amidst the COVID-19 pandemic. I show how protecting communities from extreme heat is further complicated by the virus outbreak and discuss what public health authorities are considering as key policies for planning for future heat emergencies during unprecedented times. Chapter 6 synthesizes the key findings and offers a series of recommendations that I believe should be considered to better protect seniors from extreme heat events in Canadian cities. After reflecting on the limitations of this project, including time constraints and difficulties with the chosen recruitment strategy, this chapter concludes with my thoughts on directions for future research and how this project could serve as a guide for similar projects in different case sites.

Chapter 2: Literature Review and Introduction to Analytical Framework

2.1. Energy Justice: A Theoretical Framework

Research on energy comes from many different disciplines. The field of energy geographies explores how energy intersects with various spatial identities and connections to place, and how energy can be conceptualized as a social relation (Calvert, 2016). Understanding and attempting to address current energy dilemmas requires insights from energy geographies as the production, distribution and consumption of energy is a major social-environmental system that occurs across places, scales, and landscapes (Zimmerer, 2011). Energy geographies helps us better understand socio-environmental aspects of energy systems across scales because it combines changing energy landscapes, including political-economic relationships and environmental changes, with the realities of how humans around the world interact with and use energy in their lives (Zimmerer, 2011).

To explore the relationship between energy access and extreme heat conditions, this research draws on theoretical ideas from energy geographies and energy justice. In a general sense, justice is a normative concept and principle that is fundamental to regulating how institutions and individuals behave towards others (Rogers, Castree, & Kitchin, 2013). When justice is applied to energy dilemmas, the concept of energy justice emerges. In short, energy justice can be thought of as attempting to apply principles of social justice to global energy problems. Energy justice first focuses on the hazards, costs, and externalities of our energy systems. It also focuses on issues concerning the accessibility and distribution of modern energy services as well as ensuring that energy

decision-making acknowledges equity, due process, and representation of different groups (Sovacool & Dworkin, 2015; Jenkins et al., 2016b; Sovacool et al., 2017). Energy justice as a concept is not always straightforward to examine because it involves many overlapping topics, such as geopolitical issues and environmental justice issues (Zimmerer, 2011).

To apply energy justice in practice, it is helpful to break it into different categories. According to the literature, the primary forms of justice that are typically examined through the lens of energy justice include distributive, procedural, and recognition (McCauley et al., 2013; Bouzarovski, 2018). Bouzarovski (2018) states that distributive justice concerns how fairly resources are distributed, procedural justice focuses on the fairness of decision-making processes, while recognition justice concerns the degree of respect that is given to different socio-cultural groups. This research focuses on distributive justice and justice as recognition, based on the research goals to better understand: 1) how energy services are distributed and utilized amongst the study participants; and 2) whether issues with energy access are being recognized within communities and broader policies.

The framework of energy justice was also selected to help answer the research question as it allows for different principles associated with justice to be examined both individually and in combination. Following the principles described by Sovacool (2013), the research question can be narrowed further to a focus on principles of availability, and affordability. By investigating people's experiences with energy access during a Canadian summer, this research aimed to uncover energy vulnerabilities including

whether the study participants have access to affordable, sufficient energy services to meet their needs during summertime heat.

2.2. Energy Vulnerability - Energy Access and Energy Poverty

2.2.1. Review of the Concepts

The central topics of this research are energy access, energy poverty, and energy vulnerability. It is important to review these terms and how they relate to one another. Arguably, the central theme of this research is energy access, or rather, ‘precarious energy access.’ Following the principles of energy justice outlined above, the term energy access will be considered to consist of both the availability of high-quality energy resources and the affordability of energy for all people (Sovacool, 2013).

When considering how people access energy, the complex topic of energy poverty often arises. The term “energy poverty” is relatively uncommon in the Canadian energy literature as it has only recently expanded to North American contexts (Bouzarovski, Tirado-Herrero, Petrova, & Ürge-Vorsatz, 2016; Rezaei, 2017). Under the framework of the Sustainable Development Goals, the United Nations proposes that energy poverty in the developed world can be thought of as lacking access to energy, while in the developing world, it refers to the experience of lacking access to electricity or dependence on burning biomass for cooking needs (United Nations, 2018a). In general terms, energy poverty refers to the lack of sufficient access to energy. This interpretation of the concept differs from that of other scholars, for example those who use the term ‘fuel poverty’ in literature coming from the United Kingdom. In 1991, British energy scholar Brenda Boardman attempted to give the ‘buzzword’ of fuel poverty a tangible

definition: “households who would need to spend more than 10% of their income on energy expenditures” (Boardman, 1991).

With these various interpretations of energy poverty continuing to be used across the literature it is understandable why there is no standard definition for energy poverty in Canada (Canadian Urban Sustainability Practitioners, 2019a). Energy poverty is usually characterized as an issue caused by of a combination of high home energy costs, a lack of accessible energy services, and low affordability (Canadian Urban Sustainability Practitioners, 2019a). As the purpose of this research is to qualify lived experiences of energy poverty, I will define energy poverty as the experience of households and communities struggling to meet their energy needs (Rezaei, 2017; Canadian Urban Sustainability Practitioners, 2019a). The terms ‘energy poverty’ and ‘precarious energy access’ are used interchangeably in this research.

Thinking beyond how energy poverty is defined and measured, it is also important to situate it within the broader framework of energy justice. Walker and Day (2012) see energy poverty as “fundamentally a complex problem of distributive justice” (p.69). Bouzarovski (2018) also connects energy poverty to injustices in policymaking procedures, stating that energy poverty is shaped by environmental features, including climatic conditions, as well as socioeconomic inequalities. One’s household and residential neighbourhood are factors that may lead to the susceptibility and the experience of energy poverty (Bouzarovski, 2018). Energy poverty can further be seen as a consequence of multiple factors, including household income, the price of energy services, and a lack of energy-efficient technologies (Nussbaumer, Bazilian, & Modi, 2012; Terés-Zubiaga et al., 2013; Romero Rodríguez et al., 2018). The way that energy

poverty is experienced is inherently geographical and political as it is created by injustices between where people live as well as the accessibility (including both affordability and availability) of energy services (Sovacool, 2013; Bouzarovski, 2018). Energy poverty is experienced differently across spatial scales and shaped by the complex politics that are present behind energy decisions. The elusiveness of its definition makes energy poverty somewhat complicated as the term is not used consistently across the literature. As Robić & Ančić (2018) argue, the lack of an all-encompassing definition is a notable gap.

Energy vulnerability is the final key theme of this research. Similar to energy poverty, energy vulnerability is not defined consistently across the literature (Bouzarovski & Thomson, 2018). Energy vulnerability has been called a framework that “serves to highlight the underlying factors that lead to energy poverty, by encapsulating the risks factors the contribute the precariousness of particular spaces and groups of people” (Bouzarovski & Petrova, 2015; Bouzarovski & Thomson, 2018, p.697). Considering energy vulnerability in terms of energy deprivation highlights that a lack of energy services is often a “temporally and spatially variable” experience (Bouzarovski & Thomson, 2018, p.697), meaning that people may experience energy poverty at different times depending on a variety of factors.

2.2.2. Fuel Poverty and Winter Extremes

Much of the literature on energy poverty focuses on ‘fuel poverty,’ a concept associated with households that are unable to sustain adequate thermal comfort, most commonly not being able to maintain a comfortably heated home during winter conditions (Liddell & Morris, 2010). Although fuel poverty has inherent connections

with relative income poverty, it is also produced by poor thermal efficiency of housing and high energy prices (Boardman, 2013; Christman & Russell, 2016).

A considerable amount of research, most notably from the United Kingdom, has focused on fuel poverty, affordable warmth, and how it is an expression of injustice (Walker & Day, 2012). The concept of fuel poverty illustrates how energy poverty is thought about in different contexts, including different weather and climate conditions.

Research from economics, health, energy efficiency, and legal studies has been conducted on fuel poverty to try to come up with a solution (Christman & Russell, 2016). Not being able to afford adequate warmth in the home has significant implications for human health. Previous studies have indicated that cold indoor temperatures are associated with excess winter deaths, most significantly for people living in poorly insulated homes (Liddell & Morris, 2010; Christman & Russell, 2016). Evidence has shown that living in fuel poverty is a matter of human rights as it affects one's ability to live a healthy and abundant life (Liddell & Morris, 2010; Gilbertson, Grimsley, & Green, 2012; Walker & Day, 2012; Christman & Russell, 2016). The literature on this topic makes it clear that fuel poverty, as well as energy poverty more broadly, is a deep-rooted issue that integrates distributional, recognition, and procedural justice.

With a large amount of attention being given to how people experience fuel poverty in the winter, one may think that this is not a multi-seasonal issue, but that is far from correct. The need for accessible and affordable energy for all people continues to be an issue during the warm seasons, even in countries such as Canada, that are known for experiencing cold winters. Summertime temperatures are expected to continue to increase, posing serious consequences for human health, as discussed later in this chapter

(Hajat, O'Connor & Kosatsky, 2010; Gachon et al., 2016; Science Media Centre of Canada, 2017). Recognizing this gap, this research focuses on energy poverty and summertime heat rather than fuel poverty and adequate warmth.

2.2.3. Access and Affordability

As mentioned, energy poverty commonly involves not being able to access energy services or not being able to afford energy services because of high home energy cost burdens. Although this research aimed to qualify the experiences of energy poverty that Canadians face, it is still important to review the number of households that are said to be experiencing energy poverty based on their income and the amount they spend on energy services. The Canadian Urban Sustainability Practitioners (2019a) state that “households that spend more than 6% of their after-tax household income on home energy services have high home energy cost burdens” (p. 3). This affordability threshold helps determine which Canadian households are experiencing energy poverty and points to other indicators of vulnerability. Although a lower income level is an obvious and very significant indicator of energy poverty, energy affordability is just one indicator for recognizing energy poverty. Other indicators of vulnerability to energy poverty can include the inability to improve energy efficiency or performance of the home, the lack of access to secure networks of energy infrastructure, and the inability to sustain adequate thermal comfort (Canadian Urban Sustainability Practitioners, 2019a).

2.2.4. Energy Poverty in Canada

According to a 2019 report by the Canadian Urban Sustainability Practitioners, the highest rate of energy poverty in Canada occurs in the Maritime provinces. The data, extracted from the 2016 Census, shows that 41% of households in Prince Edward Island

are experiencing high home energy cost burdens. A snapshot of energy poverty in Ontario, Canada's most populated province, further illustrates the relevance and importance of this issue. Currently 1.1 million households are experiencing energy poverty in Ontario, in both rural and urban settings (Canadian Urban Sustainability Practitioners, 2019a). Rural households are more likely to experience energy poverty due to higher transmission charges on energy bills. However, since most Canadians live in urban centres, most households who experience precarious energy access live in urban areas (Canadian Urban Sustainability Practitioners, 2019a).

Although the experience of energy poverty is linked to low incomes and income poverty more broadly, households with a range of incomes are also known to experience high home energy cost burdens (Canadian Urban Sustainability Practitioners, 2019a). Many Canadians living in households described as having moderate incomes also experience high home energy cost burdens. This may be due to the various factors and contingencies that may lead to energy vulnerability including the geographical location of their household as well material factors such as ventilation, presence or absence of insulation, presence or absence of shaded areas, and the number of orientation of windows (Ueijo et al., 2011; Thomson et al., 2019; Canadian Urban Sustainability Practitioners, 2019a). This is significant as it highlights that this issue is not only experienced by low-income households and further explains that the term energy poverty cannot only be considered a problem associated specifically with general poverty.

2.2.5. Energy Efficiency and Building Codes in Canada

Another factor shaping the issue of energy poverty in Canada are housing types and building energy codes (Lockhart, 2020). Household energy consumption and energy

performance are affected by the kinds of energy efficiency systems in place (Canadian Urban Sustainability Practitioners, 2019a). Because the focus of implementing energy-efficient technologies is primarily on minimizing energy use and creating clean energy grids, these technologies are crucial in helping to lift households out of energy poverty (Lockhart, 2020). The National Energy Code for Buildings (NECB) in Canada, which is currently under public review to be updated, sets out technical requirements for the energy-efficient design and characteristics of new buildings (National Research Council Canada, 2017). This approach to setting a standard for energy efficiency for buildings in Canada offers a tremendous opportunity to help eliminate energy-related carbon emissions in our built environment and is a major contributor in Canada's transition to a low carbon future (Lockhart, 2020).

Most of the energy used in buildings in Canada is to heat and cool spaces (Lockhart, 2020). Often, the way that this energy is consumed is not efficient as it is commonly lost through air leakage through small gaps in the building assembly and construction (Lockhart, 2020). Recognizing that energy loss through buildings is a major issue, the National Energy Code for Buildings proposes a requirement for buildings to have their air tightness, or the ability for air to leak, to be tested. By testing a building's air tightness, or the amount of air that is being leaked, energy and money can be saved (Lockhart, 2020).

Finding solutions to household energy efficiency issues is a topic that warrants a lot of attention, especially in relation to Canada pushing towards a low-carbon future. However, these solutions are not necessarily going to help people who are living in less efficient dwellings, and who do not have plans to, or cannot, retro-fit them to implement

recommended energy-efficient technologies. Because of these disparities, less efficient households may have higher energy costs compared to households that are either newer or are perhaps in a different category or type of housing.¹ The age of a dwelling (since construction) affects the likelihood that the people living there will experience energy poverty. Data collected in Canada shows that households living in dwellings built before 1960 are most likely to be experiencing energy poverty (Canadian Urban Sustainability Practitioners, 2019a).

The differences in dwellings' ability to use energy-efficient technologies further illustrate injustices that are maintained by the experience of precarious energy access. Having adequate housing with available, affordable, and clean energy is a matter of social equity (Lockhart, 2020). Although the intentions of this research were not to directly assess the energy inputs and outputs of households, this snapshot of literature on energy efficiency and its connection to energy access in Canada is essential when considering the different manifestations of energy poverty. Further, exploring building codes and household energy consumption provides important context for how people access energy in an environment where they spend a large proportion of their time.

2.3. Extreme Weather and Climate Change

2.3.1. Our Changing Global Climate System

¹ Following the categorization by the Canadian Urban Sustainability Practitioners (2019a), different types of housing include: Apartment 5+ storeys, Apartment <5 storeys, Row house, Semi-detached house, Apartment or flat in a duplex, Single-detached house, Other single-attached house, and Moveable dwelling.

This research aimed to understand how Canadians experience energy access during extreme heat conditions. To properly understand this problem, it is necessary to briefly review the literature on global climate extremes, how Canada is currently experiencing temperature changes, and our changing climate in a global context.

A robust set of evidence indicates that the earth has warmed and is continuing to face temperature increases largely due to anthropogenic influence (Bush & Lemmen, 2019). Evidence shows increases in near-surface and lower atmosphere air temperature, sea surface temperature, and global sea levels (Bush & Lemmen, 2019). The Intergovernmental Panel on Climate Change (IPCC) defines ‘climate extremes’, also referred to as extreme climate or weather events, as “the occurrence of a value of a weather or climate variable above (or below) a threshold value near the upper (or lower) ends of the range of observed values of the variable” (2012, p.116). This definition does not come without its complexities as there are various definitions of thresholds and what is deemed a ‘climate extreme’ or ‘weather extreme’ may vary in different locations.

Some climate extremes, such as droughts or floods, may be the outcome of an accumulation of weather extremes, such as short-duration heavy precipitation events (IPCC, 2012; Bush & Lemmen, 2019). Adding to the ambiguity of the definitions of climate and weather extremes is the fact that not all extremes necessarily lead to a severe impact. Although the definitions may not be easily summarized, these extremes are without doubt significant. As a result of our changing global climate system, it is expected that the frequency, intensity, and duration of climate and weather extremes will continue to increase around the world and across Canada (World Meteorological Organization, 2014; Bush & Kemmen, 2019).

2.3.2. Extreme Heat

The IPCC has stated that due to rising global temperatures, extreme heat events are expected to increase and intensify (Health Canada, 2011; Hoegh-Guldberg et al., 2018). An extreme heat event is often associated with terminology such as ‘extreme temperatures during summertime’ and ‘heat wave’ (Health Canada, 2011). However, what constitutes an extreme heat event varies in different jurisdictions (Health Canada, 2011, p. 2). Scientifically, an extreme heat event occurs when a high-pressure weather system stops over an area, which causes warm air to build up close to the ground (Science Media Centre of Canada, 2017). In contrast, a heat wave, as defined by Environment Canada (2002), is “a period with more than three consecutive days of maximum temperatures at or above 32°C”. These terms are essentially describing the same broad experience, the temperature being excessively hot.

For this research, the term extreme heat and extreme heat event will be used most frequently. Because this study is not focused solely on one particular heat episode, using only the definition of heat wave would be inconsistent with the research question. Although it was deemed most fitting to broadly examine experiences of extreme heat in Canada, examining participants’ perspectives and level of knowledge of heat waves and their potential risks was also considered important. The term extreme heat is used most often in the literature from Health Canada, and for reasons of consistency and credibility, this study will follow their definition.

2.3.3. Changes in Temperature Across Canada

This research focuses on how changes in temperatures are felt in Canada. The Canadian climate is extremely diverse, with apparent variations between regions (Zhang

et al., 2019). The surface air temperature of an area is closely linked to the ability to grow certain crops, the functioning of unique ecosystems, and human health and wellbeing (Zhang et al., 2019).

Historical temperature data in Canada is not evenly distributed across the country, and there is no reliable data for all time periods. Data that shows changes in temperature across the whole country only begins in 1948 (Zhang et al., 2019). Despite these limitations, historical observations allow us to better understand climate change impacts and support climate services across the country. Daily temperature data also give us other indices, such as annual highest and lowest day or night temperatures (Zhang et al., 2019). Further, indicators such as heating and cooling degree days², can provide valuable information regarding energy planning (for heating and cooling demand) and crop growth (Zhang et al., 2019). Indices that consider the number of days when the daily maximum temperature is above a specific threshold (such as 30°C and 22°C), as well as the number of ‘hot days’ and ‘hot nights’ a region experiences, have significant implications for public health planning (Bush & Lemmen, 2019; Casati, Yagouti, Chaumont, 2013). Current evidence suggests that extreme heat days will become more frequent (Bush & Lemmen, 2019). Health Canada³ has identified that over the next 30 years, the number of

² Heating degree days are defined as the annual sum of daily mean temperature below 18°C. Cooling degree days are defined as the annual sum of daily mean temperature above 18°C (Zhang et al., 2019)

³ Health Canada is “the Federal department responsible for helping Canadians maintain and improve their health while respecting individual choices and circumstances” (Government of Canada, 2014a).

hot temperature days will double in some parts of Canada (Government of Canada, 2020a). Extreme heat days are also expected to become more frequent in northern areas that have never experienced these types of temperatures before (Bush & Lemmen, 2019).

2.3.4. Increasing Summertime Temperatures and Urban Heat Islands

While increasing daily temperatures and extreme heat events are a global phenomenon, this research focuses on how these changes are experienced in urban areas, specifically Ottawa, Ontario. Extreme weather and climate events, such as extreme heat, have significant adverse effects on urban populations. Some of these impacts affect the quality of life and overall health of urban citizens as well as the amount of energy that is consumed (Santamouris & Kolokotsa, 2015). These events are of concern especially for urban areas due to the “urban heat island” effect, which occurs when the air temperature in populated urban areas is higher than the surrounding areas (Hajat, O’Connor, & Kosatsky, 2010; Tsilini et al., 2014; Santamouris & Kolokotsa, 2015; Hoegh-Guldberg et al., 2018). This phenomenon is caused by a variety of factors, and the intensity of the effect depends on the combination of these factors. A significant factor in the creation of the urban heat island effect is the abundance of concrete, asphalt, and shingles in cities. The heat from the sun gets absorbed into these materials and other aspects of the built environment and gets emitted at night (Chown Oved, 2019). Another factor is the geometry of urban structures that increase the reflection of solar radiation. The local weather, excessive numbers of vehicles releasing waste heat, not enough vegetation surfaces such as parks and green roofs, and increases in urban population leading to more anthropogenic heat, also add to the urban heat island effect (Santamouris & Kolokotsa, 2015; Gachon et al., 2016; Science Media Centre of Canada, 2017).

Various studies have examined the impact of urban overheating on populations and how extreme heat conditions affect the environmental quality of households and the thermal comfort of citizens (Sakka et al., 2012; Beizaee, Lomas, & Firth, 2013; Santamouris & Kolokotsa, 2015). A 2015 study highlighted the significance of urban overheating for European households living in energy poverty. Without adequate environmental protection from outdoor climate conditions, or the ability to seek out desired energy services, these households were found to be in an extremely vulnerable position for their health and wellbeing (Santamouris & Kolokotsa, 2015). As urbanization is becoming even more widespread throughout the world, cities are getting warmer, and these heat island effects are being felt in more and more cities (Luber & McGeehin, 2005). A study by Harlan et al. (2006) looking at the effects of neighbourhood type and heat stress further supports the point that certain groups of people are more vulnerable to the harmful effects of heat exposure than others, particularly people living in warmer neighbourhoods with fewer social and material resources, such as access to air conditioning (Harlan et al., 2006; Luber & McGeehin, 2005). It is clear that the urban heat island effect, as well as urban socio-demographics, play a role in producing heat vulnerability.

2.3.5. Reporting in Canada

Canadian communities are attempting to adapt to these circumstances. Having an established warning system is necessary to allow populations to better understand when they are at risk. The Meteorological Service of Canada (MSC), which is a part of Environment and Climate Change Canada (ECCC), is responsible for issuing heat warnings when air temperatures and humidity go beyond the established threshold for the

region being analyzed (Science Media Centre of Canada, 2017). These thresholds are based on health evidence and vary based on location, amount of humidity and nighttime temperatures (Science Media Centre of Canada, 2017).

In southern Ontario, the threshold for a heat warning is “when two or more consecutive days of daytime maximum temperatures are expected to reach 31°C or warmer and nighttime temperatures are expected to fall to 20°C or warmer” (Government of Canada, 2019). This specific threshold is based on criteria that may lead to heat-related illness or death in that region (Government of Ontario, n.d.). However, monitoring the weather and evaluating this criteria threshold are not the only steps in properly warning populations about heat events. ECCC currently follows a protocol known as the *Harmonized Heat Warning and Information System for Ontario* (HWIS), that was created as a pilot project leading up to the Pan Am and Para-Pan Am Games in Ontario during the summer of 2015 (Science Media Centre of Canada, 2017). This project, run by the Ontario Heat Health Project Team, was established in 2016 to help make heat warnings more consistent across the region. The goal was also to help advise Public Health Units (PHU)⁴ to follow specific protocols of their own (Government of Ontario, n.d.; Science Media Centre of Canada, 2017). This protocol includes providing PHUs with an early

⁴ According to the Ontario Ministry of Health and Long-term Care a Public Health Unit is “an official health agency established by a group of urban and rural municipalities to provide a more efficient community health program, carried out by full-time, specially qualified staff.” There are 35 public health units in Ontario (Government of Ontario, n.d).

notification that criteria for a heat warning are forecast to be met. By issuing a heat warning 18-24 hours in advance, this gives the PHU of the region enough time to choose whether they need to issue a message to the public alongside the warning (Science Media Centre of Canada, 2017). Once ECCC has confirmed that a heat warning is in effect, the PHUs are responsible for taking appropriate action by reaching out to municipal partners, alerting the public and providing health-protective information (Science Media Centre of Canada, 2017). If the heat warning is forecasted to last longer than two days, PHUs are expected to declare an extended heat warning. It is at this time that the PHUs work closely with municipal and community partners to ensure the safety and comfort of the public. Partners include a variety of municipal departments (public transit, libraries, social services, city-run community centres, etc.), large NGOs such as the Red Cross or Salvation Army that may provide emergency management services, community housing, long-term care homes and other health outreach services, schools and child care settings, recreational facilities (pools, splash pads, etc.), and local businesses (Government of Ontario, n.d.). The final step of the HWIS protocol is to notify the public that the warning has ended. This protocol, and its development in other provinces, shows that the Canadian health system has recognized the significance of extreme heat events and the potential issues they pose for Canadians.

2.3.6. Canadian Public Health Risks and Vulnerable Populations

A significant concern associated with extreme heat events are the possible health risks for human populations. Health impacts occur when the body's ability to properly regulate body temperature is compromised, leading to the body's core temperature rising above its normal range. This physiological response can lead to health impacts which

vary based on the exposure, the individual and their pre-existing health condition, and their ability to take protective measures (Gachon et al., 2016; Science Media Centre of Canada, 2017). Some of the known health impacts that are common with episodes of extreme heat include skin rashes⁵, dehydration, heat cramps, heat exhaustion⁶, heat fainting⁷, and heat stroke⁸ (Science Media Centre of Canada, 2019). The severity of heat-related health issues is further reflected in the mortality rates associated with extreme heat events.

Efforts to address the health effects of extreme heat on populations often try to assess and classify who is most vulnerable. Vulnerability, a prominent theme in this research which will be defined and discussed more thoroughly later in this chapter, is a measure that comes with different conceptualizations (Clark & Preto, 2018). Although everyone may be at risk for heat-related health risks, public health officials deem seniors and children to be particularly vulnerable to extreme heat events (Health Canada, 2011; Science Media Centre of Canada, 2017; Carey, Monaghan, & Stanley, 2017). Children and seniors are more at risk because their bodies tend to sweat less, meaning they may have trouble regulating their body temperature. They are also deemed more at risk as they

⁵ Heat rashes or *Miliaria rubra*, is caused by the inflammation of clogged sweat glands (Health Canada, 2011).

⁶ Heat exhaustion is caused by the excessive loss of water and salt (Health Canada, 2011).

⁷ Heat fainting or *Parade syncope*, is the result of the loss of body fluids through sweating and by low pressure (Health Canada, 2011).

⁸ Heat stroke is a result of the body going into heat overload and is the most serious type of heat illness. Symptoms of heat stroke include a core body temperature higher than 40C/104F, complete or partial loss of consciousness as well as a reduced mental ability (Grubenhoff, du Ford, & Roosevelt, 2007; Health Canada, 2011).

may depend on caregivers to take protective action for them (Science Media Centre of Canada, 2017).

Seniors, the focus of this research, may also experience a reduced thirst sensation and an increased susceptibility to chronic dehydration (Health Canada, 2011). Alongside these physiological factors, seniors who have limited mobility and agility, have visual, cognitive, or hearing impairments, reduced literacy, or experience social isolation may experience greater risks associated with exposure to extreme heat conditions. Older adults may also have limited access to information about heat-related alert systems and differing perceptions of risk based on previous life experiences and habits (Health Canada, 2011; Science Media Centre of Canada, 2017). Exposure to extreme heat may also worsen existing chronic health conditions or illnesses, such as those affecting the lungs, heart, kidneys, and nervous systems, as well as mental health issues (Health Canada, 2011; Science Media Centre of Canada 2017). In addition to this, certain prescription drugs, such as antidepressants, antihistamines, and diuretics may affect the body's normal thermoregulatory function (National Collaborating Centre for Environmental Health, 2010). The most critical consequence is on the body's ability to regulate temperature and cool itself down because of a disrupted capacity to sweat. Unfortunately, the users of these medications may be unaware of the added risk their use presents during extreme heat conditions (Lomax & Schönbaum, 1998; National Collaborating Centre for Environmental Health, 2010).

Another factor increasing vulnerability to heat-related health conditions is the inability to access resources and services that help with cooling. People living in certain socially disadvantaged situations (low income, homeless, living alone) may not be able to

access adequate cooling services, such as air conditioning and fans that are recommended to cool air temperature (Richardson, Kagawa, & Nichols, 2009; Wolf, Adger, & Lorenzoni, 2010; Health Canada, 2011). Here the connection between energy access and extreme heat becomes very apparent, as being able to attain modern energy services that allow one to keep cool is intertwined with the topic of precarious energy access (Casillas & Kammen, 2010; Simcock et al., 2018). As mentioned, energy poverty has frequently been examined in relation to health risks faced by people who cannot keep themselves or their households warm in cold winter conditions (Chard & Walker, 2016; O'Sullivan, Viggers, & Howden-Chapman, 2018). But the significance of energy poverty does not end when winter does. For example, O'Sullivan et al. (2018) examined the thermal comfort of children in school classrooms with inadequate energy services in New Zealand, aiming to understand the experiences of being overly hot while at school and how that impacts student performance. This case study illustrates the importance of considering how different populations, in different environments, experience energy poverty during summer heat conditions.

The significance of extreme heat events and their implications for human health, especially for vulnerable populations, is strengthened by the knowledge that these events are not well reported in Canada. Many deaths that can be attributed to heat-related illness go un-documented (Health Canada, 2011). Bustinza et al. (2013) examined the health impacts of a heat wave in Québec in July 2010 by analyzing both the crude daily death rates and emergency admission rates during the period of the heat wave. Results of this study indicate that there was a significant increase in both crude daily death rates and emergency department admissions during the heat wave. However, this study also

concluded that there has been a reduction in mortality during heat waves compared to past heat waves, which can be attributed to the increased use of air conditioning and public health measures (Bustinza et al., 2013). This study provides an example of how health impacts associated with extreme heat are reported and understood, though such reporting is not consistent across Canada. The Toronto Star (Chown Oved, 2019) highlighted this by investigating the July 2018 heat wave in Québec. During this event 89 people died from the heat across Quebec, yet, there were zero reported deaths in Ottawa (which is geographically very close to Quebec) and the rest of Ontario (Chown Oved, 2019). These statistics show discrepancies in the reporting of heat-related deaths as this heat wave was felt across both provinces. In an interview with the Toronto Star (Chown Oved, 2019), Dr. David Kaiser of Montreal Public Health stated that it can be difficult to address a problem without adequately measuring it, and that active surveillance is key in limiting the number of heat deaths. With the knowledge that heat events are going to continue, preparing for associated health risks is of utmost importance.

2.4. Gap in the Literature

Examining energy access in relation to extreme heat represents a gap in the literature. There is evidence of the heightened risk of extreme heat conditions because of rising global temperatures and a strong body of research pertaining to affordable heat during winter months. However, only a handful of studies have examined the implications of energy poverty during extreme heat conditions – especially using qualitative methods (Wolf, Adger, & Lorenzoni, 2010; Soebarto & Bennetts, 2014; Nicholls & Strengers, 2014; O’Sullivan, Viggers, & Howden-Chapman, 2018). Rezaei (2017) states that the current literature on energy poverty has an “exclusive focus”

towards energy poverty in the home and the experience of feeling cold (p. 14). Moreover, there appears to be no in-depth study of these relationships in a Canadian urban area. Recently, the Canadian Urban Sustainability Practitioners (CUSP) began trying to increase awareness of energy poverty in Canada by creating the *Energy Poverty and Equity Explorer* tool. This online resource aims to help educate people on the geographic spread of energy poverty and inform governmental partners of the need for equitable clean energy programs (Canadian Urban Sustainability Practitioners, 2019b). This research is in line with the goals of this work by exploring how people experience accessing energy during summer months in Canada.

Previous studies have also argued that place-specific and people-specific research needs to be developed that can help illustrate the complex spatial contexts where energy poverty takes place and what people do to cope with it (Petrova et al., 2013). This research takes up this challenge by examining seniors' day-to-day experiences with energy access and extreme heat. Using a qualitative methodological framework with the prominent themes of barriers to energy access, extreme heat, health and quality of life, isolation, vulnerability, and access to knowledge, this research aims to advance discussion and inform decisions on the timely and important problem of precarious energy access during extreme heat conditions.

2.5. Analytical Framework - Qualifying Experiences of Energy Access and Extreme Heat

This final section of this chapter explains the analytical framework. After defining what constitutes vulnerability and resilience in the context of this research, I explain the framework that I used to guide the empirical analysis. After consolidating other resources I adapted a discourse of vulnerability and resilience that fits the research problem. As this

research aimed to understand the lived experiences of people accessing energy services during extreme heat conditions, vulnerability and resilience were used as key concepts to understand how participants experience different constraints and utilize different coping strategies to manage. By positioning the analysis of the data within the themes of vulnerability and resilience, this approach aimed to uncover and re-present the stories and realities of study participants and how they connect to broader issues of inequality, social justice, and energy justice.

2.5.1. What Constitutes Vulnerability?

Understanding the various dimensions of vulnerability can help reveal inequalities amongst groups as well as the processes that create and reinforce them. Although examining vulnerability is important, health scholars have pointed to problems with labelling people as vulnerable, such as the possibility of stigmatization and oppression, as well as the consequences of generalizations (Brown, 2011; Piggott, 2015). A recent study published in *Critical Public Health* also found that the term vulnerability is often vaguely outlined within public health literature, which can cause issues for how vulnerable populations are cared for (Katz et al., 2019; Stranges, 2019). Katz et al. (2019) determined that using the term vulnerability in research or in health care without precisely contextualizing the issue being investigated is troublesome, as it leaves the public trying to “fill in the blanks” on what it is the people are vulnerable to, how the vulnerability is produced, or by whom (Katz et al., 2019; Stranges, 2019). Using language such as “vulnerable groups” without defining who these people are, the public may believe that vulnerability is an inherent deficit, potentially leading to (or reinforcing) racism and classism towards the groups that are deemed vulnerable (Katz et al., 2019;

Stranges, 2019). For these reasons, researchers must recognize the power dynamics and potential for misattribution of problems when using vulnerability as a term in research.

Keeping this in mind, it is necessary to ask: how can vulnerability be usefully defined and what constitutes vulnerability within this research? Cutter (2016) places the origins of the term in a disasters context, with vulnerability defined as “susceptibility to harm” (Blaikie et al., 1994; Wisner et al., 2004; Cutter, 2016). This paradigm included scholars who were interested in studying the susceptibility of groups to certain hazards and risks (Wisner et al., 2004; Cutter, 2016). The term vulnerability then progressed when used in the context of climate change adaptation, with its definition now including the capacity to adapt (Cutter, 2016). Vulnerability takes on a different meaning when used in the context of health care. Here, vulnerability is classified based on health outcomes and adverse social determinants of health as well as susceptibility to harm (Hurst, 2008; Piggott, 2015; Clark & Preto, 2018). Lastly, human geography research focused on the geographies of care has viewed vulnerability as “a state of being that works to highlight the connections between people and the interdependencies that shape one's need for an other” (Hanrahan, 2018, p.246). Evidently, the term vulnerability holds many meanings across disciplines and holds significance in different areas of study.

Recognizing the overlapping disciplines relevant to my study as well as my research problem, I will use the definition of vulnerability in the Oxford Dictionary of Human Geography: “Vulnerability is the susceptibility of individuals, households, and places to serious harm... Vulnerability is a function of risk, the probability of a harmful event and the level of exposure to it, coupled with personal characteristics (Rogers, Castree, & Kitchin, 2013). I decided to follow this definition as it is clear and can be

understood within the context of this research, with extreme heat conditions as the harmful event being studied.

2.5.2. What Constitutes Resilience?

Beyond examining vulnerability, this research also sought to understand how people cope and utilize certain strategies to avoid bad outcomes during extreme heat conditions – in other words, their resilience. In the context of this research, resilience can be thought of as one’s capacity to cope with change or a threat (Weichselgartner & Kelman, 2015). More specifically for this project, resilience is understood as one’s ability to adequately cope with extreme heat conditions and reduce or avoid potential bad outcomes. Vulnerability and resilience are related conceptually but are not the opposite of each other, as groups can be highly vulnerable without lacking resilience (Cutter, 2016).

2.6. Vulnerability and Resilience – An Analytical Framework

This analytical framework provides a way to understand the lived experiences of participants in this study. My framework followed the work of Schröder-Butterfull & Marianti (2006) who provided an outline and terminology for understanding the vulnerability of older people. Their model, without being deterministic, highlights the relationship between vulnerability and resilience, as well as the complexities and interlinkages between the risk of exposure, threats, coping strategies and potential for bad outcomes. This model guided the analytical framework of this research, depicted in Figure 3. The framework focuses on three main ideas:

- 1) What makes one vulnerable to the threat of extreme heat;
- 2) How a higher likelihood of exposure, due to numerous factors, can make one more vulnerable;

3) How the ability to be resilient, or adequately cope may make one less likely to experience bad outcomes.

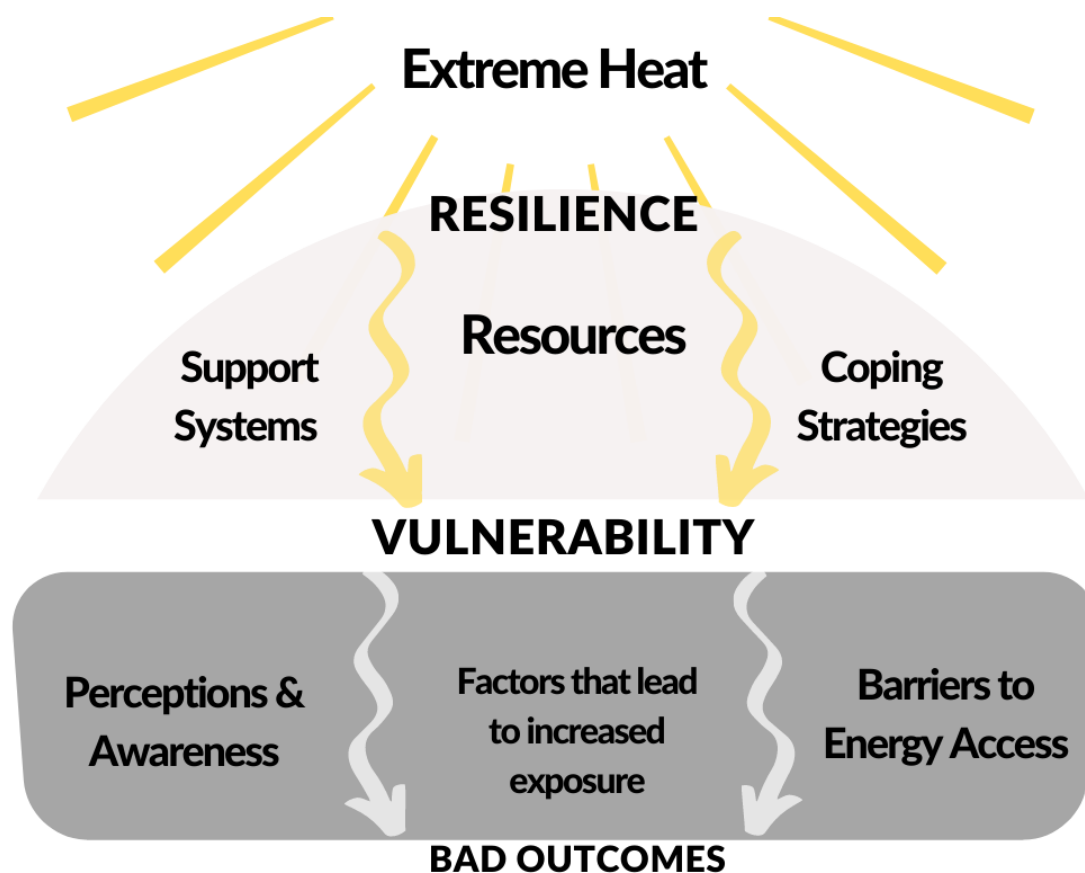


Figure 3: Conceptual map of analytical framework

As seen in this concept map, the relationship between extreme heat, vulnerability, and resilience cannot be seen as a straight line. Instead, Figure 3 attempts to illustrate the complexity of these topics to represent that vulnerability and resiliency are an ever-changing journey; an experience that does not simply come to a stop. It also important to indicate that this process is experienced differently for each individual. Beyond the conceptual shape of this analytical framework, this visual also includes some of the key analytical themes found within the data, which will be discussed in future chapters.

Among other things, this study examined participants' risk of exposure to the threat of extreme heat. Before considering individual factors, the study sample was considered to share some common risks of exposure to summertime heat: all were living in the Ottawa area, meaning that they experience roughly the same outdoor environmental conditions⁹, and all were in the same age demographic of at least 65 years old, who, according to literature, are considered to be a vulnerable group to the threat of summertime heat.

This baseline understanding of participants' risk sets the foundation for examining what factors lead to differences in their exposure to summertime heat. The more exposed one is to extreme heat correlates with increased vulnerability to the bad outcomes assessed in this study: negative effects on one's physical health, mental health, and emotional wellbeing. The literature on this topic reveal that various factors may increase this vulnerability, including pre-existing health conditions, precarious energy access, mobility issues, lack of independence, a poor social support network, the quality of housing, and one's economic sufficiency and stability. Another factor that may impact one's vulnerability is awareness about the threat of summertime heat. This is important as some may not realize the significance of summertime heat as a life-threatening event. It is further important to consider that one's level of awareness and opinion may not only be

⁹ Here, it was taken into consideration that all participants who were interviewed did reside in Ottawa at the time of interview. But again, this research aimed to investigate participant's overall lived experiences with extreme heat conditions, not specifically pertaining to one period of time. Meaning that participants have different experiences and histories with various outdoor environmental conditions that they may address.

formed by their present circumstances but also their past life experiences and outcomes (Schröder-Butterfull, & Marianti, 2006). By considering participants' retrospective remarks and histories, such as a previous experience with symptoms of a heat-related illness, I aim to better understand how specific levels of awareness or opinions may have been created and influence one's current state of vulnerability.

Lastly, the term 'coping strategy' will be used to refer to actions one chooses to take to either help lessen their chances of experiencing a bad outcome or avoid certain factors that may increase their vulnerability. Reviewing what coping strategies people use, including resources provided by different levels of government, may point to potential difficulties in the provision and delivery of information and aid. It is further meaningful to examine whether or not the coping strategies people use actually increase their resilience. The overall success of certain strategies may highlight the need for those to be more heavily promoted and used by others.

2.7. Conclusion

The experience of energy vulnerability and the increase in extreme heat events are widespread problems for many Canadians. When combined, these issues pose serious threats to health and wellbeing of vulnerable populations. Extreme heat events can cause serious health consequences and death, and without proper awareness and cooling strategies in place people are at risk. As temperatures continue to increase, especially in urban centres, the use of energy services, such as air conditioning and electric fans, continue to be recommended by health officials as a way to stay safe. Considering the problems of uneven access to energy and the experience of energy poverty, people's experiences with coping with the heat differ dramatically. The literature

points to the need to explore these experiences to determine how to keep populations safe. The limited research that combines issues of energy justice, extreme heat events in urban areas, and public health in Canada inspired the design of this research.

Chapter 3: Methodology

3.1. A Qualitative Case Study Methodology

To investigate how seniors experience the relationship between energy access and extreme heat, I used a qualitative case study approach. I decided to use a qualitative methodology because of my motivation to explore not only the related themes of this relationship but also uncover the voices and experiences of a vulnerable population. This methodological approach is appropriate for the task of understanding the lived experiences of senior citizens and how they cope during summertime heat. Using a qualitative methodology allowed me to place myself within the research, both in my role as a research instrument with my interactions with people as well the findings, instead of merely being a “neutral, detached observer” (DeLyser et al., 2010, p.6). Situating myself as a qualitative geographer also allowed me to maintain a certain level of flexibility when attempting to understand the many nuanced meanings of people’s lived experiences (DeLyser et al., 2010; Dunn, 2016). My decision to pursue qualitative research is also supported by the fact that qualitative researchers often “seek to answer questions that stress how social experience is given meaning” (Denzin & Lincoln, 2005, p.10; DeLyser et al., 2010). With the combination of my key research intentions and my primary research question, it was clear that a qualitative approach would be most fitting.

To answer the research question and to better understand individual experiences, semi-structured interviews with volunteer participants were used as the primary research tool, chosen to allow participants time and freedom to share their experiences openly and on their terms. A semi-structured interview guide (see Appendix A) was used to help navigate the conversation. This open-ended interview structure was useful in

keeping the interviews focused and also allowing for different avenues and themes to be explored (Jamshed, 2014). Further, semi-structured interviews allowed for more comprehensive analysis of the responses, as the guide provided organization to the interview conversations (DiCicco-Bloom & Crabtree, 2006; Jamshed, 2014).

3.2. Case Study Site

I decided to follow a single case study methodology because it allows for an intensive examination of the participants' experiences and how they compare to one another (Baxter, 2016). The decision to focus on one case study site was also influenced by the time constraints of this project and my desire to take the time to build rapport and connections with the research participants.

I decided to select Ottawa, Ontario, as my case study site with support both from the literature as well as the development, landscape, and population demographics of the city. First, the limited literature that does exist on energy poverty in Canada is primarily focused on rural communities. By selecting a major city as the primary case study, this project allowed urban Canadian residents to share their experiences with energy access during summertime heat. It will hopefully add new insights to the discussion of energy poverty in Canada. Beyond this gap in the literature, I selected Ottawa as the research site because it has a growing population of seniors (The Council on Aging of Ottawa, 2017). With the focus on this research being the experiences of senior citizens, it was vital to choose a site where many seniors live. Lastly, Ottawa was selected because of its high average daily maximum temperatures during the summer and recent meteorological data showing many cases of extreme heat events (Government of Canada, 2018a; Government of Canada, 2018b; Government of Canada, 2018c).

3.3. Study Population

The study population consisted of English-speaking senior citizens at least 65 years old living in Ottawa. Seniors were chosen as the target population because evidence indicates that they are particularly vulnerable to heat-related health risks (Wolf, Adger & Lorenzoni, 2010; O’Sullivan, Viggers, & Howden-Chapman, 2018). Seniors were also of particular interest for this study because of the assumption that this population may have lower autonomy and control in confronting extreme heat conditions, including greater mobility constraints than younger age groups (Science Media Centre of Canada, 2017). In other words, seniors may have unique limitations in terms of their ability to access energy and maintain adequate thermal comfort. Another important aspect of seniors’ vulnerability is associated with class and wealth inequalities, as some Canadian seniors may be living in or near poverty. Although this project did not specifically collect information regarding income level or wealth, it is necessary to recognize that this factor is central within the framework of energy justice and vulnerability to extreme heat.

To provide clear inclusion criteria, the definition of a senior citizen being “an elderly person, especially a person over 65” (The Canadian Oxford Dictionary, 2005; Statistics Canada, 2006) was used. Choosing to use this definition as a marker of who to include in this research was not straightforward as the definition of ‘senior citizen’ is often contested in the literature (Statistics Canada, 2006; Government of Canada, 2014b). Although it is difficult to find an objective definition of who is considered a ‘senior citizen’, for the sake of straightforward recruitment, I used the above definition.

3.4. Recruitment of Participants

Participant selection was performed using a combination of criterion sampling, convenience sampling, and snowball sampling (Stratford & Bradshaw, 2016). The criteria used in the recruitment process were that the participant must be 65 years of age or older, speak English, and currently live in Ottawa. Participants were also recruited based on the need to find a diverse set of individuals with different living conditions, levels of independence, gender identities, and income levels. I determined the sample size guided by the principle of saturation, a criterion used for deciding when to discontinue data collection (Saunders et al., 2018). After completing the interviews, I felt confident that interviewing more people using the same sampling strategy would yield little additional insight. Thus, no further development of a theory, concept, or connection would be made (Saunders et al., 2018). However, I did not reach saturation in terms of all the potential people I could have recruited.

Volunteer participants were recruited in Ottawa during the summer of 2019 (Table 1) The primary recruitment tools included posters promoting the study (Appendix D and Appendix E), and the use of gatekeeper organizations, which also included in-person recruitment. I used these strategies in an attempt to access a diverse group of seniors with various backgrounds and experiences from different neighbourhoods in Ottawa. Posters clearly describing the research purpose, inclusion criteria and my contact information were displayed, with permission, in various public places across Ottawa that seniors may frequent. These included public libraries, community centres, recreation facilities, legions, and retirement homes.

Table 1: Summary table of participants.

Participant Pseudonym	Age Group	Neighbourhood	Location of Interview	Living Situation (independent vs. non-independent)*	Pre-existing health condition**
Cynthia	75-79	East End	Gloucester 50+ Centre	Independent (apartment)	N/A
Regina	70-74	N/A	Gloucester 50+ Centre	N/A	N/A
Kathleen	70-74	Orleans	Gloucester 50+ Centre	N/A	N/A
Robert	70-74	Fallingbrook	Gloucester 50+ Centre	Independent (house)	N/A
Lois	75-79	N/A	Gloucester 50+ Centre	Independent (apartment)	N/A
Thomas	65-69	Carleton Heights	Abbotsford House	Independent (house)	N/A
Dorothy	75-79	Glebe	Abbotsford House	Independent (apartment)	N/A
Sandra	70-74	Alta Vista	Abbotsford House	Independent (house)	N/A
Betty	95-99	Glebe	Abbotsford House	Non-independent (long-term care)	Yes
Kevin	75-79	Glebe	Phone	Independent (condo)	N/A
Charlotte	80-84	West Boro	Unitarian House of Ottawa	Non-independent (retirement home)	N/A
Diane	80-84	West Boro	Unitarian House of Ottawa	Non-independent (retirement home)	Yes
Martha	80-84	West Boro	Unitarian House of Ottawa	Non-independent (retirement home)	N/A
Josephine	80-84	West Central	Unitarian House of Ottawa	Non-independent (retirement home)	Yes
Ellen	80-84	West Central	Unitarian	Non-	Yes

			House of Ottawa	independent (retirement home)	
Margaret	80-84	West Central	Unitarian House of Ottawa	Non-independent (retirement home)	Yes
Judith	70-74	West Central	Unitarian House of Ottawa	Non-independent (retirement home)	N/A
Sheila	75-79	Old Ottawa South	Phone	Independent (apartment)	Yes
Elizabeth	75-79	South Ottawa	Phone	Independent (condo)	N/A
Phillip	65-69	South Ottawa	Phone	Independent (condo)	N/A
Peter	60-64	South Ottawa	Good Companions Centre	Independent (apartment)	Yes
Jane	70-74	West Boro	Good Companions Centre	Independent (apartment)	N/A
Vivian	90+	Gloucester	Good Companions Centre	Independent (house)	N/A
William	70-74	Centretown	Good Companions Centre	Independent (apartment)	N/A
Suzanne	75-79	Sandy Hill	Good Companions Centre	Independent (apartment)	N/A
Teresa	65-69	Hull	Phone	Independent (house)	N/A
Leona	70-74	Centretown	Phone	Independent (apartment)	Yes
Nancy	65+	N/A	Phone	N/A	N/A
Max	65+	N/A	Phone	N/A	N/A

* Note: Independent living refers to living in an environment where no assistance is needed.

** Note: Pre-existing health conditions were self-identified by participants, as health data was not specifically collected. Participants may have had health conditions that they did not choose to disclose.

3.5. Gatekeeper Organizations

To supplement the posters, different organizations served as gatekeepers, or ‘intermediaries’, between myself and the participants to help provide access to the intended study population (De Laine, 2000; Clark, 2010, p. 486). These organizations included three senior’s community centres (Gloucester 50+ Centre, Abbotsford House at the Glebe Centre, and the Good Companions Centre), and a retirement residence (The Unitarian House of Ottawa), as indicated in Figure 4.

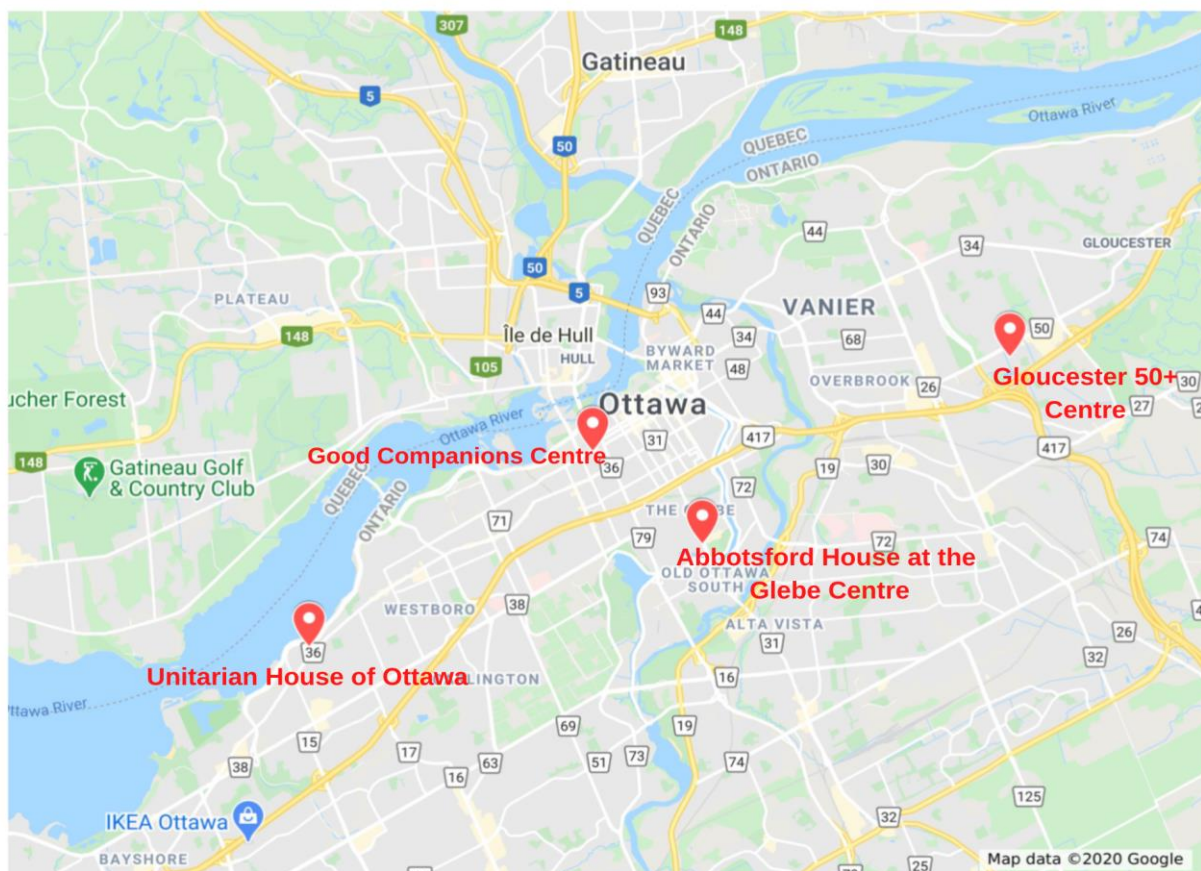


Figure 4: Map of gatekeeper organizations in Ottawa, Ontario. (Source: Google Maps).

I gained access to participants from these places by contacting the administration of the organizations. By getting permission to attend organized events for seniors and

visiting these organizations that seniors often frequent, in-person recruitment turned out to be useful in accessing this population. Recruitment of participants also continued through snowball sampling, or having participants help connect the researcher with other potential participants. This strategy typically involved communicating with participants over email and arranging a phone interview.

The use of gatekeeper organizations alongside the other recruitment strategies helped recruit participants with different living situations. While all the participants who were recruited from the retirement home, The Unitarian House of Ottawa, did live there, the participants recruited from the community centres came from different places across Ottawa. This enabled me to compare energy use for cooling purposes in different home environments.

3.6. Data Collection

Using the recruitment strategies described, I conducted 27 semi-structured interviews. Most interviews were conducted between June 27th, 2019 and August 28th, 2019. On average, each interview lasted 35-50 minutes and was recorded using an audio-recorder and was stored electronically in a secure manner. However, some interviews had a shorter duration due to the participant's schedule or the depth of their responses. Interviews primarily took place in person at the organization where the participant was recruited, in a spot that was most convenient and comfortable for the participant. Although most interviews were conducted in-person, 6 interviews took place over the phone, either at the participant's request or if they were not able to meet in person. The phone interviews were conducted in the same fashion as the in-person interviews, with questions being asked from the interview guide.

In addition to the one-on-one interviews, two interviews involved two participants being interviewed together, which was decided based on the participant's needs. Lastly, a group teleconference with 5 participants was conducted through the help of a program run by one of the gatekeeper organizations, the Good Companions Centre, which will be discussed in further detail in later chapters. This unique opportunity not only allowed me to reach those participants who could not physically visit the centre, but also provided me with key insights into the use of telephone reassurance programs.

The variety of interview styles allowed every participant a chance to participate in the research, even if they did not want to, or could not meet in person. Further, the interviews allowed a unique set of voices to participate, which made for a diverse data set. The data collected included the participant's responses to the questions from the interview guide as well as a few demographic descriptors, if the participant chose to share. The participant was asked what age range they belonged to and which neighbourhood they lived in. These questions were asked to help with the organization of the data and to look for patterns and themes.

Overall, my experience with data collection and the interview process required patience and some creativity. Gaining access to participants was more difficult than initially expected, as it was often challenging to get the attention of potential recruits. I tried to alleviate this barrier by creating another recruitment poster (Appendix E) that included large-sized font and eye-catching colours and images. After I began displaying the new poster, I found that I was able to start a conversation about my project more efficiently with potential recruits. Although 27 interviews may seem like a small sample,

I believe the experiences and stories told by the participants allow for an in-depth investigation into prominent themes and how they connect to the research question.

3.7. A Self- Reflexive Narrative

Organizing and analyzing the qualitative data involved a self-reflexive approach. As a researcher examining the words, voices, and emotions of other people, I took it upon myself to invoke a sense of transparency and introspection throughout the research methodology and analysis process. To accurately portray the voices of the study participants, I needed to reflect upon my positionality and the power I hold as graduate geography student listening to and protecting their truths and experiences. To instil credibility, dependability and trustworthiness into my interpretation of the data, I followed the 'writing-in' approach to constructing qualitative geographical knowledge. As described by Mansvelt & Berg (2016), 'writing-in' is an approach to writing that involves re-presenting the research and not simply stating or reflecting upon the research outcomes. I choose to re-present the research in this way because of my wish to keep the authenticity of the participant's voices as much as I can throughout my writing. I aim to re-present the knowledge gained from this study but also how my position affects the discourse and where I speak from. I understand the sensitivities, including the possibility of misinterpretation, involved with this research and my role as a researcher coming from a different community. I recognize the power dynamic that often exists within social science research. I may have held this position of power during my interviews as I was facilitating the conversation with my semi-structured questions and was recording the audio (with consent). Although I strived to create a safe, comfortable interview experience for my interviewees, this dynamic may have left participants feeling intimidated

or uncertain with their responses. Throughout the research process, I also have continually acknowledged my privilege as a young person who lives with considerably less vulnerability to extreme heat and has never experienced precarious energy access. Being aware of this allows me to embed critical self-evaluation throughout the entire research process, including the dissemination of the results. Further, I actively avoided misinterpreting the words of the participants by first writing notes on the interview in a fieldwork notebook, including how the interview was initiated, the exact location, and the tone of voice/attitude of the participant. Using this supplementary information alongside the detailed interview transcript allowed me to be more confident that I do not take any statements out of context.

I also decided to use pseudonyms and gender-neutral pronouns when discussing the responses given by participants. As I did not collect information on how each participant identifies, the language I use to reflect their voices must adhere to this fact. This research did not contain a gender-based analysis, and for this reason, I believe it is not my place to assume one's gender identity. For the sake of clarity and giving life to the participants' quotations, I did assign pseudonyms that can be deemed 'equivalent' to the name they provided on their consent form. I believe social science research, and especially qualitative research, requires inclusiveness and acceptance to go beyond the interactions with participants but also be visible in the writing and discourse about the research. Additionally, as I am a strong advocate for gender inclusivity and acceptance, I wanted to ensure that I upheld my true values in the writing of this thesis.

3.8. Analysis

After the data was collected, I transcribed the interviews verbatim to facilitate coding and analysis. The participants were given the option to receive a record of their interview to make edits or comments, and these were sent to the participants who requested them. I then took my finalized interview transcripts and began to organize and code the interview data and my additional research notes using NVivo 12 software, as well as through my own thematic organization techniques (primarily using separate documents and note cards). As stated by Basit (2003), qualitative data analysis is not a “discrete procedure” and instead, is an activity that continues throughout the entirety of the project and writing process (p. 145). Further, coding and analysis are not synonymous, meaning coding the data is just one step of the analytical process (Basit, 2003). For this project, it was essential to code the interview data as a way to organize and visualize the data and as a starting point for understanding the key themes and topics amongst participant’s experiences. Although this research did follow an inductive approach to a certain extent, the coding process followed a method noted by Miles and Huberman (1994), where I began my coding with a ‘start-list’ of codes that I gathered to be significant from the initial research concepts and literature. I then proceeded with coding the interview data with an open-mind and used latent content analysis to interpret any underlying meanings within the participant’s experiences (Bengtsson, 2016). After categorizing and identifying the data using my coding system using ‘nodes’ and ‘sub-nodes’ in NVivo, I then took the time to understand what the data meant in the context of my research question. With the continuation of my self-reflexive approach and the use of latent content analysis, I then built an analytical framework, which will be discussed in later chapters, to assist with the discussion and presentation of key findings.

3.9. Conclusion

This chapter discussed the decision to use a qualitative case study methodology for this research and the selection of Ottawa, Ontario as the case study site, as it is a large urban centre with a growing population of seniors and has a history of extreme heat events. This chapter also discussed my recruitment strategies, use of gatekeeper organizations, data collection, and analysis process. Finally, it explained the self-reflexive approach I used throughout the research process and its importance when examining the voices and experiences of other people.

Chapter 4: Heat Vulnerability and Energy Vulnerability

4.1. Introduction

This chapter presents the key findings from the interview data centred around the first two points of the analytical framework: what makes someone vulnerable and how specific factors create and contribute to vulnerability. Instead of simply focusing on vulnerability as one broad theme, I broke down this framework into three sub-themes:

1. Perceptions of vulnerability
2. Factors that contribute to vulnerability
3. Factors that contribute to energy vulnerability

These sub-themes will allow for a more comprehensive investigation into the complexity of vulnerability found throughout the interview data.

4.2. Sub-Theme 1) Perceptions of Vulnerability

As the participants were asked about their experiences with energy access during extreme heat conditions, including how they typically feel during these events and how their day-to-day activities are affected (or not affected), various feelings and perceptions were gathered. Analyzing these responses produced three main points: First, some participants recognized and expressed concern for themselves as a person living in a state of vulnerability. Second, some participants expressed concern for other people who they deemed vulnerable, especially child family members and loved ones living with pre-existing health conditions. Third, participants expressed varying levels of awareness of the topics associated with this research, affecting their perception of their vulnerability.

4.2.1. Concern for Themselves

The majority of respondents expressed concern for their own health and wellbeing during periods of extreme heat. Many participants first expressed concerns about feeling uncomfortable, oppressed and hesitant to leave their homes on hot days, saying that this worry and hesitation stops them from participating in certain day-to-day activities that they would like to do. Participants also expressed specific concerns about experiencing symptoms of nausea, dizziness, irritability, and lethargy, all of which can have a large impact on one's ability to cope with extreme heat events.

In addition, 10 participants mentioned the effects of humidity as a significant contributor to their concern for their health and wellbeing during extreme heat events. Four participants stated that they are worried about the potential for increased breathing problems (such as shortness of breath) that are exacerbated with high humidity and pre-existing health conditions, such as asthma. Concern for one's health, wellbeing, and overall vulnerability seemed to vary based on one's perception of dangerous and unsafe conditions. A participant, Nancy, stated that they are very aware that they only have a "small window" of time that they can spend being exposed to the heat (e.g. being outdoors) before they are putting themselves at risk for serious health implications. This participant had a pre-existing medical condition that affects their ability to perspire, adding to their concerns (Interview Transcript 26). Another participant shared a similar awareness, stating that they not only feel uncomfortable during extreme heat, but they also feel that the conditions are "dangerous in some way" (Interview Transcript 14).

Having a clear understanding of one's vulnerability seemed to influence one's perception of their ability to cope. Ellen shared their experience of living with a terminal

illness and having to conserve their energy on hot days to manage their condition. They addressed how they feel about coping with extreme heat:

I believe that you can't expect people to cope for you. You've got to cope yourself... You have to take some initiative and move yourself and do something about it if you hear the heat is coming. If you don't know what to do, there are numbers to call (Interview Transcript 13).

This participant undoubtedly has an understanding of their vulnerability and feels a sense of responsibility to ensure they know how to take care of themselves. Based on the interview data, I believe that in certain situations, people living with a pre-existing health condition may be better equipped with awareness about their vulnerability to heat extremes. Because of their conditions, they may be more conscious of heat precautions and the symptoms associated with heat illnesses. William explained that they are aware that their ability to cope has been affected by vulnerability associated with their age. They noticed that as they get older, they are not coping as well with the heat compared to when they were younger (Interview Transcript 22). Understanding where vulnerability stems from, e.g. Ellen's health conditions and William's age, likely enhances their ability to change their coping strategies to align with their needs.

In contrast, three participants clearly stated that they were not concerned for themselves in terms of vulnerability. Although they all seemed to recognize the potential risks associated with extreme heat and that these may be of concern for other people, they themselves were not concerned about the heat. For example, Cynthia expressed that they are "fortunate" to not be bothered by the heat (Interview Transcript 1), while Philip pointed out that they themselves are not bothered by the heat, but recognize that the

people around them sometimes find it difficult to cope (Interview Transcript 18). These responses indicate that being concerned for one's vulnerability was not a unanimous perception among seniors in this study.

Another notable finding was that some participants expressed that they enjoy the hot weather and that their concerns predominately lie within the winter months and coping with cold weather. When asked how they feel during summertime heat, 4 participants were quick to change the focus of the question to winter extremes. These respondents all agreed that summertime heat is enjoyable, especially after experiencing harsh winter months. Judith described summertime as a "welcomed treasure", referring to their anticipation and excitement towards this season (Interview Transcript 15). Further, Jane stated that they are comfortable with the heat and that summer is their favourite season. They shared that they often experience depression during the winter and are always afraid of falling (on ice) and hurting themselves (Interview Transcript 20). These positive perceptions of summertime heat may mean that some do not fully recognize their vulnerability or take heat precautions seriously. As this study interviewed people living in Ottawa, a city which endures harsh snowfall and cold temperatures, it is understandable that participants have strong concerns about coping during the winter (Ottawa Public Health, 2020a). But this may present an issue if some seniors think that once the snow melts and the weather gets warmer, they are free from vulnerability and no longer have to be concerned about risks associated with weather extremes. Some people who enjoy the summer heat may be putting themselves at an increased risk of heat-related illnesses if they prioritize their enjoyment of warm weather over the potential risks. The narrative of 'the heat does not affect me' can be dangerous.

4.2.2. Concern for Others

The interview data also revealed that some participants were particularly concerned for other people who they deem vulnerable to the risks of extreme heat. A majority of interviews made statements that showed concern for other people, especially loved ones who have precarious energy access, pre-existing health conditions and lack of autonomy or isolation.

Concern for loved ones was especially seen in the case of Sandra, who is worried about their mother during extreme heat conditions. Their mother, Betty, who is 95 years old and has dementia, currently lives in a long-term care centre in the Glebe neighbourhood. Sandra and their mother, who were interviewed together, voiced their opinions about the risks associated with long-term care homes during summertime heat. Sandra stated: "...[I]t is very hard on people in long-term care...because a lot of people don't realize that a lot of the long-term care facilities here [in Ottawa] are not air conditioned" (Interview Transcript 7). Although Sandra does their best to practice certain coping strategies at their own home to stay comfortable during the heat, they find that most of their stress comes from the worry that their mother suffers from extreme heat in their residence. Sandra also pointed out that during extreme heat periods families often take their loved ones out of their care homes and bring them to their own houses, where air conditioning might be more readily accessible. Although Sandra knows that others take this precaution, they find that they cannot help their mother this way because the layout of their home is not suitable for Betty's mobility challenges. Instead, Sandra always checks in with Betty's nurse at their residence to ensure they are remaining cool. Despite this constant worry, Sandra explained that their mother's living situation is

fortunate compared to others: "...[W]e're lucky because the hallways are air conditioned. I don't think the rooms are actually air conditioned..." (Interview Transcript 7). They further explained that their mother-in-law's living situation was even worse: "Our mother-in-law was in [a long-term care home], and it wasn't air conditioned, and the room had to be over 35 degrees. Like you were panting in there, it's just wrong" (Interview Transcript 7).

These statements highlight the fact that some seniors and older adults may feel burdened by the living conditions of their loved ones. Although they might be concerned for their own health and safety, the added stress and anxiety that comes with being a caregiver or provider for a loved one, especially an aging parent, seems to be exacerbated during these periods of extreme heat. For Sandra, the worry they have for their mother is not alleviated by the services and facilities of their long-term care home. In fact, Sandra conveyed distrust in the care provided at their mother's residence. They find themselves worried that their mother is not being monitored properly, especially to ensure they are drinking enough water to keep themselves hydrated throughout the warm days. Although Sandra's concern for their mother may seem admirable, as many seniors do not receive the same amount of family care, the reality is that Sandra always feels the emotional impact of Betty's vulnerability. Understanding the effects of living with the responsibility of someone else's health is necessary as the health and wellbeing of the person in that role are also significant. Sandra's perception of vulnerability to extreme heat further highlights the differences in people's awareness of the seriousness of this issue.

Based on the lived experiences of Sandra and Betty, as well as other participants, the findings show that being seriously concerned for a loved one and their ability to cope

with extreme heat conditions can lead to constant worry, leaving the person in the caregiver or ‘concerned’ position perhaps paying less attention to the potential risks they may face. In Canada, many people care for a family member or friend who have a serious health condition, disability, or aging-related issues (Turcotte, 2013). Because of their caregiving responsibilities, those who care for someone may experience psychological consequences, financial pressures, and negative health effects. In the case of this study, it is important to consider how seniors who act as a caregivers experience the effects of other people’s vulnerability besides their own. As Statistics Canada highlights, this topic is especially important to consider in the context of Canada’s aging population, as well as the increase in life expectancy and prevalence of chronic illnesses (Turcotte, 2013). With these continuing and projected increases, the number of seniors who will need help or care will double in the next 30 years (Carrière et al., 2008; Turcotte, 2013). Alongside this information, one must keep in mind the projections for increased extreme heat events. Although this study did not specifically look into the potential consequences associated with caregiving, whether that be to a family member or friend, the topic stands out amongst the findings. I believe the experience of being a caregiver adds a different dimension to one’s perception of vulnerability.

A few other participants noted that they are concerned for loved ones or friends, especially if they are living with a pre-existing health condition, aging-related issue, or precarious energy access. When Elizabeth was asked if they are ever concerned that their friends or loved ones were at risk for heat-related illnesses, they stated: “...Yeah. ’Cause a lot of my friends now are in the older age bracket and it concerns me...Because the majority of them have something wrong with them” (Interview

Transcript 17). William stated that their biggest concern is for their 95-year-old mother who lives in a retirement home out of town (Interview Transcript 22). In addition, Teresa explained that they are concerned for one of their friends who is in their 90s and does not have air conditioning in their home. They stated that they are worried that their friend does not know how to cool their home adequately and suffers from dehydration (Interview Transcript 24). Each of these respondents clearly expressed the reason why they are concerned for the particular individual. Elizabeth's concern for their senior friends, William's concern for their elderly mother, and Teresa's concern for their friend living without air conditioning highlight the differences in vulnerability within the study demographic. Further, how these respondents expressed concern for people in their life shows that they perceive the vulnerability of these people to be significant. Although each case was unique, their responses all focused on what they can do to help.

Another key finding was the number of respondents who stated that they were not concerned for others during extreme heat conditions. When the participants were asked if they were presently concerned for friends or family, 9 people responded that they were not concerned. Although the majority of the interview participants (13 respondents) did indicate a concern for others, analyzing these responses is still important. The tone of these responses seemed to highlight the privilege that exists amongst some of the study participants. Some mentioned that they know that everyone in their life has access to air conditioning and other resources to keep cool in their homes. Lois stated, "Maybe I am privileged, and I only have friends that are aware" (Interview Transcript 4). I believe this raises an important point about how living with privilege affects one's perception and ability to understand other people's vulnerability. The participants who said they were

not concerned for others during extreme heat situations may be unaware of the inequalities that exist within their community, including those living in energy poverty. As with other issues, it is not surprising that some people are not aware or choose to not pay attention to the differences and injustices within their community.

In summary, it is evident that participants have varying perspectives on vulnerability in the context of extreme heat. Some participants are worried about their own health and wellbeing, and others are more concerned for their friends or loved ones who may be more at risk than they are. Still others dismissed any feelings of concern or worry about their own vulnerability and did not seem to notice the inherent differences in people's experiences with coping. These perspectives show that some people recognize the seriousness of this issue, whereas others may be less inclined to think about the situation as a broader problem. The differences amongst these findings also point to the idea that privilege affects one's empathy towards other people. When considering the lack of awareness about precarious energy access in Canada, including in Ottawa, I believe it is necessary to inform people that even though it may be a hidden problem, it still deserves attention. To better protect seniors and ensure they have the resources to best cope with their vulnerability, I believe that the wider population should have a better understanding of the inequalities in their community.

4.2.3. Awareness and Perception

The last section within this sub-theme on perceptions of vulnerability focuses on participants' awareness of other topics relevant to this research: climate change, extreme heat events, and precarious energy access. This was essential as one's level of awareness can affect how they perceive vulnerability and the seriousness of these issues.

Participants were also asked how they access information about these topics. This gave the participants a chance to explain whether they think the information they are receiving is accessible and credible, and whether they think it is useful in helping them cope. This theme helped understand whether the participants were: 1) interested in discussing topics related to climate change, 2) aware that their age demographic are deemed especially vulnerable to the health risks associated with extreme heat events, and 3) satisfied with the information they receive about extreme heat conditions and how they access it.

A wide range of information sources convey the seriousness, relevancy, and urgency of the broader problem of climate change in relation to summertime heat. These sources include not only academic literature in many disciplines, but also news articles, political statements, and social movements (such as the climate marches) seen throughout the world. Although information and education about climate change, and the various issues associated with it (including extreme heat events) is widely available for some, the public's level of awareness of these issues is not equal. With this in mind, I asked participants if they are: 1) particularly worried about climate change, and more specifically, the increase in summer temperatures across Canada, and 2) whether they pay attention to information and news about climate change.

Sixteen participants stated that they were worried about climate change and the expected increase in summertime temperatures. The most noteworthy finding within these responses was the attention paid to concerns about future generations. Two participants, Josephine and Ellen, gave similar responses that they are aware of what the future might look like, with summers continuing to be very hot and an increase in severe weather conditions, such as tornadoes and wildfires (Interview Transcript 12 & 13). With

thinking about the future comes worry about how we will adapt and cope. Ellen made this point very clear, saying: “There are some things that I am of course a little doubtful about. And I have to think, how will I cope?” (Interview Transcript 13). I believe Ellen is expressing her doubts about what the world will look like in the future and wonders what she will need to do protect herself. This worry about the future is also supported by Margaret’s response, who when asked about her concern about climate change stated:

I am very concerned for my children and my grandchildren, and the future for young people in general. What sort of future will they have?...I am sure that it must be a very big concern for a lot of young people...And I feel rather helpless, what can I do? I do not have the energy that I used to have to do things (Interview Transcript 14).

I believe that many people share Margaret’s feelings about how the future will look for new generations. It is clear that some seniors recognize the intergenerational effects of climate change; how past actions are now making current conditions even worse and how humans are continuing to act in a way that is jeopardizing the future of the planet. This is supported by the statement given by Judith, who said: “We are just killing ourselves...and the generation behind us, the generation behind us that is coming” (Interview Transcript 15). Jane shared a similar response:

I look at my granddaughter and think that she will never know what it was like before...She won’t know the fun things we used to do. We have taken it away from them. We have actually denied our kids and grandkids. It’s our generation...If you are between 40 years old and up, it’s us that has done the damage (Interview Transcript 20).

These responses are eye-opening and indicate the manner in which some seniors view climate change, as a problem that they contributed to. I believe these feelings of guilt, helplessness, and uncertainty about the future should be taken seriously and should be more widely discussed as something that may affect seniors' mental health and wellbeing. I think there is a tremendous opportunity to harness these negative attitudes and encourage people to learn what they can do to make a difference.

When participants were asked whether they pay attention to information and news about climate change, most responded that they do, with most stating that they receive this information and news from the radio or television programs. It is noteworthy to mention the different attitudes and tones that these responses were given in. I interpreted the most prominent feelings and tones that participants carried when speaking about how they receive information about climate change as passion, anger, and defeat. Some participants made it clear with their statements that they are very passionate about climate change issues and find themselves having many discussions about the subject with people in their life. Other participants did express interest in paying attention to the issues but felt as if there is nothing left to do to help solve the problem. Philip mentioned that he is beginning to become more interested in learning about climate change issues and raised an important point by saying: "What have we done? How can we fix it? And a lot of that you can never fix. You can only go forward trying to put a Band-Aid on it. But you cannot repair what's been done" (Interview Transcript 20). This statement highlights the feelings that others shared about climate change being too challenging to go about making any significant improvements. Some feel that the world is too far gone and are focused on the 'doom and gloom' of the current conditions instead of being hopeful and

motivated to enact change. This thought pattern is seen through the statement made by Max: “I don’t think anything can be done about climate change because that is just the way the world is turning” (Interview Transcript 26). Although many seniors are passionate about climate change issues and eager to contribute to positive change in their own lives, it is also important to recognize that some may not want to listen because they believe there is no point.

Some participants provided suggestions on what they think is needed to help seniors better understand climate change and accept the reality that we are going to continue to experience increasing summertime temperatures. Five participants made clear statements that they do not think seniors are having enough conversations about climate change and that more needs to be done to ensure information is readily accessible to educate people. Dorothy stated that they believe that all levels of government should initiate these conversations, but also pointed out that different levels of government often have varying opinions about the state of our climate emergency (Interview Transcript 6). Diane further contributed to this point, explaining that they are skeptical that the political systems in Canada are not acting quickly enough to combat the issues we are facing. They also mentioned their disbelief that some people in their life do not believe that climate change is real, which Diane believes is a really destructive opinion to have (Interview Transcript 10). These statements further highlight the need for accessible information about climate change. Understandably, many will hold onto their belief that we are not currently living in a climate emergency, but that does not mean the conversations with these people should end. Overall, these findings support the idea that having a greater awareness of climate change, and the effects it has on various systems,

may help seniors have a better understanding of the issue of extreme heat and why summertime heat is increasing. I believe being aware of the changes in weather patterns, including increasing summertime heat, can help seniors be better prepared to protect themselves as each summer arrives.

4.2.4. Awareness of Extreme Heat Issues

Beyond the issue of climate change more broadly, I examined the participants' awareness and understanding specifically of extreme heat events and the risks associated with them. When asked if they pay attention to information about extreme heat, including weather alerts and heat warnings, all participants stated that they do pay attention, although to different extents. This initial response indicates that the sample interviewed do have a general awareness about summer weather conditions when they are making decisions about their day-to-day lives. This awareness may affect their perception of their vulnerability and the risks associated with extreme heat conditions.

Two participants noted that the reason they pay attention to the weather conditions during the summer is because of their history with heat-related illnesses. Diane explained that they have previously had an episode of heat exhaustion from being outside for too long during a heat wave. They explained how this event affected them by stating: "Right then I knew I reached my limit. And I haven't ever let it get that far again" (Interview Transcript 10). Charlotte explained that due to their experiences with having migraines during periods of extreme heat that they are very aware of how the heat can affect them (Interview Transcript 9). This history of heat-related illnesses encourages them to pay more attention to the heat to avoid these symptoms.

4.2.5. How Participants Access Information

How participants access information about extreme heat in their day-to-day lives, including weather alerts and heat warnings, is important because being aware of a heat event can help one follow appropriate coping strategies. Asking how participants tend to access their information helped understand how the information regarding extreme heat conditions is relayed, and if it is reaching this demographic.

A key finding within the interview data was the prominent use of electronics, such as television programs, radio programs, and smartphone applications, as a source for information regarding weather alerts and heat warnings. All participants expressed that they depend on the use of electronic media to access information regarding outside weather conditions and tend to check the weather every day. Based on these responses, it is clear that the seniors interviewed have the ability to access and use electronic forms of information and may prefer it over other forms of accessing information. Some participants communicated that they prefer to listen and watch television programs, most notably news channels, that provide up-to-date weather forecasts. However, it is important to recognize that not every participant has the same experience with accessing technology. Most participants did share that they use a personal device, such as a computer, phone, or tablet, to obtain weather information. Still, one participant shared that they access this information by visiting their local library and its public computers, as they do not have a device at their home (Interview Transcript 25).

Another significant finding was the realization that while people may be receiving information that may help make informed choices, they may not be fully understanding the information. Providing information to the public is one thing, but ensuring that the information is easy to understand is another. When asked if they

understood what heat waves are, one participant mentioned that they had never heard of the description of heat wave that is used often in health and meteorology contexts. They stated that they often do not know where to look to find out how long an extreme heat event will last for and what it means for nighttime temperatures (Interview Transcript 26). This points to a potential need to include more opportunities for lay people to learn what certain terms mean in regards to extreme heat conditions. Having a complete understanding of a situation can help with awareness and making informed decisions.

4.2.6. General Awareness

Beyond assessing if participants are paying attention to weather alerts and heat warnings themselves, I also examined whether they believe the general senior population have enough awareness about extreme heat conditions and related risks. The responses indicate a range of opinions: five participants said they believe the issue is often not discussed enough and there is not enough widely available information about the risks that people may face during extreme heat conditions, whereas others stated they believe there is enough awareness but the public is not listening.

Sheila stated that they think there is enough awareness about the risks of extreme heat and believes it all comes down to a personal choice: “If they [the public] are going to listen to it or not, that’s their choice... If people aren’t smart enough to listen then that’s their own choice” (Interview Transcript 16). Kevin shared this similar opinion: “For some people, it wouldn’t matter how much you told them, they still wouldn’t listen” (Interview Transcript 8). Further, Nancy stated: “Well for me, I think it is up to them, if they don’t listen then I say it’s their fault if they are not becoming aware (Interview Transcript 26). These findings show that some people believe that there is not

much that one can do to increase public awareness of this issue. Judith identified the need for other people to provide empathy towards people who struggle with coping with extreme heat conditions: "...People have to give consideration to people who do find the heat hard on them. For whatever reason, it doesn't matter. Because it's not a joke...it's a frustrating situation to be in and not to have access to some way of relieving, you know. So, I guess we just need more information about it given out to people." (Interview Transcript 15).

As with other matters that require personal awareness and choice, there is always the hope that the public will listen to, agree with, and remember information about issues that are pertinent to them. We, as researchers, can continue to hope that the public will make the correct choices and continue to educate themselves on issues, such as the risks associated with extreme heat. Although I understand that this belief may make some people feel defeated or unmotivated to continue to encourage the public to become more aware, I believe that this makes it all the more necessary and important. Choosing to be informed and listen to experts and officials is a personal choice, but this does not mean we cannot explore different awareness strategies and potential challenges that people face when accessing information.

4.2.7. Suggestions to Increase Awareness

Participants were asked what they would suggest to help increase public awareness of the potential risks of extreme heat, especially for seniors. The most common response was to make information about extreme heat more widespread on television and radio programs, as well as in newspapers. These respondents all agreed that providing resources about how to cope during extreme heat conditions through a

mixed media approach would be the best way to increase seniors' awareness. Thomas stated the city health unit should create more information guides and pamphlets that are specifically targeted to seniors and what they need to watch out for. They suggested that seniors should be sent information about how to take care of themselves during summertime heat (Interview Transcript 5). Ottawa Public Health does have information about how to protect yourselves and others during extreme heat conditions on its website, including downloadable content about the seriousness of heat warnings and what makes one more vulnerable. Although this information is available online, this participant may not have known about this resource because they are not looking online. I believe this is not a unique case: many other seniors may be missing out on the same resources because they are not aware of these platforms. Another participant further illustrated this point by stating they were aware that they can access information about heat warnings and related risks from the City of Ottawa, but could not remember where they are supposed to look for it (Interview Transcript 25). These comments emphasize the need to ensure information is accessible to seniors who may forget where to look between summers.

Beyond its own online resources, which include information on how to stay healthy during a heat warning, the effects of hot weather, and how to effectively use a fan to cool a room, the Ottawa Public Health website directs people to call the Ottawa Public Health Information Centre for information about extreme heat, invites them to connect with their services on social media platforms, and encourages people to sign up for weather advisories by downloading Environment Canada's weather application *WeatherCAN* (Ottawa Public Health, 2020b). Although these resources may be accessible to some, some seniors may not benefit from these resources if they do not know where to

look for them or how to navigate the website. As a lot of the information about the health risks associated with extreme heat is specifically focused on seniors, it is alarming that relevant resources may not be reaching the target population.

Increasing awareness using strategies other than online platforms and websites requires a different approach. Suzanne highlighted that not everyone has access to the same technology:

Well, you have to realize that some seniors are not using the iPhone. There are some...but the percentage I think is still low. And there is still a lot of attitude of 'I don't want one'. So I think there is a gap, that's why the knowledge isn't passing from the technology to the population (Interview Transcript 23).

This statement points to the need for information regarding heat alerts and warnings, as well as related risks, to be more accessible beyond the devices that other demographics commonly use. Five participants shared a similar opinion that organized, in-person talks and workshops about how to protect yourself and others during extreme heat would be a useful strategy for increasing awareness amongst seniors. Thomas described having been to a workshop focused on seniors maintaining stability and mobility at their community centre, explaining that they think it would be a great idea to offer a similar workshop on extreme heat for seniors at community centres around the city (Interview Transcript 5). Sandra agreed with this idea and stated that there needs to be more education, specifically in long-term care facilities (Interview Transcript 7). These statements highlight the need for more awareness programs and resources to be delivered in person. Delivering these types of resources in seniors community centres, where many seniors visit in their day-to-day lives, could help ensure seniors pay attention to their vulnerability to extreme heat.

When Diane was asked what they would suggest to increase the spread of awareness, they pointed to advertising and marketing strategies that grab attention:

I remember the change in smoking advertising, the anti-smoking advertising... As long as they were giving you the facts about it, people said 'it doesn't affect me'. But when they started to say that it wasn't cool to smoke, and they showed pictures of people hacking and coughing. Then I think people started to pay attention. So, they had to learn from the advertisers (Interview Transcript 10).

This statement suggests that existing information strategies about seniors and extreme heat are not relaying the seriousness of the issue enough. Although taking care of yourself and others during extreme heat events is not comparable to purchasing cigarettes, perhaps more seniors would pay attention to the issue of extreme heat if the health effects were made more prominent in public health awareness campaigns.

Another noteworthy finding was that all the participants interviewed at the Unitarian House retirement home expressed that they were aware of the risks related to extreme heat conditions. These participants mentioned the use of information posters (Figure 4) that the facility had posted on all the exit doors of their retirement home.

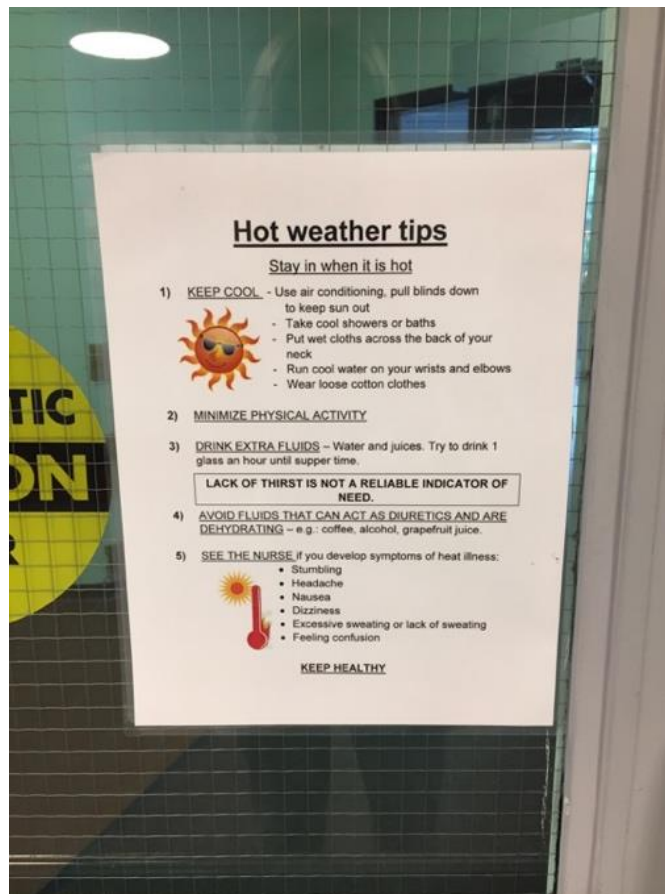


Figure 5: ‘Hot weather tips’ poster found in Ottawa, Ontario. (Source: Samantha Doris)

These posters, titled ‘Hot weather tips’, provide information on how to stay cool during hot weather, how to avoid dehydration, and what symptoms are often present with heat illness. The use of posters as a tool for awareness seemed to be beneficial at this site as the residents stated they use the poster to remind themselves of what to be cautious of during hot days. This type of messaging that includes tips on how to take care of yourself also seems to be an excellent way to make the information easy to understand and remember. Displaying posters in locations where seniors often visit is not too costly and reasonably straightforward to accomplish. Although it may seem like a no-brainer for seniors residences, community centres, and City buildings to have these types of posters,

they were not visible during my fieldwork in Ottawa. This poster at the Unitarian House was the only resource on extreme heat that I saw throughout my time visiting various establishments throughout the city.

Overall, participants' suggestions point to the need for messaging and awareness campaigns to go beyond online platforms. Ensuring information is accessible on radio and television programs, as well as newspapers, is critical in reaching this demographic. Although most of the participants did share that they use a personal device, such as a smartphone, tablet, or computer to access information about weather alerts and heat warnings, some seniors in Ottawa do not have access to technology in their homes, while others may have the means to access it but choose not to use it or do not know how. Keeping in mind these differences, I believe it is necessary for the messaging about this public health concern to be delivered in ways to suit this demographic better, as they really need to hear it. In-person workshops or lectures, posters and other visual messaging seems to be a move forward in ensuring seniors are receiving this information. As with other public health matters, such as smoking cessation, the tone and attitude behind the messaging often need to be considered. In the case of ensuring seniors are paying attention to the risks associated with extreme heat, I believe the information, such as the symptoms of heat illness and the location of cooling centres, need to display the seriousness of the issue and be clear and easy to remember.

4.3. Sub-theme 2) Factors that contribute to Vulnerability

This section explores factors that may contribute to one's vulnerability to extreme heat conditions. Based on an inductive examination of the interview data and related literature, I identified four main factors: 1) pre-existing health conditions, 2)

social isolation, 3) mobility, and 4) socioeconomic status. As discussed, this research assumed that all participants in the study already have a baseline vulnerability to extreme heat because of their age demographic and location. Analyzing these other factors helps reveal and explain differences and inequalities in participants' vulnerability levels and experiences with extreme heat and energy access.

4.3.1. Pre-existing Health Conditions

Research shows that having pre-existing health condition(s) makes a person more likely to experience health impacts during extreme heat conditions (Science Media Centre of Canada, 2017) Individuals who are chronically ill, including those with cardiovascular, respiratory and renal diseases as well as those with neurological disorders, diabetes and psychiatric illnesses are particularly vulnerable (Bouchama et al., 2007, Hajat, O'Connor, & Kosatsky, 2010; Nitschke et al., 2013; Science Media Centre of Canada, 2017). Furthermore, certain prescription medications, especially those that affect hydration levels and sweat production (e.g. diuretics and anticholinergics) which may inhibit heat loss, have been associated with increased risk of heat-related illness (Hajat, O'Connor, & Kosatsky, 2010).

The interview findings lend further support to this body of evidence. However, since this study did not directly collect health information or medical histories from the participants, the responses concerning one's health outcomes and symptoms varied across the interviews and included only what participants wished to share. One participant, Ellen, described their experiences with coping with pulmonary hypertension during extreme heat conditions. They shared that due to their condition they have low energy levels during summertime heat, which requires them to alter their day-to-day

activities and adjust how much effort they can put into tasks before they start feeling ill (Interview Transcript 13). Judith shared that during extreme heat they often feel nauseous, dizzy, and tend to sweat a lot, which they believe is partly because of a pre-existing disease and the medication they take (Interview Transcript 15). These responses indicate that those with pre-existing health conditions experience symptoms that amplify the impacts of heat on their life and day-to-day activities.

William expressed that their health condition is “severely affected” by humidity and they rely on air conditioning in their home to avoid falling ill (Interview Transcript 22). This participant’s condition seems to have increased their vulnerability to overheating and they have taken action to ensure their living environment is safe and comfortable. Similarly, Teresa, whose husband has asthma, stated that the combination of heat and humidity in their home, together with their husband’s health condition, made it too uncomfortable without air conditioning (Interview Transcript 24). These experiences with pre-existing health conditions emphasize the importance of having reliable cooling strategies in place. While these particular respondents did not seem to face barriers in accessing energy services, such as air conditioning, others who live with a chronic illness may not be able to afford the same resources. Overall, the findings from the interviews are in line with the literature on the risk factors for heat illness in seniors, with those living with a pre-existing condition experiencing higher health risks associated with heat.

4.3.2. Social Isolation

Social isolation can be understood as the experience of having a low quantity and quality of contact with others, including “number of contacts, feeling of belonging, fulfilling relationships, engagement with others, and quality of network members”

(National Seniors Council, 2014; Nicholson, 2008). The negative effects of seniors living in social isolation are vast and not only include serious consequences for physical and mental health, but also for the contributions seniors make to the economy and their community (National Seniors Council, 2014). The effects of social isolation often involve inter-relationships or cyclical patterns that make the association difficult to understand (e.g. the lack of social network may lead to poor health and/or poor health may lead to the deterioration of one's social network) (National Seniors Council, 2014).

Acknowledging the significance of this issue, as well as its inherent challenges, I examined social isolation as a contributing factor to increased vulnerability to the risks associated with extreme heat conditions.

Social isolation is an issue all year round, but in the summer, a key concern is that people may suffer from the heat without anyone knowing. Seniors have an increased vulnerability to the health risks of extreme heat if they are not adequately cooling their living environment or seeking out alternatives such as cooling centres (Hajat, O'Connor, & Kosatsky, 2010; Science Media Centre of Canada, 2017; Ito, Lane, & Olson, 2018). This vulnerability may be worsened if no one knows that they are not coping with the heat safely. During a heat wave that hit Quebec and Ontario in July 2018, 66 people in Montreal and 89 people across Quebec died because of the heat, many of them reportedly seniors living in apartments without air conditioning (Chown Oved, 2019). One can speculate that some of those people may have been experiencing social isolation, and that stronger social networks might have helped them get out of their homes or learn more about the severity of the situation and how to cope. In fact, research suggests that social

isolation may be associated with a decreased use of services due to a lack of awareness (British Columbia Ministry of Health, 2004; National Seniors Council, 2014).

The interviews affirmed the significance and seriousness of isolation. When asked about its effects, Suzanne stated that they believe isolation is “a major concern because it reduces all of your thinking about alternatives” (Interview Transcript 23). Suzanne explained that people living by themselves often have a mindset that they want to be independent and do not want anyone knowing about the details of their life or living situation. However, this type of mindset leads to worsened social isolation and may leave people not knowing about certain resources that may help them (Interview Transcript 23). Suzanne concluded with:

I think isolation, combined with any kind of weather event like too much heat is enough to keep them [people living in isolation] sitting in their chair where it is comfortable, because we get older, we do like our comforts (Interview Transcript 23).

This highlights that many seniors may be living in social isolation and feel confined to their home during extreme heat conditions. If they do not have adequate cooling strategies or the social capital and confidence to call on support, they risk falling ill without anyone being aware.

When asked about social isolation and seniors, Teresa referred to the ‘fear factor’ that seniors who are living alone may face. Teresa stated that seniors living alone may be scared to have their windows open to keep their home cool because of the worry that someone may break in (Interview Transcript 24). This statement is a reminder that seniors may be vulnerable to other serious issues while they are trying to remain safe and

healthy during extreme heat conditions. Encouraging certain cooling strategies, such as opening windows to cool an indoor space, may not seem viable for someone who is concerned for their safety and the security of their home.

These findings affirm social isolation as a factor that can increase health risks for seniors. From my investigation of interview data alongside the literature and public health bulletins on the matter, I conclude that there needs to be more attention given specifically towards seniors who are living in social isolation and struggle to cope with extreme heat conditions. Findings revealed that telephone programs that allow seniors to build social connections and have a chance for someone to ‘check-in’ on them may be an effective resource, which will be discussed in more detail in the next chapter. Past heat events reveal that the combination of isolation and extreme heat can be deadly. Researchers, as well as public health and policy officials, need to ensure that seniors who are experiencing isolation are seen and looked after during extreme heat events.

4.3.3. Mobility

Another factor that may increase vulnerability is one’s mobility or ability to get around safely. Although this may be linked with pre-existing health conditions and social isolation in some instances, mobility during extreme heat is significant on its own. Mobility is defined as “movement in all of its forms, including basic ambulation (walking), transferring from a bed to a chair, walking for leisure and the completion of daily tasks, engaging in activities associated with work and play, exercising, driving a car, and using various forms of public transport” (Satariano et al., 2012). Research indicates that mobility, including the ability to safely leave home, is essential to healthy aging and has significance for public health policy (Satariano et al., 2012). As ageing

populations grow, there is rising interest in the health effects of mobility and strategies that can optimize mobility for seniors (Satariano et al., 2012; Haustein & Siren, 2014). This study found that individual mobility levels are not only affected by extreme heat, but one's mobility may also contribute to vulnerability to associated health risks.

Twelve participants stated their mobility is significantly affected by extreme heat, for reasons including fatigue and difficulty breathing. A majority of respondents stressed that their mobility worsens during periods of high humidity because it aggravates their pre-existing health condition(s), including arthritis and asthma, hindering their ability to walk and participate in activities such as gardening, visiting friends, and completing tasks such as grocery shopping. These comments point to a link between mobility and social connection: as mobility decreases due to heat and humidity, seniors may face increased isolation as they reduce their outings and therefore interactions with others. Heat-related declines in mobility are especially worrisome for seniors who cannot access cooling strategies at home. If they rely on going out to cool down during extreme heat, decreased mobility may lead them to stay at home and suffer.

The data also revealed the importance of being able to safely access and use a means of transportation during extreme heat conditions. Being able to get where you want to go, whether by walking, car, public transit, or other means is a very important part of fulfilling one's mobility needs and independence (Satariano et al., 2012; Haustein & Siren, 2014; Musselwhite, Holland, & Walker, 2015). When participants were asked to explain if their ability to safely access and use transportation is affected by extreme heat conditions, some stated that they do not face any added challenges in getting around during extreme heat, with some driving their own vehicles. However, 10 participants

shared their hardships with trying to access and use public transit in Ottawa during extreme heat conditions. Many of these respondents mentioned that they find themselves feeling too hot and uncomfortable while taking public transit, which includes OC Transpo bus services and Para Transpo, Ottawa's minibus and taxi service for those with a disability or who are unable to take conventional transit options (OC Transpo, 2020).

Respondents expressed extensive concerns about waiting outside for the bus or Para Transpo service to arrive. Elizabeth stated they often find themselves restricted by their surroundings and their reliance on Para Transpo: "I can't afford a car anymore and I can't leave when I want to because I am reliant on Para [Transpo]...I've waited as long as an hour and a half" (Interview Transcript 17). Elizabeth often worries that they are exposing themselves to the heat and sunlight for extended periods of time while they wait for the minibus or taxi to pick them up (Interview Transcript 17). Josephine also pointed to the issue of having to wait for the bus exposed to direct sunlight, stating that most bus stops don't have shaded areas and even when the bus stop does have a shelter, it actually acts as a "big insulator and makes it [the heat] worse sometimes" (Interview Transcript 12). Jane shared a similar experience with relying on buses to get around and waiting outside for the bus to arrive, mentioning that they often do not want to have to take the bus during extreme heat because they are worried about their health, but have no other choice because of their commitment to visiting their community centre (Interview Transcript 20). These remarks highlight a dilemma many may face: at what point do you put your concerns about heat-related health risks in front of your commitments and need to leave home for goods and services, as well as social connection?

Teresa expressed frustration about Ottawa's transit systems being unsynchronized and inaccessible for many people who have mobility issues. She described a friend who is unable to walk to the bus stop due to mobility challenges and no longer can drive. They explained that their friend is completely reliant on other people driving them to places such as grocery and drug stores to get necessities because they have no other way to get around. Teresa believes that the transit systems needs to include a more accessible feeder system that better connects people who cannot walk to the main bus routes. This would allow seniors a way to safely access the bus and more independence in terms of leaving their home when they need to.

The number of respondents who expressed that they are fully reliant on public transit services and are forced to experience these challenges each time they want to go somewhere highlights the inequality and privilege that exists within the topic of transportation access. Diane made this clear, saying:

I think people who own cars do not really think in terms of other people's discomfort when they have to go and watch and wait for a bus...When you have an air conditioned car and you walk from the air conditioned house to the air conditioned car [the heat] probably doesn't really impact you that much. On the other hand, if you have a limited budget, you really have to think about what you are doing (Interview Transcript 10).

For some, driving a car is something they may take for granted, whereas others see it as a luxury and something they cannot afford. The interview data affirms literature on the subject that finds those who have access and can drive a car have considerably more mobility and less vulnerability to extreme heat because of their ability to move around

without having to rely on bus schedules and wait outside for periods of time (Haustein & Siren, 2014; Musselwhite, Holland, & Walker, 2015).

The literature on mobility, transit, and the health and wellbeing of ageing populations is continuing to develop, with much interest given to examining the importance of public transit and community-based systems to increase mobility. Research also states that we will most likely see increased levels of private mobility because of the current ageing population in Western society being heavy car users (Musselwhite, Holland, & Walker, 2015). This study's findings contribute to this literature by examining what needs to be considered in terms of seniors' mobility and use of public transit during periods of extreme heat. Researchers need to think of strategies to deal with two challenges simultaneously: keeping seniors safe and healthy during extreme heat conditions whilst also encouraging the use of public and active transit to decrease emissions. With more seniors relying on personal vehicles into later life and the reality that using a car during extreme heat conditions decreases the amount of time one has to spend outside, some seniors may be less inclined to transition to forms of transit that build greener communities (Musselwhite, Holland, & Walker, 2015).

4.3.4. Socioeconomic Status

Lastly, socioeconomic status was found to be a contributing factor to heat vulnerability. Socioeconomic status is widely recognized as a key determinant of health (Plouffe, 2003; McIntyre et al, 2016). Research clearly indicates a correlation between low income and low self-reported health, increased risk of chronic illnesses, and poor mental health (McIntyre et al, 2016). Research also indicates that socioeconomic factors play an important role in one's vulnerability to the health risks of heat (Science Media

Centre of Canada, 2017). Being able to utilize certain coping strategies such as air conditioning, as well as the type, quality, and location of one's housing, depend on one's economic situation. Recognizing the sensitivity of the topic, participants were never directly asked to disclose their current economic status or income levels. Instead, they were asked to explain their experiences with extreme heat and accessing energy services and whether cost was ever a significant issue for them.

The data revealed that some participants feel restricted in terms of staying cool during extreme heat, first because of the added expense to pay for services such as air conditioning when they are already low-income, and second because of their current living conditions. While some participants did not express any concern with energy affordability, nine participants described not being able to access and use air conditioning in their home because they cannot afford it. Diane described the situation in their retirement home apartment: "Well I wish this building was air conditioned, I wish I didn't have to fight my budget in order to air condition my apartment... The hallways are air conditioned, but we are not allowed to leave our doors open" (Interview Transcript 10). Diane also expressed that they wished they had a ceiling fan in their apartment but could not afford the electrician to install it. These barriers to accessing air conditioning and ceiling fans in their apartment may be increasing Diane's risk to heat-related illnesses, even though there is air conditioning in the hallways and common areas of their building. Judith, who lives in the same retirement home as Diane, expressed a similar frustration that because of the age of the building there is no central AC, requiring the tenants to install and pay for their own air conditioning in their rooms. Diane and Judith's concerns point to a larger issue, as many seniors living in retirement homes or long-term

care homes may be experiencing similar situations. Elizabeth worried about the cost of energy services, stating:

I am very cost cautious because of my lack of income and so I worry always about the cost of it. Even if it's a fan on, it troubles me. But at this age I have to be so concerned with surviving really (Interview Transcript 17).

Elizabeth also shared that they are a part of the Ontario Electricity Support Program but still find themselves concerned that their apartment will be too hot during extreme heat, leaving them with increased vulnerability. Elizabeth described trying to retrofit their apartment without having to spend too much and stated:

But even after all of that, I don't live, what I would call a normal life. Because my life hinges on walking into the apartment and thinking, is it too hot? And then, even when I turn on a lightbulb, it worries me (Interview Transcript 17).

Elizabeth's situation is very serious and clearly illustrates how one's income level affects the way they live and cope during extreme heat conditions. Being unable to utilize and access the energy services that one desires to stay safe and comfortable during the heat is a systemic issue that requires more interventions and resources to ensure people like Elizabeth are taken care of.

4.4. Sub-theme 3) Energy Vulnerability

The final sub-theme of this chapter highlights key factors found to contribute specifically to energy vulnerability: 1) accessibility and affordability, and 2) personal choice. Up until this point, this chapter has focused on participants' vulnerability to the health risks of extreme heat. This sub-theme investigates how participants access energy services during extreme heat conditions, and factors that affect their ability to access the

energy services they desire. Inability to access energy services produces energy vulnerability, which in turn increases vulnerability to extreme heat conditions for those who cannot access cooling strategies that require energy.

4.4.1 Accessibility and Affordability

The ability to access and afford energy services is a rather obvious reason why people experience energy vulnerability, as being able to access desired energy services requires being able to afford energy bills. The majority of participants did not express that they experience energy vulnerability. However, as discussed above, the few who did express that they struggle to access the energy services they desire, or have to significantly limit their use of energy services because of the cost, can be said to be experiencing energy vulnerability. Not being able to utilize energy services, such as air conditioning and electric fans, because of cost is a serious factor as to why people struggle to keep their living environment safe and comfortable during extreme heat. One participant, Diane, stated that they believe air conditioning should not be so closely attached to cost and “should be considered a human right” (Interview Transcript 10). By making implicit comparisons to clean water and safe housing, they make an argument that energy services such as air conditioning should be considered essential.

Accessibility and affordability of energy services are closely linked to power and autonomy. One’s ability to make decisions for themselves in terms of how they access and utilize energy services for cooling purposes may have a significant effect on whether they experience energy vulnerability. Although the majority of respondents stated that they feel in control when making decisions about how they use energy services in their home, the responses from participants who are not living independently are

noteworthy. As noted, some participants who were living in a retirement home described feeling confined to their apartment unit and facing constraints in suggesting alterations to the building. Although giving authority to the property management or other officials to make changes in shared residences is necessary in most cases, I believe this raises the question of whether or not residents in these shared living facilities feel that they have the power to speak up and suggest changes to ensure they remain safe and healthy during extreme heat events. Furthermore, some seniors may not have the autonomy to seek out other ‘cool spaces’ (such as shaded parks or air conditioned malls) outside their home, especially if these spaces are not accessible. This experience may increase their feelings of constraint in terms of staying cool during extreme heat.

Many factors affect the indoor temperature of someone’s living environment, many of which may be out of their control. Factors such as the material features of the dwelling, geographical location, restrictive tenancy relations, ventilation, the number and orientation of windows, and the absence or presence of shading are all significant in determining one’s risk for experiencing excessive indoor heat (Uejio et al., 2011; Thomson et al., 2019). Any of the varying factors may lead to excessive indoor heat; not having the financial capacity to make adjustments to one’s dwelling increases not only the likelihood of experiencing energy vulnerability, but also vulnerability to the health risks associated with extreme heat.

The connection between income inequality and inadequate indoor summer cooling is consistently found in the literature (Uejio et al., 2011; Mitchell & Chakraborty, 2014; Thomson et al., 2019), and this research further demonstrates that financial constraints are a determinant of one’s experiences with coping with extreme heat.

Although this study did not collect specific information about each participant's income level or dwelling types and structures, it still highlights the importance of energy affordability as one of several overlapping dimensions of vulnerability when people are trying to cope with extreme heat conditions.

4.4.2. Personal Choice

The interview data revealed that one's personal choice to use or not use energy services can also contribute to energy vulnerability. While it seems safe to assume that no one would knowingly choose to experience energy vulnerability, in some cases values or beliefs caused people to not use energy services for reasons unrelated to cost.

Concerns for the environment were found to be one such reason why certain people chose not to use, or to significantly limit, energy services as a cooling strategy. As discussed, some participants stated that they try to pay attention to their carbon footprint. For example, Phillip revealed that their environmental awareness had changed their energy behaviours. Philip stated that they are more 'energy conscious' and decided to limit their use of air conditioning in their home even though they had access to it. Phillip also pointed to unnecessary spending on hydro bills when other, less expensive cooling strategies also provide relief in their home: "It doesn't make any sense to be throwing money away on electricity if you don't need to do it" (Interview Transcript 18). When further discussing the importance of energy conservation and being a self-identified 'environmentalist', Philip stated:

If I need it, I will turn on a fan. Obviously, if it gets too hot it would be a health hazard. So, you know, you don't want to overheat but at the same time, you don't

put the air conditioning on just because you have an air conditioner (Interview Transcript 18).

For Phillip, it seems as though choose to limit their spending on air conditioning even though they do not face any barriers to accessing it.

Similarly, Teresa described themselves and the person they live with as environmentalists who are conscious of the environment and their actions year-round. Teresa explained that during the summer months, they follow a routine of strategically opening and closing their windows to ensure that their home always stays cool enough for them to remain safe and comfortable, especially overnight. By following this routine, they stated that they are able to keep their home environment cool without the need to turn on their air conditioning. Because of their personal values and awareness of the environmental impacts of cooling strategies, they strive to decrease their household's carbon emissions and their access to energy services is rather limited.

Although both of these participants seem to be aware of the risks associated with heat, these experiences highlight a dilemma: when to prioritize your own health and safety over your other personal beliefs and habits. The balance between utilizing energy services to stay safe and healthy and wanting to be environmentally conscious is not straightforward. Using energy services as a strategy to cool down a space and avoid health risks during extreme heat is widely recommended by public health bulletins, but what if people choose not to follow these recommendations because they are also told to do their part to protect the environment? These findings suggest that diminished access is not always an issue of class injustice, but sometimes reflects a personal decision to avoid using energy services.

4.5. Conclusion

This chapter examined participants' experiences with energy access and extreme heat using the vulnerability section of the analytical framework. Examining not only participants' responses, but also their tones and attitudes, allowed for the discovery of various perceptions of vulnerability including what it means to them, how they attribute to other people, and whether they are aware of it. It was found that participants have varying perceptions of what being vulnerable to extreme heat means and who they are concerned about. The investigation revealed that all participants are paying attention to weather alerts and heat warnings but have varying levels of awareness of what is meant by these terms and how they are supposed to be used alongside information about heat-related symptoms to prevent over-exposure and illness. Other key insights include how participants access information regarding extreme heat, primarily through electronic media, and the suggestions for ensuring information regarding the health risks of heat goes beyond online platforms.

This analysis also accounted for the factors that contribute to vulnerability and discussed how this research affirms existing literature but also provides a new perspective on how these factors are actually experienced and what needs to be done to account for them. This sub-theme discussed four key factors (pre-existing health conditions, social isolation, mobility, socio-economic status) found to contribute to increased vulnerability to extreme heat. While all four of these factors have been extensively researched in terms of their general health effects on seniors, the findings from this qualitative study provide a nuanced perspective on how seniors experience their effects in relation to extreme heat, and highlight the need for further interventions to address them. Key insights include the

significance of social isolation as a factor increasing senior's vulnerability to extreme heat. The findings indicate that more attention needs to be given to seniors who are isolated and living alone and how to best protect these people before extreme heat events occur. Another key finding highlights the importance of public transit as a tool to help individuals with poor mobility and reduce carbon emissions in cities, although taking public transit also places individuals at a higher risk of exposure to extreme heat. More research needs to investigate how to promote the use of public transit while protecting seniors from the health risks of extreme heat. The findings on socioeconomic status indicate that not being to afford energy services is a significant barrier that some experience when trying to keep their home environment cool and safe during extreme heat conditions.

Lastly, this analysis examined participants' experiences with energy vulnerability. Although many participants did not reveal that they were experiencing precarious energy access, or energy poverty, the findings still emphasize the importance of considering why people are not using energy services for cooling purposes. For some, the affordability of energy services is a key factor in their experience with keeping their home environment at a safe temperature during extreme heat conditions. Lack of autonomy and power to make changes to certain features in one's living environment was also found to be a barrier for people trying to access air conditioning to cool their home. Another key insight from the data revealed that some participants may be experiencing a form of energy vulnerability because of their decision to prioritize environmental causes. Choosing not to utilize certain cooling strategies, such as air conditioning, because of a desire to reduce emissions may be seen as a positive. But if it leaves people with

inadequately cool home environments during extreme heat, and potentially increases their risk of developing a heat illness, it is a dilemma worthy of further investigation.

Overall, this chapter highlighted how lived experiences lead to various perceptions and attitudes towards the threat of extreme heat, how vulnerability is reinforced by different factors, and the connection between energy vulnerability and extreme heat. The findings discussed in this chapter show the complexity of this research problem as it is both a public health issue and energy justice issue. The voices, stories, and experiences found within the interview data indicate the seriousness of this issue and the need for efforts to focus on helping to protect seniors from extreme heat events.

Chapter 5: Pathways to Resilience

5.1. Introduction

This chapter analyzes and discusses the concept of resilience: how the ability to be resilient, or cope, may make one less vulnerable to bad outcomes. As in the previous chapter, I broke down this broad topic into sub-themes based on the research findings:

- 1) Coping Strategies
- 2) Resources and Cooling Centres
- 3) Support Systems and Social Isolation

These sub-themes focus on different pathways to resilience that participants reported experiencing during extreme heat conditions. They provide further insight into what actions participants take to protect themselves, how participants feel about the coping strategies they use, and what they deem as important to ensure all seniors are resilient to extreme heat conditions. This chapter delves into the relationship between vulnerability and resilience by acknowledging that fluidity exists between the two. Although these concepts were split into separate chapters, they are conceptually connected. This chapter aims to discuss how those who are vulnerable to extreme heat events recognize resiliency and what pathways help them become resilient.

I use the term ‘pathway’ to signify that there is no simple solution to promoting or increasing individual or community resiliency. There are numerous dynamic processes, including place-specific factors and privilege, that affect the ability to build and promote resilience. Increasing both individual and community resilience to extreme heat events cannot be achieved with a singular action. Instead, a network of initiatives that work to prepare and protect vulnerable individuals is needed. By examining participants’

experiences, I narrowed my focus to what they deemed most important for increasing the resilience of individuals as well as the senior population as a whole.

5.2. Sub-Theme 1) Coping Strategies

When participants were asked to discuss how heat affects their day-to-day lives, many mentioned what strategies they use to reduce their vulnerability in the first place and how they adapt their lifestyle and routines to keep safe and healthy during extreme heat conditions. Beyond solely using air conditioning at home, participants described using cellular or solar blinds, closing drapes or curtains, strategically opening and closing windows (depending on the location of the window and if energy services are being used inside), staying hydrated, wearing cool clothing, and taking cool showers as key strategies for dealing with extreme heat conditions. One participant, Nancy, described their personal adaptations to the heat:

I use the strategy of closing my curtains when the sun comes around and time the air conditioning with the off-peak hydro hours. I also have electrolyte supplementation, I use cooling vests, and I make sure ice packs are in the freezer and ready to go”

(Interview Transcript 26).

This participant’s experience highlights strategies that can be used to help keep an environment (and a body) cool when the use of energy services is not feasible due to energy poverty or other factors. The findings on how participants combat the heat with personal practices reveal that many seniors are resourceful, efficient, and creative with their strategies to keep their home environments cool and safe. These findings also show that many participants are following public health suggestions on how to keep one’s dwelling at a safe temperature.

In terms of one's mobility and ability to safely move around during extreme heat conditions, participants also provided specific strategies they use to manage the restrictions they often face. Many participants explained that they try to lessen the impact of heat on their mobility before it becomes a significant issue. The most common strategy discussed was timing activities and errands, including the usage of public transit, to points of the day where the heat is not at its peak. While some participants stated that if it is too hot they do not go out, others said that they still try to participate in their usual activities but adapt their schedules to avoid prolonged exposure to the heat. Participants that mentioned this seemed to be cautious by ensuring they plan to avoid being outside when the sun is the strongest, but also motivated to maintain active lifestyles even during extreme heat conditions. Five participants mentioned that they like to walk every day but find that walking is more challenging when temperatures are too high. To work around this barrier, they all adapt their daily routines and walk early in the morning, when the sun is not as intense. Charlotte stated that they might even choose to walk inside, on the stairs or hallways, when the temperatures are too extreme (Interview Transcript 9). These adaptations are crucial for people to avoid the risks associated with heat and reduce their vulnerability, but also to overcome restrictions in terms of doing the things they enjoy.

As mentioned in the previous chapter, mobility is a significant part of healthy aging as well as helping to prevent social isolation. Being able to adapt to the heat while maintaining one's mobility is a vital part of some seniors' experiences with extreme heat, but not everyone's. With some participants saying that they just chose not to leave their home during extreme heat may be a good recommendation in some situations, I believe specific strategies, such as timing errands and outdoor activities to not take place during

peak heat, should be more widely discussed as alternate ways to protect yourself instead of choosing to stay indoors. In terms of community resilience, I believe more should be done to ensure people are kept safe but are also able to cope in a way that does not hinder them from participating in activities that contribute to good health and wellbeing.

5.3. Sub-Theme 2) Resources and Cooling Centres

Personal strategies are not the only essential ways to promote resiliency to extreme heat. Another pathway to resilience is the use of resources and support systems. Participants were asked if they believe there are enough resources and services in Ottawa that help people cope with extreme heat, and enough awareness about those resources, including cooling centres and other air-conditioned public spaces. The responses to these questions connect to the discussion on awareness and privilege in the previous chapter.

5.3.1. Resources in Ottawa

Participants were asked whether they believe there are adequate resources and services in Ottawa that help seniors cope. This was asked as an open-ended question, allowing for participants to think of specific resources and services on their own. Their responses reveal important differences in participant's experiences. Five responded that they believe there are enough resources. However, each of them recognized that they are in a position where they are comfortable and are currently not struggling to cope with the heat. Another five participants responded that they "do not know" if there are enough resources for seniors to cope with the heat in Ottawa. William summarized this nicely:

From what my needs are and where I am at my point in life...From what I know of it all, I think there are. But that's the only reasonable answer I can give because

I don't have a constant oxygen mask on and stuff like that. So if I were, I would probably be more aware of things (Interview Transcript 22).

Margaret echoed this, stating that they do not know about the resources in Ottawa and that they "cannot answer for the population" (Interview Transcript 14), though they did mention that they think shopping malls with air conditioning are an excellent resource for people who cannot access air conditioning at home. Margaret also said that they believe there could be more parks with green space and sprinklers or water activities for young people to use during summertime heat. This participant is aware of some of the existing resources that promote resiliency in their community but believes that more can be done. Another participant, Suzanne, gave the response: "I truly do not know. I am not involved in that at all, but I do think we are fortunate in Ottawa that the government has an older population focus" (Interview Transcript 23). I interpret this statement to mean that although they do not use resources or services offered or promoted by the city, they witness attention being given to the care and protection of seniors. Overall, I believe that even though these respondents may not be fully aware of whether there are enough resources because of the position they are in or their lack of awareness, their recognition of their privilege and existing inequalities is important.

Lastly, six participants responded that they do not think there are enough resources or services in Ottawa to help people cope with extreme heat conditions. Two of these stated that they know people who suffer from the heat, especially those without air conditioning in their homes. One participant stated:

I have heard horror stories about other people who don't have air conditioning in their homes. Or quite often in an apartment building... unless you can convince

your neighbour on the other side to open their door...you aren't going to get any air flow, really (Interview Transcript 24).

This participant believes not enough is being done to ensure seniors are staying cool and safe in their homes. Meanwhile, two other participants highlighted the fact that they do not think there are enough resources to keep seniors safe from the heat when they are using public transit. Although these statements could be the result of lack of awareness of existing resources, I still believe the responses indicate that more attention needs to be given to resources that not only ensure seniors are safe at home but also when they are outside in the heat.

The range of responses indicates that the participants have had different experiences with extreme heat and also have different levels of awareness and empathy towards other people's circumstances. While the opinions of this group of research participants are not generalizable to the population at large, these findings can still provide insight into how seniors think about community resources and their privilege.

5.3.2. Cooling Centres

To examine whether participants were aware of specific existing resources that are promoted as ways to help seniors cope with extreme heat, I focused on whether participants believe there is enough awareness about the use of cooling centres and other air-conditioned public spaces. I examined these resources as they are popular ways that cities try to ensure air conditioning is accessible to all people, especially those who do not have access at their home. Although this study did not do an in-depth investigation into the role of cooling centres, their operation, or their promotion across the city of Ottawa,

examining what participants had to say about them was critical in understanding how they serve vulnerable populations and how they could potentially be improved.

Cooling centres are air-conditioned spaces that are open to the public for free during heat extremes and emergencies in many cities, including Ottawa. These facilities that become cooling centres are typically already community spaces, such as seniors centres, community centres, recreation centres, and public libraries (Ottawa Public Health, 2020b; The City of New York, n.d.). Although these facilities are typically already used as public spaces with open access when they are designated as cooling centres, their hours may be extended, and their policies may be relaxed. In Ottawa, the city orders for emergency cooling centres to be opened when Environment and Climate Change Canada issues a heat warning (Ottawa Public Health, 2020b). In previous heat extremes, the City of Ottawa has advertised five public facilities across the city that are open for residents in need of relief (Pringle, 2020; Ottawa Public Health, 2020b). These centres are often publicized through media and public messaging and are typically only open until the heat warning no longer remains in effect (Pringle, 2020; Ottawa Public Health, 2020b). Examples of how the centres are publicized and promoted to residents in Ottawa can be found in Figure 6 and Figure 7.



Figure 6: Tweet from the City of Ottawa publicizing the opening of emergency cooling centres. (Source: Twitter).



Figure 7: Tweet from Ottawa Public Health publicizing a heat warnings and information regarding cooling centres. (Source: Twitter).

These tweets that were published during summer 2020 include links to webpages that provide information about the locations of the emergency cooling centres and information about how to stay safe during extreme heat conditions. Beyond the facilities that become cooling centres, other locations are often promoted as places where people

can cool down during the heat. These include shopping malls, public beaches, splash pads and wading pools, as well as parks and greenspace (Ottawa Public Health, 2020b). Both the City of Ottawa and Ottawa Public Health promote these resources as a way for people, especially those who are most vulnerable, to be resilient to extreme heat events.

When asked if they believe there is enough awareness about cooling centres in Ottawa, five participants stated that they do believe there is enough awareness and that the general public knows about places, such as libraries, public pools, and shopping malls, that they can visit to access air conditioning. Peter stated that they had seen multiple shopping malls promoted as a cooling centre by the city (Interview Transcript 19). Sheila said that they had seen shopping malls advertised as cooling centres on TV (Interview Transcript 16). Clearly, these participants are accessing the information that is being communicated about cooling centres and further highlight the significance of shopping malls as a resource for seniors to use to cope with the heat.

Mentions of shopping malls as a place seniors visit to cool down were relatively common in the data set. Even when the discussion was not on cooling centres, the usage of shopping malls as a place to cool down during extreme heat events was mentioned 11 times throughout the interviews. This highlights just how popular shopping malls are in some seniors' lives and the potential they hold to be places where seniors, and other vulnerable people, can escape the heat and gain access to information about how to protect oneself. However, promoting visits to shopping malls as a way to increase resiliency is not without issues, which will be discussed later on.

In contrast to these findings, three participants responded that they do not think there is enough awareness about cooling centres, and two of them did not know what they

were. Suzanne stated that a lot of seniors do not know where to go other than the mall to cool down:

They go into malls, and not because they want to sit in the mall all day but because it is the only place they can find coolness. And there should be things for people who can't get to the mall and for people who are living alone. They shouldn't have to die of heat in the building (Interview Transcript 23).

This statement emphasizes that promoting shopping malls as a resource for seniors to cool down during the heat only benefits those who can access them. Some seniors may not be able to get to a shopping mall, or a library, or another type of cooling centre, whether that is due to place-based risk factors such as poor access to transportation, mobility issues, or financial barriers. These visible disparities in accessing cooling centres further reinforce people's experiences with energy vulnerability and not being able to access energy services.

It is also important to recognize that promoting cooling centres may not benefit those who prefer and choose to stay at home during hot weather, even if they are unable to be comfortable and cool there. Recall the findings that indicate that some seniors hold feelings of fear and worry about extreme heat conditions and may choose to remain inside in their home, which can be potentially a dangerous environment during hot weather, because they are afraid of being over-exposed to the heat while trying to access cooler environments. This is further supported by research coordinated by *Cool Neighbourhoods NYC*, a sustainability and resiliency program designed to protect communities in New York City from extreme heat. They note that although cooling centres are open across the city during heat waves, data suggests that many people,

including those who are deemed most vulnerable, prefer to stay home which can be dangerous for their health (Lane et al., 2013; The City of New York, n.d.).

What do these findings mean in terms of cooling centres and other air-conditioned public places being a way to promote resiliency for seniors in Ottawa? It is clear that providing public cooling centres and communicating where they are and how to access them can give people a place of refuge during extreme heat. However, those who are unable to get to an air-conditioned public place are at a disadvantage, raising questions about the accessibility of these places, especially for those who rely on public transit and may directly expose themselves to the heat while waiting outside for these services. Information accessibility is another concern: some seniors may not be aware of these resources, perhaps because communication about them occurs predominately online.

Based on this study and other sources, I conclude that the proper utilization and promotion of these types of resources can help build resilient communities, particularly for those who are deemed most vulnerable to extreme heat (Lane et al., 2013; The City of New York, n.d.). However, I do believe that the usage of cooling centres as a critical strategy for building and promoting resilience in Ottawa is an area that demands further research. To best prepare and protect vulnerable communities from future heat events, different strategies should be explored to determine how to utilize cooling centres best and increase their effectiveness.

5.4. Support Systems and Social Isolation

The last sub-theme focuses on support systems. As discussed in the previous chapter, social isolation is a key factor in contributing to one's vulnerability to extreme heat. The reality that some seniors may be in situations where they are isolated and in a

home environment that is too hot without anyone knowing is extremely serious. To combat this issue, strategies and interventions need to go beyond public spaces, and focus on how to reach people in their homes. The data reveals that promoting support systems can increase resiliency, especially for those who are isolated.

The importance of support systems, which can be considered a network of people or individuals through whom one finds practical or emotional support (Merriam-Webster, 2020), was highlighted throughout the interview data. Charlotte explained their support system in the retirement residence they live in. They explained:

...We are very fortunate here because we care for each other and they do have a person that checks the different floors. And there's usually a card that says if this isn't removed by 9:30, you know, to knock and then you get somebody. But a lot of people don't use that. But you see people coming and going, and if you haven't seen anybody for a bit you just knock on their door and say 'hi, what's happening'. And people do that for us. Everybody does that for each other (Interview Transcript 9).

Charlotte's experience with support systems and the 'check-in' system with hotel-like doorknob cards is an example of a retirement home that is proactively ensuring that its residents are not suffering alone in their apartments without anyone knowing. While this particular retirement home seems to be using effective strategies, this is not necessarily consistent across other independent and non-independent living facilities.

Teresa shared their experience with being part of someone else's support system, by 'checking-in' and providing support to a friend who lives alone and is vulnerable to the health risks associated with extreme heat. They shared: "...We will just give her a

quick phone call and that works really well... So if she is on the phone, you don't have to worry" (Interview Transcript 24). This experience emphasizes how straightforward and effective support systems can be as a communication tool to ensure seniors who live alone are not suffering from heat illness and are practicing appropriate cooling strategies within their home environment.

Seven of the participants who live independently noted that they do not have a support system or people who check-in on them during extreme heat events. Although many of these respondents are the same people who stated that they are not concerned about the heat, this finding still raises an important point: whether some seniors are too quick to say that they are not at risk to extreme heat. From the tone of some of their responses, I believe there is a chance that some people may discredit the usefulness of support systems if they think there is a negative connotation with someone asking how they are doing. If someone takes pride in living independently and being in good health, they may not necessarily think they need a support system. If these people did have an unexpected change in their health and fell ill due to the heat while at home, would someone know to 'check-in' on them? I believe this question highlights the need for the discourse around support systems to not only be used by those who are socially isolated and in poor health but for everyone.

5.4.1. Telephone Programs

Telephone programs came up as an effective support system to check-in on individuals who may be socially isolated or choose to stay at home during extreme heat conditions. One telephone program, *Seniors' Centre Without Walls*, which is run by the Good Companions Senior's Centre in Ottawa, was examined. While interviewing

participants at this senior's centre, a few participants referred to this program as a great way to connect people who may be isolated or who have restricted mobility and cannot visit the centre in person.

I was given the opportunity to participate in one of the calls with this program and speak with those who use the service. This program is facilitated through free multi-person phone calls that provide participants with a variety of educational seminars, lectures, and general conversations that help build social connections (The Good Companions, 2020). This type of reassurance program allows for seniors who may not have a support system elsewhere in their life, a chance to reach out to others and be 'checked-in' on if they live alone. From what I gathered from participants (including those who do not use the program) as well from my experience participating in a call, I believe these programs have the potential to be excellent tools at connecting with seniors during extreme heat events. However, while an extreme heat event is occurring is not the time to identify who is socially isolated or most vulnerable. Instead, it is necessary to build social networks and connections prior to an emergency so that at-risk individuals can be contacted and provided with potentially life-saving information during the extreme heat event (Kiyota et al., 2015; City of New York, n.d.).

5.4.2. Buddy Systems

Overall, using telephone programs as support system tools may help prepare and protect vulnerable communities and increase their resiliency to extreme heat events. But similar to cooling centres, telephone programs still may leave some without support. Recognizing that some seniors may not have the ability to use a telephone or may choose not to have one, other strategies to connect with these people are necessary to ensure their

safety. An example of such a strategy is the community-led project *Be A Buddy NYC*, which was launched in New York City in 2017 to help promote resiliency in heat-vulnerable communities (City of New York, n.d.). Created as a pilot program, this initiative aimed to address the health impacts associated with extreme heat by focusing on how to best communicate with those most at risk and how to enhance people's response capacities and preparedness (City of New York, n.d.). By working alongside community organizations, buddy systems were created to link vulnerable individuals with a trusted volunteer who will check-in on them during extreme heat events. This system includes door-to-door checks, where the buddy volunteer will visit the vulnerable individual to ensure they are staying cooling and using effective protective measures during heat emergencies (City of New York, n.d.). This program emphasized the need to include hard-to-reach vulnerable individuals in efforts to increase community resilience.

This example of what New York City is doing to address heat vulnerability and promote resiliency shows considerable promise to be organized and replicated in other urban centres. Although this type of initiative is not necessarily managed the same way by other cities, the promotion of a buddy or 'check-in' system is frequently seen in communication about extreme heat events. In recent publications and heat health brochures from Health Canada, support systems are widely discussed as a key strategy or 'tip' to ensure vulnerable individuals are cared for during extreme heat events. The key difference between the *Be A Buddy NYC* initiative and this communication is that in the latter the responsibility is placed on the vulnerable individual to prepare in advance of extreme heat events to arrange for someone to check-in on them, whether by phone, online, or in person. Thinking back to the findings on whether seniors are paying

attention to extreme heat events as well as their general awareness towards the risks associated with heat, the findings indicated that being informed is mostly a personal choice. I believe this illustrates the need for a shift in the language used in communication about taking care during extreme heat events. I do not think we can assume that all vulnerable individuals are taking the necessary steps to arrange support systems on their own. Although I understand the limits of ensuring public safety, I believe to promote resiliency best and protect vulnerable populations, more efforts need to be put in place in Ottawa that encourages the creation of support systems before heat emergencies happen. Whether that is through initiatives similar to *Be A Buddy NYC*, telephone programs like *Seniors Centre Without Walls*, or other strategies, I believe that for senior populations, especially those who are socially isolated, to be resilient to extreme heat there needs to be more guidance, encouragement, and reminders to build support systems.

5.5 Conclusion

This chapter analyzed and discussed different pathways to resilience found within the interview data. Using this framework, I presented the key findings that aligned with promoting individual and community resiliency through various initiatives. Three sub-themes (Coping Strategies, Resources and Cooling Centres, Support Systems and Social Isolation) were used to organize and discuss how participants experience resiliency as well as my thoughts on existing programs and what these findings reveal about what deserves more attention. The first sub-theme found that being apprehensive about continuing participating in daily activities because of extreme heat and its risks was

common, and identified the need for more effective strategies to educate seniors that they can safely leave their homes during summertime heat.

The second sub-theme indicated that many seniors are aware of their privilege and the fact that others may be less resilient to extreme heat than they are. It also found that cooling centres can be an excellent resource for some, but still reinforce inequalities in access. The final sub-theme of this chapter identified a need for more programs and initiatives in Ottawa that emphasize the importance of support systems for everyone, not just those who are socially isolated. With extreme heat events expected to increase, more needs to be done to prepare the public in advance of these events happening. By encouraging support systems, people can recognize who is vulnerable in their social network and who should be 'checked-in' on more than once during an extreme heat event.

Overall, this chapter highlighted the importance of building resilient communities and a few of the different pathways that can be taken to help seniors cope with extreme heat events. Again, recognizing the relationship between vulnerability and resilience, it can be said that many of the study participants are resilient to extreme heat, despite their vulnerability. These findings show that despite the many factors and hardships that participants experience, as discussed in the previous chapter, vulnerability does not always equate to poor resiliency. By combining the lived experiences and opinions of the participants as well as a discussion of what is currently being done to help build resiliency to extreme heat, I provided insight into the importance of language, communication tools, and public programs in helping all seniors become resilient to extreme heat conditions.

Chapter 6: Conclusion

6.1. Initial Thoughts

I began this research project by asking a question about lived experiences in hopes of understanding how a vulnerable population experience precarious energy during extreme summer heat. I wondered what types of experiences people would describe and how people experience the dimensions of energy access and energy poverty. I also hoped to qualify their experiences by giving them an avenue to document their hardships or strategies they use to cope. As many previous studies and publications have focused on providing a quantitative analysis of the issue, this research aimed to include voices that are often excluded from those types of projects. In pursuing these questions and goals, I aimed to speak to as many willing participants as I could to gather a set of voices to ground theories of energy justice in lived realities and add depth and nuanced explanations to the predominately quantitative research that exists on the subject.

When I set forth to complete my fieldwork in various neighbourhoods of Ottawa, I was eager to meet seniors who had many different experiences and stories to share. I recognized the importance of the research problem I was studying, as well as its urgency and relevancy as I was often having these conversations on extremely hot summer days. I hoped to validate the experiences of seniors and allow them to speak on a matter they might not typically share with other people. I am aware that some consider this type of qualitative research to be ‘merely’ a collection of individual responses or stories. But I believe this research is more than the sum of individual experiences: it provides an opportunity to gather unique tones, attitudes, emotions, and voices towards a broad issue. This rationale is further supported with a comparison to using surveys or written

questionnaires to collect data. These quantitative research methods are limited in their ability to gather insights beyond the numerical or statistical analysis of results. With the use of semi-structured qualitative interviews, I was able to gather more than just answers to questions. For example, one significant insight I gathered was the amount of compassion and empathy that many participants had towards other people. Many participants took the time to think through the question by first sharing their own experiences or opinions and then extending their thinking by considering the situations of other people who may be more vulnerable than themselves, even considering people they do not know. This was further emphasized when participants made suggestions that were more broadly applicable than what they thought would personally benefit from. This insight allowed me to better understand how seniors perceive these issues and the importance of empathy and awareness in building more resilient communities.

Using a qualitative approach also allowed for the collection of emotions, which are significant to understand how people feel towards their own experiences as well as the research topic more broadly. While conducting interviews, many participants gave very emotional responses when asked about their thoughts on extreme heat and precarious energy access. I believe that being able to collect this information and effectively analyze it alongside the verbal responses produces further clues, ideas, and insights towards people's experiences.

Another specific example of an insight that a purely quantitative approach might have missed were the attitudes associated with participant's thoughts about climate change. Beyond just addressing the question I posed, many participants openly expressed their feelings towards climate change issues. Connecting these emotions with

participant's responses allowed me to get a better understanding of how participants understood and viewed climate change, which would have most likely been overlooked or missed while using a survey method.

Although there is merit in quantitative research, my responsibility as a human geographer led me to connect real voices and experiences to a research problem that is profoundly connected to human behaviour, our built environments, and our health and wellbeing. This thesis contributes to existing quantitative research by allowing for the collection of real emotions and experiences towards an issue that is largely examined numerically. By gathering the responses qualitatively, including the examples given above, this allowed for new insights and further questions to be found. Further, I believe the interviews were also a learning opportunity for the participants, as many of them expressed that they had never paid much thought to the issue of energy vulnerability in their communities or the seriousness of the risks associated with heat.

6.2. Extreme Heat and COVID-19

The analysis and writing of this thesis took place at a unique time, as the COVID-19 pandemic swept across the world. Although the data collection took place before these events, this public health emergency magnifies the importance and relevance of this research. The shutdowns and closures of non-essential businesses and organizations, as well as orders instructing physical distancing, restricted gatherings, and mask wearing, affected (and at the time of writing, is continuing to affect) everyone. These changes began in the spring and were further felt by the time summer arrived. As summertime heat appeared in Ontario, which came early in the season, it was clear that COVID-19 was going to amplify the risks of extreme heat events. Public health

authorities were now going to be faced with both the outbreak of the virus and the need to reduce the spread and community transmission, as well as trying to protect vulnerable communities from the heat.

Bearing in mind the factors that increase one's vulnerability to extreme heat events (see Chapter 4), it is evident that the pandemic interacts with those factors, potentially making them worse. People who are at the highest risk of severe illness from COVID-19 include seniors, people living with chronic medical conditions (such as heart disease, lung disease, liver disease, cancer, diabetes, etc.), people who are immunocompromised, and people who are living with obesity (Government of Canada, 2020b; World Health Organization, 2020). From this list, it is evident that many of those who are most vulnerable to COVID-19 are the same people who are vulnerable to the health effects of extreme heat events (see Chapter 4).

Seniors with pre-existing health conditions, or those who take medications that may increase the risk of heat illness, are now faced with taking care of their condition whilst also taking necessary precautions to avoid getting the virus. This is problematic because specific symptoms of heat illness, such as high fever, are also symptoms of COVID-19. In other words, symptoms of heat illness may be overlooked in emergency rooms if someone presents with a high fever. This is a potential issue despite current research that suggests that when community transmission is low, the risk of illness due to extreme heat is a lot higher than the risk of illness due to COVID-19 (Henderson, 2020; Global Heat Health Information Network, 2020).

Due to changes in the utilization of public spaces as well as stay-at-home orders, factors such as mobility, social isolation, and financial status are also affected. As

indicated in Chapter 4, mobility, social isolation, and socioeconomic status all play a role in one's vulnerability to extreme heat events. Seniors who rely on visiting friends' and family's homes, community centres, shopping malls, and other public places as a way to stay active and build social connections (as well as keep cool) were faced with the challenge of no longer being able to do these things. Further, seniors who rely on public transit may have also experienced barriers in being able to get around during essential trips if they could not or chose not to use those services. Because of the widespread closures and layoffs in the workforce, seniors who were working may have also lost their income or faced financial strain that may have affected their ability to afford energy bills and access air conditioning and other energy services.

Because of the recommendations to stay at home as much as possible, seniors and other vulnerable groups may have been put in a situation where they were staying in a hot, unsafe home environment. This is hugely problematic, and I believe it highlights the need for extreme heat messaging and communication to be reviewed. Individuals who are vulnerable to heat illness need to be told that they should leave their home environment if it is too hot and find a public space where they can find relief. The messaging needs to be consistent and address risk perceptions and fears, as well as use language to ensure that vulnerable people do not feel as if they are stuck in their homes if they are unsafe (Global Heat Health Information Network, 2020).

Alongside the need for consistent public health messaging, the COVID-19 pandemic also emphasized the need to provide better guidance to cooling centres and how they should operate to protect citizens from extreme heat events while also being compliant with reducing the spread of the outbreak. In Ottawa, the public health unit

created a working group after the first extreme heat event of the summer to devise a plan to protect the public from the heat as well as COVID-19. Beyond providing information to the public, part of this plan included encouraging apartment buildings to have "cooling rooms" where tenants could seek relief if their apartments were too hot (provided they wear a mask, practice physical distancing, and self-assess for symptoms). Additionally, the plan encouraged the City of Ottawa to keep water fountains in public spaces open despite them being 'high-touch' surfaces as a way to prevent dehydration on hot days (Robinson, 2020). I believe this case example of what was done in Ottawa highlights the many complexities involved with stopping the spread of the virus while still keeping in mind other public health hazards and issues.

I believe the relevancy and complexity of the issue of extreme heat conditions are emphasized by the pandemic and the many changes that have been made to our day-to-day lives. Considering the problems relating to ventilation and the spread of the virus, people wearing masks on extremely hot days, and telling people to stay indoors (in potentially unsafe environments), it can be said that vulnerability to extreme heat has most likely increased for many people. It is clear that because of the COVID-19 pandemic, health authorities are now having to consider how to best protect the public from multiple risks and hazards at the same time. This period consists of many unknowns and questions. Still, there may be a silver lining in the fact that specific policies and plans concerning heat safety may now be reviewed and revised to protect vulnerable communities better. By examining seniors' experiences with extreme heat conditions and the COVID-19 pandemic, key stakeholders can be informed about what needs to be improved and how to best plan for the future.

6.3. Key Findings

This research generated insights not only from the analysis of the data, but also from the research process in its entirety. The contributions of this research can be found not only within the data, but also through the way this project sparked interest and further conversations for many participants. The analysis of the interview data in combination with my insights from the research process revealed the following key findings:

- Seniors have varying perceptions of the threat of extreme heat and associated risks, primarily due to differences in personal health status and concern for others, privilege and socioeconomic status, the ability to access information about extreme heat, knowledge of heat terminology and heat-health risks, and interest to pay attention.
- Some seniors feel guilty and uncertain about climate change. Many feel as if their generation is to blame and feel helpless in trying to protect generations to come.
- Pre-existing health conditions, social isolation, mobility, and socioeconomic status were found to be contributing factors to one's vulnerability to extreme heat.
- Having to rely on public transit significantly affects one's experience with coping with extreme heat. Some seniors who take transit are worried about their health and being over-exposed to the heat, but have no other transportation options.
- Most participants did not reveal that they experience energy vulnerability in terms of accessing and utilizing energy services to stay cool. Although this can be seen as a positive finding for this particular study sample, some participants did express concern over the cost of energy or faced challenges within their home environment due to structural barriers or lack of autonomy.

- Some seniors described facing a dilemma between a desire to stay cool (by using energy-consuming cooling strategies), and a concern for the environment (by using less energy). This suggests that some seniors may prioritize their personal beliefs and values over public health recommendations.
- Having an “unlimited access” mindset about energy was quite common amongst participants. Many seniors seemed to be in a position where they do not face any barriers to energy access and do not pay much thought to the fact that other people may not share that same experience. This suggests that many people are unaware of the energy injustices within their communities and is particularly concerning in regards to the air conditioning - climate justice nexus. The environmental damage associated with air conditioning use was not being considered by the individuals with this mindset. It is also important to clarify that these individuals are not the same people who expressed feelings of guilt for climate change or compassion towards other people.
- There are various pathways that seniors can take to become and stay resilient during extreme heat conditions. Key pathways included individual coping strategies such as avoiding peak heat times of the day by carefully planning activities and errands, the use of resources such as cooling centres, and the use of support systems.
- Some seniors expressed that 'support' is only intended for those who are sick or in need of assistance in many areas of their life. To best protect all seniors from the threat of extreme heat, this discourse needs to change to remind seniors that seeking support is not a sign of weakness or frailty.

Based on these findings, I offer a series of recommendations (Table 2). Some of these were collected directly from participants; others emerged through the analysis of literature and existing policies, programs, and initiatives. Table 2 is organized into columns detailing recommendations, supporting findings, and example(s) of how the recommendation could potentially be put in place. The recommendations are streamlined into two sections: 1) Communication Strategies, and 2) Messages to Emphasize.

I believe these recommendations provide a blueprint for what should be done better to protect seniors from extreme heat events in Canadian cities. This list does not detail all the issues that need attention, but instead provides recommendations that fall within the analytical framework of this study. Further, these recommendations take into account that there are certain limits to raising knowledge and awareness of individuals, especially those who are deemed vulnerable. Some individuals may be in circumstances where they cannot access information recommended for them and they may not have the power or autonomy to make changes due to certain factors, such as socioeconomic status, or health conditions such as dementia. With an understanding of these limits, attention should also be given to policies that take the sole responsibility off the vulnerable person to change their circumstances and instead, provide them with support and the opportunity for direct interventions. Policies and interventions that target building retrofits, especially towards the subsidization of low-income housing and older retirement homes and long-term care homes can directly assist individuals who may be experiencing energy poverty in a progressive way.

These recommendations were written to be considered by various stakeholders involved with promoting resilience to extreme heat, including different levels of

government, public health authorities, municipal initiatives, and community organizations. As seen in the findings, as well as in the literature, implementing strategies and policies regarding extreme heat in different regions typically involves many actors, all of who need to work together and be consistent with their messaging, intentions, and goals.

Table 2: Key recommendations based on findings and literature review

Recommendation	Explanation	Example(s)
Communication Strategies		
Provide education to seniors on the terminology associated with extreme heat conditions	Seniors should have a clear idea of what the meaning behind weather alerts are and what constitutes different extreme heat events, such as heatwaves and heat warnings	Provide opportunities to learn about heat terminology and heat safety through a mixed-media approach (online, television, radio, newspapers, posters & pamphlets, workshops, etc.)
Make information about extreme heat more widespread and accessible	To ensure seniors are best prepared and protected from extreme heat events, information and awareness campaigns need to go beyond online platforms. More attention needs to be given to how to reach target audiences best	Information should be made available through a mixed-media approach (online, television, radio, newspapers, posters & pamphlets, workshops, etc.)
Specific public health attention and communication needs to reach seniors who rely on public transit	Seniors who use public transit need to be aware how to protect oneself while waiting for and utilizing those services during extreme heat	Information in the form of posters or flyers should be provided near transit stops as well as on the transit itself

<p>Ensure information and promotion regarding cooling centres is accessible</p>	<p>Seniors who are in a position where they need to utilize cooling centres must be able to plan and know where they are located and how long they are open for</p>	<p>Provide accessible information before the first heat event occurs and provide reminders throughout the entirety of the heat event</p>
<p>Develop outreach strategies to help reach seniors who cannot easily get to cooling centres or have anxiety and or fears about leaving their home</p>	<p>Without information on how to access cooling centres and strategies in place to assist people in getting there, some seniors may feel as if they are unable to go and instead stay in a potentially unsafe environment</p>	<p>Strategies could include putting up posters/flyers in apartment buildings without air conditioning, in newspapers, radio, and television programs</p>
<p>Messages to Emphasize</p>		
<p>Consider seniors who act as a caregiver in messaging about heat vulnerability</p>	<p>Caregiver burnout may affect seniors who are not only taking care of themselves, but also a loved one during extreme heat conditions.</p>	<p>Acknowledge seniors who act as caregivers in the public health dialogue regarding vulnerable groups. Caregivers should be supported and provided with information on how to best care for themselves while tending to the needs of others</p>

Encourage conversations about climate change and provide accessible information to seniors	Providing accessible information may help seniors who experience feelings of guilt and helplessness towards climate change. By educating, seniors may feel motivated to practice green strategies and set a good example to others	Providing opportunities for discussion (e.g. among support group network, public lectures or events in retirement homes and community centres) could help talk through feelings of guilt
Ensure seniors are aware and equipped with strategies that allow them to leave their home during summertime heat safely	By promoting heat safety strategies seniors can safely go outdoors and not feel as if they must stay indoors (which may lead to poor health)	Strategies such as effectively timing activities to avoid peak heat should be widely promoted instead of only the “stay-at-home” discourse
Ensure seniors who are socially isolated are made aware of the threat of extreme heat	Seniors who are socially isolated or living alone must be protected and reminded of what to do during extreme heat conditions before the heat event takes place to ensure they are not left alone in an unsafe environment	Information regarding extreme heat needs to reach seniors who are isolated through phone calls, mail, and in-person discussion
Encourage the creation of more initiatives that act as reassurance programs and allow for the creation of social contact	The support of such initiatives and programs give seniors a chance to build social connections and support systems as well as for the reassurance of the safety and wellbeing of the individual during extreme heat events	Initiatives such as telephone programs and buddy systems should be supported

6.4. Research Limitations

Given the constraints I faced in terms of timing and recruitment options, I recognized that it was implausible for me to have a representative set of participants. Although this research intended to examine people's experiences with energy access, including the experience of energy poverty, participants were not recruited based on income level or socioeconomic status. In other words, I did not focus on class or wealth inequalities present within the participant sample, as this was not a central priority of this research. Being careful of the sensitivities involved with research of this kind, as well as the time constraints of my fieldwork season, I instead focused on collecting the lived experiences of different seniors and using these experiences as the empirical data driving my analysis. These factors may be partly the reason why I did not speak with a larger number of participants who were experiencing energy poverty.

Another limitation of this research relates to the recruitment strategy I used. Because I primarily relied on gatekeeper organizations to access participants, many of the participants had very similar experiences and shared things in common. To increase the diversity in my study sample, I would have explored more organizations in Ottawa that could have helped me access individuals who are deemed most vulnerable (i.e. public housing corporations, community and social services, public health unit). Despite the limited diversity in the sample, I am confident that the discoveries I did find still reveal important information, recommendations, and further questions about the relationship between energy access and extreme heat.

6.5. Directions for Future Research

Throughout this research process, I thought of different ways that this research problem could be approached and what directions this topic can be taken in. One valuable direction that I believe future research should focus on is the experience of extreme heat specifically in senior's retirement homes, long-term care homes, and other shared living facilities. Although my study did interview participants living in these types of environments, I believe it would be extremely valuable to more closely examine these spaces and how they may be contributing to seniors' vulnerability to extreme heat, especially concerning individual's lack of autonomy and buildings that are prone to excess heat because of their age or material features. Investigating seniors' experiences as well as doing a physical survey of their built environment could inform policies that better protect seniors during extreme heat events.

Another noteworthy direction for future research is to focus on seniors' experiences with heat outside of their home environment. Although my study did touch on how participants cope with extreme heat when they are outside of their home, I believe this particular subject merits more research attention. As indicated in Chapter 4, mobility and social isolation are two key factors that contribute to one's vulnerability with extreme heat and may also be a significant reason why individuals do not go outside during summertime heat. By further investigating what could be improved within the landscape of an urban centre to better protect and support seniors may reveal profound insights into what could be done to encourage heat safety together with community participation and social connection during summertime heat.

Reflecting on the research gap on energy access and extreme heat in Canada that motivated this study, there is not an abundance of research investigating the relationship

between energy access and extreme heat for other vulnerable groups. As discussed in Chapter 2, seniors are not the only demographic that is deemed vulnerable to the health risks associated with extreme heat. Children, as well as people who are experiencing homelessness, are also at higher risk during extreme heat events. I believe there is a wide range of possibilities for future research to investigate how these other vulnerable groups experience extreme heat and energy access in Canada. Similar to this study, analysing these demographics would require a high level of sensitivity. But I believe researchers with experience interviewing families and children, as well researchers who will take the time to build rapport with vulnerable communities, could examine these issues in the same manner I did in this study.

Lastly, I believe my case study of Ottawa, Ontario can be seen as an example of a way to examine energy access and extreme heat in different urban centres across Canada. Because of the time restrictions of this study, it was not feasible to make a comparison with other sites. I do think a project of a larger magnitude and time frame could find interesting insights by studying the differences in policies, programs, and experiences of people in multiple cities who experience similar summertime heat conditions. Assessing the effectiveness of different community or city-wide programs and strategies that aim to protect communities from extreme heat could help other sites to adopt successful programs.

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Appendices

Appendix A: Semi-structured interview guide

Guiding Questions for semi-structured interviews

1. If you choose to share, which age range do you belong to? Ages 65-69? Ages 70-74? Ages 75-79? Ages 80-84? Or 85+?
2. If you choose to share, which neighbourhood or part of Ottawa do you live in?
3. What comes to mind when you think of a hot summer day in Ottawa?
4. How do you usually feel in these situations?
5. What does your day-to-day life consist of when it is really hot outside? Does your routine change? Do you visit certain places? Do you stay away from others?
6. Does your mobility or independence typically change in these conditions?
7. What does your support system look like? Do you have people checking on you?
8. Do you do anything to prepare for such situations?
9. Do you pay attention to heat alerts and warnings when making decisions during the hot summer days?
10. If so, how do you access information regarding the weather? What is your primary source of information? (ex: tv weather network, weather online webpage, phone, word of mouth, by stepping outside before leaving completely, etc.)
11. Are you ever concerned for friends or loved ones that they are at risk for heat-related risks (such as heat stroke etc.)?
 - a. If so, is there a particular reason that you are concerned for them? (pre-existing health condition, lives alone, etc)
12. What comes to mind when you hear the term ‘heat wave’?
13. Do you believe there is enough awareness about the potential risks associated with heat waves? Are these potential risks spoken about enough?
 - a. Who usually starts the conversation about the potential risks? (Health care provider? Friends? Family?)
14. If you don’t think there is enough awareness, what would you suggest to increase the awareness?
15. Do you ever find yourself leaving an environment (home, recreation facility, etc.) because you are not in control of the temperature?
 - a. If so, can you tell me more about that?
16. Do you ever find yourself in a position where you wish you could make an environment cooler by using energy but you don’t access to make those changes? (ex: locked thermostat, no control for fans, etc.)
 - a. If so, can you tell me more about that?
17. Do you ever feel restricted by your surroundings in terms of staying comfortable during extreme summer temperatures?
18. If you ever do feel restricted, what do you think are the biggest obstacles to

ensuring you always feel comfortable (in terms of temperature) when in different environments (home, recreation facility, library, community centre, etc.)?

19. Are there enough resources/services in Ottawa that help you cope with hot summer temperatures? If not, what would you like to see?
20. Are there enough resources/services in Ottawa that enable you to access the energy services (air conditioning, etc.) that you desire? If not, what would you like to see?
21. If you take transit in Ottawa (OC Transpo, Para Transpo), are you ever too warm while using those services?
22. Do you ever find walking around outside a challenge (or more of a challenge) during hot summer temperatures in Ottawa?
23. Do you think there is enough awareness about what public places have air conditioning in Ottawa and can be used as a 'cooling centre' or emergency shelter?
24. If you use air conditioning at home, how often do you use them during the summer? Do you ever feel your usage is restricted or is not meeting your needs?
25. If you don't use air conditioning at home, what is the main reason behind this?
26. Do you ever wish you could change your energy access (in terms of accessing services such as air conditioning) but feel restricted due to the layout or structure of the building you live in? (i.e. old apartment building or home, live higher than 3 storeys up, no central AC only window)
27. Do you ever feel worried about the increasing summer temperatures?
28. In general, do you often pay attention to the news and/or other forms of communication that are reporting about climate change and energy in Canada?
29. Is there anything else you would like to add?

Appendix B: Letter of Information



Letter of Information

Project title: Energy Access & Extreme Heat

Principal Investigator:

Dr. Carol Hunsberger, Assistant Professor, Geography

University of Western Ontario

Additional Researcher:

Samantha Doris, MA Candidate, Geography

University of Western Ontario

You are invited to participate in a research project about your experience with energy access and summertime heat. The purpose of the study is to explore energy poverty by examining the lives of Canadians and their experiences with energy access in the context of climate change and the increased frequency of heat extremes. This study aims to uncover whether 'energy access' is one of the key factors in determining senior's experiences during extreme heat conditions. Our objective is to investigate how energy access impacts your experiences with coping with hot summer temperatures in Ottawa, Ontario. Further, this study aims to investigate any potential barriers children and seniors may experience in terms of accessing energy in the context of keeping cool during the summer (i.e. using air conditioning). Therefore, we are interested in your experiences and views about hot summer temperatures and energy access in Ottawa. People with all different opinions and experiences are welcome and encouraged to participate.

If you decide to take part in the study you will be asked for an interview with the researcher, Samantha Doris, lasting between 20 to 60 minutes. The interview can take place in person in a place that is convenient for you, or by phone if you prefer. The interview will be audio recorded, but if you do not wish to be audio recorded you may still participate. Afterwards we will notify you via email that your transcript of the interview is available for review through Office 365's OneDrive, a secure platform. If you choose, you can make any additions or corrections that are needed. After receiving the email that your transcript is available we please ask you to provide revisions within 2 weeks, otherwise, we will assume you are comfortable with the contents of your transcript. Reviewing your transcript could take about the same length of time as the interview itself.

The risks of participating are minimal and involve sharing your personal thoughts on the topic. To protect your identity, information collected in the study will be stored under secure conditions and your name will not be used in any writing that results from the

research. Instead, you may chose a pseudonym as a non-identifiable descriptor. A list linking your study number/pseudonym with your name, age range, the neighbourhood you reside in Ottawa , and contact information will be kept by the researcher in a secure place, separate from your study file. Only the researchers will have access to the information collected, which will be securely deleted or shredded 7 years after the project ends. Although, representatives of Western University's Non-Medical Research Ethics Board may require access to your study-related records to monitor the conduct of the research. The main benefit of participating is the opportunity to share your experiences coping with hot summer temperatures in Ottawa, specifically in terms of accessing energy to cool down. You will not be paid to participate. Information gathered through the study may benefit society by spreading awareness about the risks associated with hot summer temperatures as well helping to inform possible strategies to help mitigate the issues associated with energy access and hot summer temperatures.

Your participation in this study is voluntary. You may decide not to be in this study. Even if you consent to participate you have the right to not answer individual questions or to withdraw at any time. If you choose to leave the study, you can decide whether or not information already collected from you may be used. You do not waive any legal right by consenting to this study.

If you have questions about this research please contact Dr Carol Hunsberger by email.

If you have any questions about your rights as a research participant or the conduct of this study, you may contact The Office of Human Research Ethics by email or phone.

This letter is yours to keep for future reference.

Appendix C: Written Consent Form



Written Consent Form

Project title: Energy Access & Extreme Heat

Principal Investigator:

Dr. Carol Hunsberger, Assistant Professor, Geography
University of Western Ontario

Additional Researcher:

Samantha Doris, MA Candidate, Geography
University of Western Ontario

I have read the Letter of Information, have had the nature of the study explained to me and I agree to participate. All questions have been answered to my satisfaction.

1. I agree to be audio-recorded in this research.

YES NO

2. I agree that we can use quotations from my interview in writing about the research – as long as we do not use your name. Remember that you will have the chance to review the transcript after the interview and make any necessary corrections.

YES NO

Print Name of Participant

Signature

Date

My signature means that I have explained the study to the participant named above. I have answered all questions.

Name of Researcher

Signature

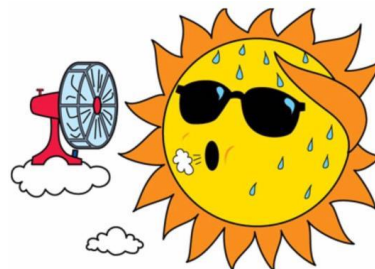
Date

Appendix D: Recruitment Poster #1



Western
SocialScience

Department of Geography



PARTICIPANTS NEEDED FOR RESEARCH IN SUMMERTIME HEAT AND ENERGY ACCESS

We are looking for volunteers to take part in a study of individual experiences coping with summertime heat and energy access in Ottawa, Ontario.

Volunteers must meet the following criteria:

A **SENIOR** who is **65 years old and older** living in Ottawa

Speaks English

If you are interested and agree to participate you would be asked to meet with the researcher, at a location that works best for you (or by telephone), to answer some questions about your experiences coping with summertime heat in Ottawa and accessing energy services, such as air conditioning.

Your participation would involve one session,
the session will be about 20 - 30 mins.

For more information about this study, or to volunteer for this study,
please contact:

Samantha Doris

MA Candidate, Geography, University of Western Ontario

Version: 02/07/2019

Appendix E: Recruitment Poster #2

HOW DO YOU
FEEL IN THE
SUMMERTIME
HEAT?

**Research on
Extreme Heat
and Energy
Access**



**Western
SocialScience**

Appendix F: Ethics Approval Form



Date: 11 June 2019

To: Dr. Carol Hunsberger

Project ID: 114028

Study Title: Barriers to Access: The Experience of Energy Poverty & Extreme Heat

Short Title: Energy Access & Extreme Heat

Application Type: NMREB Initial Application

Review Type: Delegated

Full Board Reporting Date: 05/Jul/2019

Date Approval Issued: 11/Jun/2019 16:18

REB Approval Expiry Date: 11/Jun/2020

Dear Dr. Carol Hunsberger

The Western University Non-Medical Research Ethics Board (NMREB) has reviewed and approved the WREM application form for the above mentioned study, as of the date noted above. NMREB approval for this study remains valid until the expiry date noted above, conditional to timely submission and acceptance of NMREB Continuing Ethics Review.

This research study is to be conducted by the investigator noted above. All other required institutional approvals must also be obtained prior to the conduct of the study.

Documents Approved:

Document Name	Document Type	Document Date	Document Version
Child_Verbal_Assent_Script	Verbal Consent/Assent	28/May/2019	3
Child_Written_Assent	Written Consent/Assent	24/May/2019	1
Children_Visual_Prompt_EA&EH	Other Data Collection Instruments	24/May/2019	1
Interview_Guide_EA&EH_Version2	Interview Guide	24/May/2019	2
Letter_of_Information_ParentConsent	Written Consent/Assent	24/May/2019	2
Letter_Of_Information_SeniorConsent	Written Consent/Assent	24/May/2019	2
Recruitment_Poster_EA&EH	Recruitment Materials	24/May/2019	2
Verbal_Consent_Script	Verbal Consent/Assent	28/May/2019	3

No deviations from, or changes to the protocol should be initiated without prior written approval from the NMREB, except when necessary to eliminate immediate hazard(s) to study participants or when the change(s) involves only administrative or logistical aspects of the trial.

The Western University NMREB operates in compliance with the Tri-Council Policy Statement Ethical Conduct for Research Involving Humans (TCPS2), the Ontario Personal Health Information Protection Act (PHIPA, 2004), and the applicable laws and regulations of Ontario. Members of the NMREB who are named as Investigators in research studies do not participate in discussions related to, nor vote on such studies when they are presented to the REB. The NMREB is registered with the U.S. Department of Health & Human Services under the IRB registration number IRB 00000941.

Please do not hesitate to contact us if you have any questions.

Sincerely,

Katelyn Harris, Research Ethics Officer on behalf of Dr. Randal Graham, NMREB Chair

Note: This correspondence includes an electronic signature (validation and approval via an online system that is compliant with all regulations).

Curriculum Vitae

Samantha Doris

EDUCATION

Master of Arts (M.A.), Western University **2018- 2020**

Human Geography, Department of Geography & Environment

Thesis: Energy Access and Extreme Heat Events: A case study of seniors in Ottawa, Ontario

Bachelor of Arts (B.A.), Western University **2014-2018**

Major in Environment & Health, Department of Geography & Environment

Minor in Biology

UNIVERSITY TEACHING EXPERIENCE

Teaching Assistant, Western University **2018-2020**

GEOG 1500: Environment and Development Challenges

Guided students through an introductory geography course; presented and taught material in laboratory sessions; facilitated group work and class discussions and communicated with students promptly.

GEOG 1400: How Humans Interact with the World

Facilitated tutorials and in-class discussions on geographic concepts and themes; responsible for grading exams and written assignments within a short timeframe.

GEOG 2310: Weather and Climate

Explained and presented scientific concepts & course objectives in laboratory sessions; created accessible learning opportunities and gathered feedback from students to improve their learning experience; guided students through their lab assignments; held office hours and provided assistance and answered questions.

GEOG 3441: Conservation and Development

Responsible for easing the transition into online learning; marked assignments and provided feedback promptly; communicated with students and answered questions.

COMMUNITY & VOLUNTEER EXPERIENCE

Alzheimer's Society of London & Middlesex, Program Volunteer **Present**

Assisted clients with dementia and Alzheimer's in community programs, provided organizational support to staff, and helped facilitate virtual support programs during the pandemic.

London Environmental Network, Volunteer **2019 – 2020**

Participated in learning about environmental policy and governance in London, Ontario by sitting as a volunteer on their board of directors.

Big Brothers Big Sisters Canada of London, Mentoring Volunteer **Winter 2019**

Acted as a mentor to a group of young girls in Grades 7 and 8 by providing a safe space for them to engage in conversations about self-esteem, healthy eating, body image, and physical activity.

Western University, Geography Social & Wellness Committee Lead **2019-2020**

Managed committee members and helped promote student engagement and wellness by organizing social and wellness events. Responsible for organizing meetings and coordinating event structure and budgets.

Western University, Wellness Education Centre Volunteer **2017-2018**

Responsible for helping to promote and distribute health and wellness resources to the campus community.

CONFERENCE PRESENTATIONS

Doris, S. (2020). Barriers to Access: The Experience of Energy Poverty and Extreme Heat. American Association of Geographers Conference. Cancelled due to COVID-19.

Doris, S. (2019). Barriers to Access: The Experience of Energy Poverty and Extreme Heat. Canadian Association of Geographers – Ontario (CAGONT) Conference.

PUBLICATIONS

“Women in Fieldwork: ‘Just Do It’”. Podcast published by the Royal Society of Canada, Voices of the RSC (April 2019)

AWARDS

The E.G. Pleva Teaching Assistantship Award	2020
Social Science and Humanities Research Council (SSHRC) award	2019-2020
Western Graduate Research Scholarship	2018-2020
Western University Certificate of Merit for Academic Excellence	2018
Western Faculty of Social Sciences Dean’s Honor List	2017-2018
W. Ross Pinkerton Memorial Scholarship	2014