Older Adults' Access to Mobility in Urban Spaces in Winter Conditions:

A Case Study of Burlington, Vermont to Identify Barriers and Strategies

for Advancing Mobility Equity for Older Adults

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Abstract

This thesis explores how the built environment, intersecting with winter conditions, shapes mobility experiences for older adults in Burlington. Drawing on the Social Model of Disability and frameworks of mobility justice, I argue that many of the barriers older adults face are not inevitable results of aging, but rather the product of spaces that have not been designed with their needs in mind. I used a multi-methods approach, including surveys of older Burlington residents, interviews with both older adults and professionals in the field, and a review of local policies and planning documents. My findings show that winter conditions reduce mobility for older adults, as well as highlight various issues impacting to different means of transportation. At the same time, I found promising strategies and interventions that aim to create more equitable, age-friendly design. This research calls for a shift in how we think about aging, disability, and mobility, emphasizing the importance of working to create spaces that support people as their abilities change, and that not only improves the lives of older adults, but improve mobility conditions for all residents.

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Chapter 1 Introduction

Everyone is always getting older. Aging is an inescapable part of the human experience, and with many people aspiring to live for as long as possible, it would be logical for our communities to be created and managed in a way that supports individual abilities to lead healthy and fulfilling experiences for the full duration of their lives. Yet, society often holds narrow and dismissive ideas about aging that lead to the marginalization of older adults, de-prioritizing their needs and the value of their lived experience. Stereotypes surrounding aging, such as the idea that growing old means resigning to a more sedentary lifestyle, losing interest in engaging with society, or that aging results in an inherent loss of independence, lead to stigmas impacting older adults. This negatively affects the perceived place and value of older adults in society and creates false narratives about how to serve the needs and wants of this population.

The resulting marginalization of older adults often serves as a self-fulfilling prophecy, and it perpetuates stigmas around aging, reinforcing inequalities that exclude them from being fully considered in the development of key societal systems. If the people shaping the world believe older adults do not need or want to participate in society, because they rarely see older adults engaging in society, systems are created that do not necessarily support older adults' ability to engage. As a result, older adults don't participate, and the belief is reinforced because they aren't seen engaging in society.

This exclusion takes place in numerous influential sectors of society, including healthcare, transportation, food accessibility, and other essential social systems, which frequently fail to address the needs of older adults. I argue that this neglect and lack of consideration are the significant forces behind the decline in the quality of life for many older adults, which affects their

ability to engage fully in society as they age. That is, although aging is often accompanied by physical and medical changes that limit individuals' mobility and access, there are many ways in which our social and built environments could shift to optimize participation in broader systems across the course of life.

Older adults are not a homogeneous group, and they should not be viewed as a monolith. The needs, wants, and abilities of this population vary widely due to their diverse experiences and identities. Older adults should have the same access to participate in their communities, explore new opportunities, and live vibrant, meaningful lives. In the pursuit of social equity and inclusion, we must evaluate and reimagine the processes perpetuating these forms of inequity and discrimination and identify effective solutions.

As a student with an interest in urban and transportation planning, along with a concern for accessibility rights and related issues, I wanted to explore how the built environment and the choices we make in designing it impact accessibility and equity for different groups. I was especially interested in the built environment's role in influencing the ability one has to move through space, and the importance that mobility has on individuals' lives.

I chose to focus on the experiences of older adults because I was intrigued by the complexity and inevitability of aging. I recognize that there are natural consequences to aging that will be experienced negatively regardless of how our environments are designed. However, as someone with a physical condition that can limit my mobility and who grew up in a home engaged in disability rights, I also recognize the power the built environment has over the levels of access and opportunity individuals have, and how influential the physical world we interact with is to every aspect of our lived experience and quality of life. Although it cannot address every aspect of

the challenges that older adults experience, I believe it is worthwhile to explore how we can design spaces that acknowledge the realities of aging, instead of accepting aging as a process defined by inevitable loss of access, independence, or value in the community.

A significant factor contributing to social isolation is the loss of mobility. While it is true that aging often brings health challenges that can limit physical movement, much of the immobility that older adults experience is due to systemic failures. The infrastructure and systems designed to support mobility in our cities and neighborhoods neglect the specific needs of older adults. Public spaces, transportation systems, and even healthcare services frequently fail to prioritize accessibility for this demographic, making it more difficult for them to engage with the world around them. In many cases, these shortcomings do not simply result in inconvenience but actively exclude older adults from participating fully in society. It is essential, therefore, to reevaluate how we design and structure our communities, ensuring that they support the dignity, independence, and well-being of people at every stage of life.

I chose to focus on Burlington, Vermont, as a case study for the exploration of this topic for a variety of reasons. The leading reason I chose Burlington is that I felt I could most effectively engage with the specifics of the city and connect with older adults in that community, because it is where I lived during the duration of my research process. However, Burlington, Vermont, was a relevant location of interest because it is an aging place. According to the Vermont Department of Public Health, “Vermont's older population is the fastest growing age group. By 2030, one in three [Vermonters] will be over the age of 60.” (Vermont Department of Health, 2024). As Burlington is the largest city in Vermont, exploring how the city could be more age-friendly is essential as the state's older population increases.

After choosing Burlington as my focus, I aimed to explore how the city's unique context shapes the experiences of its residents. To develop comprehensive and effective solutions, it is essential to consider local contexts. Therefore, I decided to investigate how winter conditions in Burlington impact the built environment and how these seasonal changes affect mobility and equity for older adults in the community, especially because Burlington is known for its long and harsh winters.

In my research, I aimed to explore how the levels of mobility equity among older adults in Burlington were influenced by both the built environment and winter conditions. Additionally, I wanted to understand what resources and systems were effectively serving the older population, as well as explore solutions to any identified areas of mobility inequity. I gathered data through a survey of older residents of Burlington, interviews with two local older individuals, interviews with two subject experts working in a government agency and a non-profit, and a review of relevant documents and policies regarding the built environment, transportation, social services, and local policies.

Research Questions

This research is guided by the following questions: In what ways do intersecting identities, such as age and ability, influence how individuals experience and navigate the built environment? How can the design of the built environment be improved to foster mobility, accessibility, and inclusion for marginalized communities? And how do winter conditions exacerbate mobility challenges for older adults in the built environment? These questions draw upon current discourse across the relevant fields like geography, urban planning, and gerontology, while also contributing new insights to ongoing conversations about mobility, equity, and age-friendly city planning.

Chapter 2: Older Adults, Mobility, and The Built Environment

Aging's Impact on Older Adults' Physical, Social, and Mental Health

Aging, health, and mobility have an intersectional relationship. How aging impacts an older adult's health influences their level of mobility access in a space. The changes that aging imposes on the body and mind shape how one can interact and move through their built environment. Conversely, Maresova et al. (2023) found that an individual's access to mobility, based on their environment, has a direct influence on their physical, social, and mental health as they age.

These interactions highlight what some scholars have defined as a socio-spatial dialectic, where humans and their environments have a reciprocal and interactive relationship. Humans continually shape and influence their environment, while it simultaneously shapes and influences them in return (Soja, 1980). My research aims to explore the relationship between how the physical environment shapes the mobility experiences of older adults and how we can respond to and modify that environment to improve these experiences. To fully understand the relationship between older adults and their built environment, it is essential to explore the wide variety of ways aging impacts an individual's physical, mental, and social well-being by understanding how these changes unfold. In doing so, we can better comprehend the context in which these individuals navigate spaces and how the built environment can either support or obstruct their mobility abilities. This comprehension is key to being able to identify and implement effective strategies to improve these mobility experiences.

To understand how aging affects the embodied mobility experience, it is important to look at the health issues that impact older adults, as these impact how individuals move through and experience their environment. While aging affects everyone differently, it often increases the

likelihood of experiencing certain physical changes and conditions. Hawker and King (2022) report that one in three individuals over the age of 65 experiences osteoarthritis, a chronic connective tissue disease that causes significant joint pain and is recognized as the leading global cause of pain and disability. Aging also increases the risk of developing sarcopenia, osteoporosis, and other conditions that cause muscular and skeletal weakness (Borst, 2004). This often leads to pain, exhaustion, and sometimes injury for older adults when moving their bodies. Instability and the risk of falling become more significant with age. One in three adults over 65 have at least one falling incident annually, with the rate increasing to one in two adults over 80 who will experience a falling incident per year (Older Adult Falls Data, 2024).

Aging can also have detrimental effects on older individuals' ability to see and hear. It was found that “of the 38 million people who are blind, 22 million [57%] are 60 years of age or older” (Harvey, 2002). This shows that older adults struggle with blindness and visual impairments at disproportionately higher rates than the rest of the population. According to one study, around 8% of adults over the age of 65 were considered to be legally blind or categorized as “low-vision” using World Health Organization criteria (Klaver, 1998; World Health Organization, 2023). There are numerous conditions that weaken an individual's vision, with age being a leading risk factor. Age-related macular degeneration (AMD), cataracts, diabetic retinopathy, and glaucoma are some of the leading causes of vision impairment (Quillen, 1999). Nagarajan et al. (2022) emphasize that vision impairment not only limits one’s ability to see but also contributes to other complications, such as increased risk of cognitive dysfunction or impairment.

Miller and O’Callaghan (2005) found evidence that aging leads to hippocampal shrinkage, which negatively impacts memory functions and increases the risk of cognitive decline. This results in many older adults struggling with both short and long-term memory, with a high

prevalence of dementia and Alzheimer's disease for those over the age of 65. One study found that about 6%-10% of North American adults over the age of 65 have dementia (Hendrie, 1998). These struggles have detrimental effects on both physical and mental health.

The numerous challenges older adults face compound as they age, leading to an increase in social isolation. One in four older adults reported experiencing loneliness in their later years. (World Health Organization, 2025) In one study, 59% of respondents reported experiencing suicidal ideation, and some studies found that many suicide cases involve individuals aged 55 and older, driven by factors such as frustration with declining physical health, the isolation caused by aging, and a perceived lack of purpose (Garnett et al., 2023). Furthermore, older individuals experience an increase in general anxiety due to a loss of physical and cognitive abilities and an increase in social anxiety about how this difference in ability will be perceived and interacted with by others (American Association for Geriatric Psychiatry, 2022; Donovan & Blazer, 2020).

Spatialized Definitions of Disability

As humans age, there often is a natural regression in physical and cognitive functions that consequently leads to fewer physical abilities for many compared to the average younger person. This often leads to aging being understood as a "disabling process." Building on Goering's (2015) spatial interpretation of disability, I argue we should spatialize our definitions of disability, emphasizing that disability, or the inability to achieve a certain task, is situational and the result of one's environment not accommodating an individual's needs. For example, imagine a hypothetical world where the average person has the ability to walk, but everyone regularly uses a wheelchair to get around for convenience or comfort. Cities would be designed almost exclusively with ramps instead of stairs, sidewalks would be well-maintained and easy to traverse for wheels, and counters and shelves would be at a convenient height to reach from a seated position, because wheelchair use would be the norm. The built environment would be designed in a way that accommodates and considers the needs of people using wheelchairs. Someone who does not have the ability to walk and subsequently uses a wheelchair would experience minimal struggles while attempting to achieve everyday tasks, because their environment does not expect and demand the ability to walk. Therefore, in most cases, they would not be considered disabled because they would have the ability to successfully complete tasks independently, with a similar amount of effort compared to others.

However, in a world where the use of a wheelchair and other differing abilities is not always considered or prioritized, the average built environment does not accommodate the needs of these different abilities, and it disables many individuals from easily achieving everyday tasks. An analysis of defining disability through space, and not the individual, reveals that the built environment holds the power to determine who has access to it and the resources it contains.

This framework of disability is often referred to as the Social Model of Disability, using disability as a label that reflects a problem with an individual's environment (Goering, 2015). If someone is unable to complete a task, it reveals a flaw in the environment that should be addressed. This is compared to the Medical Model of Disability. The Medical Model of Disability views disability as something caused by an "abnormality" in an individual's condition, and it understands disability as a problem that should be "cured" or "solved" (Marks, 1997). "From the medical model, a person with a disability is in need of being fixed or cured. From this point of view, disability is a tragedy, and people with a disability are to be pitied. The medical model of disability is all about what a person cannot do and cannot be" (People With Disability Australia, 2025). It also places the blame and responsibility for access upon individuals. If an individual with a differing level of ability wants to have an equal level of access and inclusion as the "typical" person, they are expected to do whatever they can to rid themselves of any abnormality in order to obtain it. Additionally, using the Medical Model of Disability, any barriers to equal levels of access that exist after a "disabled person" has "assimilated" as much as possible are resigned to the unfortunate reality that that individual must face because of "their condition" (People With Disability Australia, 2025). This way of viewing these inequalities as immutable, with no other solution, is disempowering and defeatist. This paradigm perpetuates processes that have led to the discrimination and marginalization of people with disabilities.

However, the Social Model of Disability reveals paths to equity. Looking at an individual's environment as the "disabling factor," with the knowledge that we as a society have the ability to shape our environment, allows us to create comprehensive solutions to the inequalities that exist for those who have different levels of personal mobility.

The Social Model of Disability is especially useful when considering older adults because aging is inevitable. Everyone is always getting older. Using the Medical Model of Disability to view the changes in health that are associated with age views older individuals' conditions as abnormalities that should be treated in order to continue to participate in society. However, the Social Model of disability allows us to recognize the fact that a change in abilities is expected as we age. As we determine the built environment, we can consider different abilities and create cities that reflect the value and inclusion of older adults instead of creating spaces that exclude those whose abilities change as they age (Zhuo & Cao, 2024).

This redefinition of disability allows for an evaluation of our communities and environments as something we can shape to include and enable groups, like older adults, who have been historically marginalized and disabled by the status quo. We cannot fully stop the consequences of aging on the human body; however, we can consider the effects age has on different individuals' abilities and create spaces and systems that grant them mobility (Zhuo & Cao, 2024).

Mobility Equity

The United Nations recognizes personal mobility as a fundamental human right. This is outlined in the Convention on the Rights of Persons with Disabilities (CRPD), which recognizes mobility's importance and impact on quality of life and access to resources and opportunities. Article 20 of the CRPD requires that countries implement designs and policies that create environments where all individuals, especially those with "disabilities," can achieve personal mobility with the greatest independence possible (United Nations Department of Economic and Social Affairs, n.d.). The UN outlines personal mobility as a vital factor for achieving social inclusion and equality in society. Many scholars have explored the importance of mobility, mobility equity, and mobility justice.

Sheller and Urry's new mobilities paradigm (Sheller & Urry, 2006; Sheller & Urry, 2016) reimagines mobility or immobility not just as a physical or logistical concern, but as a fundamental component of life that is deeply connected to social life, inequality, and power. It expands the definition of mobility and explores how infrastructure, policies, and social norms shape levels of mobility access.

Building on this, Sheller (2020) introduces the idea of mobility justice, explaining how the built environment has been designed in a manner that excludes marginalized and vulnerable groups by restricting their ability to move in or through space. Building on this, Sheller (2020) argues that mobility is a fundamental right, one that is intricately tied to justice, access to public life, and the equitable distribution of social goods.

When we recognize that mobility is structured by human-made factors, we begin to see that those in positions of power, including planners, policymakers, and institutions, have the ability to

either enable or restrict movement for certain individuals and groups. This supports the social model of disability, where, in this context, a mobility disability is not simply the result of personal limitations but rather a consequence of systemic marginalization and neglect. Individuals are disabled not by their own abilities, but by environments that fail to meet their mobility needs, denying them equal access to movement and space. However, recognizing that these environments are shaped by human influences allows us to also understand that we have the power to empower and enable individuals with different mobility abilities rather than disabling and marginalizing them. Some scholars explore this concept of our ability to manipulate our environment to create more accessible and empowering spaces as the pursuit of mobility equity (Brown, 2022). Recognizing mobility as a fundamental right means that pursuing mobility equity, especially for vulnerable groups such as older adults, is essential and should be treated as a social and policy priority to create more just communities.

The Built Environment and Aging Adults' Mobility

As previously discussed, physical and cognitive limitations can emerge as an individual ages. Consequently, environments that are not designed to meet the needs of older adults can significantly hinder their ability to navigate public and private spaces. This section reviews the literature surrounding various aspects of the built environment, mainly focusing on walking infrastructure, public transit, and personal vehicle usage. It will explore different factors that impact the mobility accessibility of each means of transportation, as well as some interventions and strategies that have been effective in creating what has been called age-friendly cities (Menec & Brown, 2018; World Health Organization, 2022).

Walkability

One of the most universal means of transportation is walking. Almost all journeys outside of the home, even if it is not the primary mode of transportation, involve walking to some degree. Although a person with few mobility limitations may not find walking from their front door to their car, or from a bus stop to a destination, to be challenging or dangerous, those who struggle with different aspects of walking may encounter barriers that make accomplishing everyday trips challenging or inaccessible. Inclusive walkability infrastructure, or the lack thereof, may greatly influence an older individual's mobility.

Sidewalks

Wilmut and Purcell (2021) demonstrate that sidewalk design plays a crucial role in enhancing walkability for older adults, particularly in promoting safety and independence in pedestrian environments, emphasizing that a key factor is the presence of a sidewalk in a space at

all. Their research has shown that older adults feel more comfortable walking on sidewalks rather than on the side of a road without a sidewalk.) While this statement may be true for many people, regardless of age, it is important to recognize why the existence of sidewalks is so crucial for the safety of older pedestrians. For older adults who have any degree of hearing or vision loss, walking on the side of a street, even if it is a low-speed road, as in a suburban or rural setting, can be dangerous because they may struggle to see or hear vehicles approaching and fail to move out of the way if needed (Tournier et al., 2016). Additionally, many older adults lack the mobility or strength to move farther quickly and safely off the road, especially if this requires stepping up on a curb or lawn. The existence of sidewalks reduces the risk of harm or incidents to older pedestrians (Wilmut & Purcell, 2021). Increasing and improving sidewalk networks and connectivity can support older pedestrians' independence and quality of life.

Similarly, because some older adults struggle with strength and stability, the ability to enter or exit a sidewalk from a curb can be a barrier or challenge, especially if a mobility aid, such as a walker or wheelchair, is being used. Curb cuts or curb ramps, the small ramps that connect the street and the sidewalk, are vital for making spaces walkable for older adults and should be located anywhere individuals may need to enter or exit the sidewalk, like crosswalks (Moran et al., 2014).

Some older adults also struggle with endurance and levels of strength to walk long routes or distances (Meredith et al., 2023). Street furniture, such as public benches, provides rest stops that have been found to make walking more accessible for those who struggle with longer journeys (Sundling & Jakobsson, 2023). Additionally, improving walking infrastructure to create shorter, more direct routes can help those with difficulties in endurance and speed (Sundling & Jakobsson, 2023).

Comprehensive sidewalk network connectivity also includes strategically placed and well-designed crosswalks. As hearing and vision loss are common with age, crosswalks should ideally have both visual and auditory indicators that it is safe to cross. This can include painted-stripe crossings, signalized crosswalks, and raised crosswalks, depending on the style of the crosswalk. Those with limited mobility and strength may also take longer to cross a street safely (Tournier et al., 2016). Planners should account for this to help decrease levels of stress for older individuals by making crossings safer and more predictable for both drivers and pedestrians through strategies like 'bump-outs' that shorten the crossing distance and provide visual cues to drivers. Tactile indicators also indicate the beginning of a crosswalk, helping individuals with visual impairment identify where a path begins and ends, and preventing them from unknowingly stepping into the street.

Finally, well-maintained and adequate curb cuts/curb ramps should be present at any location where one is expected to transition between the sidewalks. This allows those using mobility aids or those who struggle with stepping on or off a curb to do so safely (Gray et al., 2012).

As many experience a reduction in their strength and mobility, especially in the hips, knees, and ankles, the presence of stairs can act as a barrier for some, especially those using mobility aids with wheels (Jacobs, 2016; Grimmer et al., 2019). Those with stability concerns may also prefer to avoid routes with stairs. The inclusion of ramps with a steady incline can make routes more accessible. Additionally, the existence of well-maintained stable handrails along stairs and ramps makes use safer and more convenient (Jacobs, 2016).

Well-maintained sidewalks, free of significant cracks, debris, and obstructions, are essential for supporting older pedestrians' safety and accessibility. Uneven pavement poses a tripping hazard to all pedestrians, especially those with mobility challenges. About 1 in 4 adults aged 65 will experience a fall incident every year, with 70% of all falls (not just those experienced by older adults) having been found to have occurred on sidewalks (*Older Adult Falls Data*, 2024; Schepers et al., 2017). It has also been found that older people, especially women over aged 65, have a higher risk of injury sustained by pedestrian falls (Wilmut & Purcell, 2021). This can be mitigated by proper sidewalk maintenance that keeps sidewalks clear of obstructions, which not only helps prevent and minimize fall events, but also ensures that those who use mobility aids like wheelchairs, walkers, and canes, can do so safely and successfully. Sidewalk width can also act as a barrier to those using mobility aids, especially wheelchairs, as pathways that are too narrow can make using the sidewalk impossible, forcing users to either go into the street or not take the route at all (Kapsalis et al., 2022).

Sidewalk lighting is another essential component of creating a safe, walkable space. As about 18% of older adults struggle with vision impairment of some kind, dimly lit sidewalks make it hard to identify tripping hazards (Health Policy Institute, Georgetown University, 2019). Further, because the physical ability to defend oneself can decrease with age, many older adults experience increased anxiety about their safety, especially while walking alone at night. Well-lit spaces have been found both to feel safer and decrease rates of crime in the area (Won et al., 2016; Bullough & Skinner, 2015).

Sidewalks present for the entirety of a walking route to desired locations can make walking as a means of transportation much more accessible for older adults. Even if sidewalks are present for a great majority of a route, a seemingly small stretch where a sidewalk is not present, requiring

a pedestrian to exit the sidewalk, temporarily walk along the side of the road, and then re-enter the sidewalk, could be enough for some older pedestrians to deem the route too dangerous or challenging to pursue. An absence of sidewalks in certain spaces, like between someone's home and a grocery store or pharmacy, could make the difference between an individual being able to maintain their independence and having to rely on others to access necessities. Just as a lack of sidewalks can keep older adults from going out, so can a lack of accessible public transit, accessible parking spaces, and other accommodations. For many older adults, these gaps in infrastructure create real obstacles that limit accessibility, reduce independence, and discourage everyday movement.

Public Transportation

For older adults who no longer drive or do not have access to private transportation, public transit is a critical resource. However, accessibility issues can decrease the effectiveness of public transportation systems for older individuals. Different identities like older age, lower socioeconomic class, and limited physical abilities often have compounding effects upon each other as they intersect. Possessing one or multiple of these marginalized identities can increase the need for public transportation. However, public transit systems are often the least accessible for these groups who rely upon them the most.

Proximity to Transit Stops and Comprehensive Bus Routes

Like walking infrastructure, one of the most severe barriers of access an older adult can face in using public transit, is the absence of transit options in proximity to where an individual resides or near the spaces they seek to go (Levasseur et al., 2015). Research found that older individuals' perceptions of the distance to a transit stop often overestimate the actual distance

(Hess, 2011; Balducci et al., 2023). It is theorized that this could be caused by many factors, including barriers in the environment interacting with limited mobility as they age, which can cause the journey to a transit stop to feel more exhausting or require more effort over a shorter distance than expected (Hess, 2011).

This perception is important to consider because the belief that one cannot comfortably or safely complete a trip can serve as a barrier for an older individual attempting to use public transit (Adler & Rottunda, 2006). Comprehending how the built environment shapes mobility for older adults requires considering their perception, which may differ from objective reality. Achieving genuine accessibility and equity requires creating environments that align both perceived and actual access.

Transit lines must also go to the places older adults want to go in order to be inclusive and useful to older individuals. Individuals who face challenges with their physical mobility may require stops that are closer to their desired destinations to complete their trips using public transit comfortably and independently (Shrestha et al., 2016). What might seem like a reasonable distance to a younger person without any physical limitations may not be the same for someone with mobility challenges. For instance, a bus stop that is a seven-minute walk from a grocery store may feel convenient for someone with minimal mobility issues. However, for someone who struggles with strength and endurance, that distance could be too far to manage alone, especially when carrying groceries (Shrestha et al., 2016).

Transit Stop Design

The design and features of bus stops play important roles in determining their accessibility for older adults. Implementing Universal Design Practices, a design approach that emphasizes

inclusivity and focuses on creating environments usable by all people, regardless of age or ability, is key to making transit infrastructure more inclusive and can make waiting for a bus a much more comfortable and feasible task for many older individuals (Audirac, 2008). Adequate seating at stops makes using transit more realistic for those who find it uncomfortable to stand for long periods (Ramírez-Saiz et al., 2025). Additionally, the implementation of appropriate lighting at stops can significantly mitigate hazards and safety concerns, aligning with the considerations discussed above (Yendra et al., 2024; Bullough & Skinner, 2015). The design of a bus stop must also accommodate the needs of those using mobility aids. An inclusive bus stop includes a concrete slab designated for waiting for the bus (Ramírez-Saiz et al., 2025). This allows wheelchair users to safely wait for the bus and have space to enter or exit the bus when using an unloading ramp (Frost et al., 2020). In addition to public infrastructure, factors such as technology, bus design, technological barriers, and cost of transportation can create further challenges that restrict the mobility of older adults attempting to utilize public transit.

Cars and Driving Limitations

The Implications of Driving Cessation

As individuals age, many experience a gradual loss of the ability to safely drive due to visual impairments, physical limitations, and cognitive issues, with one study finding that older drivers may be twenty times more likely to be involved in fatal crash than other drivers (Pitta et al., 2021; National Institute on Aging, 2022). However, the use of a personal and private vehicle can be the most accommodating, reliable, and convenient method of transportation for those who can access one. Additionally, in a car-centric landscape (including most of the US), resources like grocery stores and healthcare facilities are often most easily accessed by car (Cui et al., 2016). The

ability to drive feels essential to identifying as independent for many residents, especially older adults. Most Americans also rely on cars to access spaces for community entertainment and recreation. The decision to stop driving, also known as driving cessation, can be incredibly difficult and intimidating to make for older adults (Rapoport et al., 2017). For many, no longer driving means sacrificing freedom and means of access. The decision can be associated with a decrease in mobility and large lifestyle changes (Adler & Rottunda, 2006). Older adults who stop driving have been found to experience mental illnesses like depression and higher rates of isolation (Chihuri et al., 2016). Individuals residing in food or healthcare 'deserts,' which are areas lacking easy access to grocery stores and medical facilities, experience significant challenges due to the limited availability of essential resources. No longer driving may also mean relocating, relying on others for rides or services, or losing access to nutritious food or healthcare altogether (Wilson, 2017; Almeida et al., 2017).

Disparities shaped by factors such as race, gender, and socioeconomic status also influence older adults' decision-making, as limited social support or financial resources can significantly affect their access to essential services and opportunities (Maliheh et al., 2022). Additionally, those who have dependents may feel pressured to continue driving, even if they no longer have the ability to do so safely; indeed, Babulal et al. (2018) found that married men were almost six times less likely to stop driving than unmarried men. Additionally, infrastructure in the U.S. regularly prioritizes drivers' convenience over the needs of pedestrians and public transit users. This creates situations where individuals feel they have no choice but to drive, regardless of the risks caused by a decline in cognitive or physical abilities.

One way to encourage older adults to have the agency to make decisions based on their safety while not forcing them to give up their mobility and independence is to improve alternative

means of transportation and divert older adults toward them. Some communities offer resources that make this transition less intimidating. Workshops about how to use public transit, buddy system programs, and walking groups can help improve the experience of making lifestyle changes after driving cessation (Luiu et al., 2018). Similarly, ensuring essential resources are located within an accessible distance to community members can also decrease reliance on cars and improve the quality of life for those who do not drive. Affordable grocery stores, health care facilities, and recreational activities within walking distance, combined with accessible walking infrastructure, can allow older adults to remain independent in their homes (Levasseur et al., 2015). Overall, making communities more walkable and improving the level of accessibility of public transit means that driving cessation does not bring an end to older adults' independence.

Equitable and Inclusive Driving Infrastructure

Most adults still drive after the age of 65. In 2021, the U.S. Department of Transportation reported that 89% of the 55.8 million adults aged 65 and older in the United States still held valid driver's licenses (National Highway Traffic Safety Administration, 2021). Age does not automatically imply an inability to drive safely, but it can be associated with a decline in cognitive abilities that impact response and processing times, making driving more dangerous, regardless of the environment. Sometimes the inability to drive safely can be attributed to an incompatibility between the driver's physical ability and the mobility of certain body parts and the car's design. For example, an older adult may still have the cognitive abilities to drive safely, but challenges with using their knees, ankles, or hands can make driving an average car hazardous. In these cases, car modifications can change the controls of a car to allow users to utilize the limbs they do have control over to operate a vehicle safely (Barnes, 1997). Barnes (1997) identified two major barriers to accessing these vehicles: education and financial support. First, programs that educate older

adults about their driving options may help some find modified vehicles that allow them to maintain their ability to drive, which greatly improves their level of independence and mobility (Greve et al., 2015). Second, programs that subsidize the cost of these vehicles and minimize the financial barriers to modified cars could also be effective in helping older adults have equitable access to driving. A more recent development may also offer some solutions: car share programs have become increasingly common and could offer vehicles with modifications for those who need them.

Parking proximity and infrastructure also play a significant role in driving equity for older adults. As discussed before, some older adults have a limit to how far they can comfortably walk. For someone with minimal mobility limitations, parking a few blocks away from their destination may make little difference in their comfort; however, for someone with mobility challenges, this can make a trip inconvenient, overly taxing, or unsafe. Designated parking spots for seniors and those with disabilities help make trips for those who drive possible. These parking spaces should also ideally have loading bays and space for those who have vehicles with wheelchair lifts. (Newton et al., 2010).

In conclusion, the configuration of the built environment and living spaces can be made more age-friendly by addressing the physical, social, and mental barriers that often narrow the activity space for older adults. These issues are primarily caused by environments designed to accommodate only those with “typical” levels of mobility abilities and a focus on car-centric mobility, which leaves many older individuals who do not meet this assumed level of ability with limited options for mobility and independence. Solutions to these inequities range across scales, from assistive devices like walkers and modified car controls to improvements in public transit and, ultimately, rethinking urban design to support independent living with dignity.

The main objective of this research is to explore how we can rethink urban spaces and mobility infrastructure and policies to promote the well-being and autonomy of older adults. However, accessibility for older adults in the built environment benefits not only the older population but also the broader community, so these improvements could have an impact on the quality of life for all sectors of the population. Progress in mobility equity, like improved sidewalk conditions, more accessible bus stops, and an increase in accessible parking spaces, not only facilitates access for older individuals but also creates safer, more accessible, and convenient mobility experiences for everyone.

Chapter 4 Methods

I selected this topic because of my interest in community and accessibility design, as well as my background and experience in urban planning. My research explores how different social identities, like age and ability, interact with the built environment to shape individuals' mobility experiences. Specifically, I aim to address the following research questions: In what ways do intersecting identities, such as age and ability, influence how individuals experience and navigate the built environment? How can the design of the built environment be improved to foster mobility, accessibility, and inclusion for marginalized communities?

In order to narrow this large topic and carve out a locally specific research niche, I made the decision to include examining how winter conditions impact the mobility equity of older adults. The addition of a seasonal component is appropriate because Burlington, Vermont, is notorious for its harsh, long winters, and the challenges of winter conditions add a different dimension to studying older residents' approach to daily life and mobility. This led me to my third research question: How do winter conditions exacerbate mobility challenges for older adults in the built environment? By bringing attention and hopefully a better understanding to these issues, I aim to contribute to the progression of creating a more equitable and inclusive city that improves the quality of life for older adults in the community.

As I wanted to explore the embodied experience of older adults moving through the city and the built environment's impact on both physical and mental experiences, I needed to gather data about existing conditions in the city and older people's perceptions and experiences of those conditions. I opted to use a mixed-methods approach, gathering qualitative data through interviews and documentation review, and generating some quantitative survey data to complement the qualitative findings. This multi-method approach, which combines qualitative and quantitative

data, allows for a more comprehensive understanding of the subject at hand. This approach allows me to explore and analyze the nuances of personal narratives and embodied experiences alongside trends and information from quantitative data.

My initial research plan involved using a combination of multiple qualitative methods, including surveys, sit-down interviews with older individuals as well as experts and service providers, go-along interviews, and mental mapping exercises with older adults to explore mobility experiences. However, due to various challenges, I had to adjust my research approach. The revised approach focuses on gathering data through mainly surveys and a limited number of sit-down interviews with older individuals, local experts, and service providers, while eliminating the go-along and mental mapping components altogether. However, I added an additional method of document review.

Contextual Setting

The sample population for this research consisted of residents of the city of Burlington, Vermont, who were 65 years of age or older. Residents of Burlington, Vermont, were selected as I wanted to explore how an urban environment interacts with age and mobility. I am also most familiar with Burlington's built environment compared to other areas of Vermont. This allowed me to better interpret and understand certain references made in survey responses and interviews. The age of 65 was selected as the cut-off age as the mid-60s is when most Americans plan to retire and become eligible for different resources like Medicare, social security benefits, and senior services in the community.

Understanding and providing the general contextual setting and background information relevant to Burlington, Vermont's older adult population, winter conditions, and general mobility infrastructure is important both for me as a researcher to explain the context in which I developed my research approach and analysis, and for readers to gain clarity and understanding of the broader context surrounding the research as a whole.

According to the Vermont Department of Health, referencing 2020 census data, Vermont has the fourth oldest population in the country (Vermont Department of Health, 2023). Over 22% of Vermont's population is above the age of 65 (United States Census Bureau, 2020), compared to 16.8% of the nation's total population. In contract, in Burlington only 12.1% of the population is over the age of 65, reflecting the presence of multiple colleges and universities in and around the city. In 2020, the U.S. Census found that Burlington's total population was 42,417, meaning that a little over 5,000 adults over the age of 65 lived in Burlington. (United States Census Bureau, 2020).

Although I was unable to find the exact averages and statistics for the winter season in which this research was conducted, I was able to cross-reference different weather reporting sources to create an understanding of the typical or expected winter conditions in Burlington, Vermont. On average, winter high temperatures generally range from 25°F to 30°F, with lows between 12°F and 20°F, and with a few days in the season generally being expected to dip below 0°F. These temperatures do not factor in wind chill, so the perceived temperature is often lower than these reported numbers (Weather Atlas, 2024). Monthly snowfall averages four inches throughout the winter season, with snow falling on an expected 17 to 20 days each month (Weather Atlas, 2024). Additionally, Northern Vermont has short days in the winter, with

Burlington experiencing less than nine hours of daylight at the winter solstice (Lake Champlain Committee, 2024).

In addition to reviewing current demographic and climate data, I also referenced Anna Royar's 2009 thesis, *Urban Life, Later Life: The Creation of an Elder-Friendly City in Burlington, Vermont*. This project provided information about how Burlington has been evaluated as an age-friendly city in the past, and it informed my own research methods and approach. The methods chapter, as well as the Possible Problems and Future Directions section, were particularly influential as they provided insight into how a similar project had been approached in the past. Royar's thesis also offered recommendations for improvements based on what had worked well.

Researcher Positionality

My positionality as a researcher was important to consider in my approaches to recruitment, data collection, and data analysis. Drawing on both the works of Merriam et al. (2010) and Gair (2012). I carefully considered how my positionality and identities influenced my approach to data collection and analysis, as well as how they shaped participants' interactions with me not only as a researcher, but as a person.

As a person in their 20s at the time of the project and someone who is not from Burlington, I had a very limited connection with the older adult population in the community and the organizations that support them. Lacking an established representation or relationship with these communities and organizations limited how accessible the population was to me and may have limited how willing potential participants felt to engage with my research. Similarly, this lack of an established connection and my identity as a younger adult not from Burlington most likely influenced how respondents expressed their experiences and ideas. Subjects may have been

hesitant to share specific examples or ideas for fear of being misunderstood, or they may have needed additional explanation from an outsider to interpret their responses in the way they intended.

On the other hand, some participants may have been more comfortable sharing sensitive examples because my perception of them as an outsider has little to no impact on their life. Further, my status as a young person and a student at the university may have benefited me, as some respondents may have been more willing and interested in helping me with a school project. Lastly, my affiliation with the university may have provided credibility.

Although I am not from Burlington, I did have some level of connection to external organizations where I had established relationships. One interviewee was a former boss whom I met while working over the summer in Burlington. Additionally, one interview with a service provider was obtained through the connections I had made while completing a summer internship at the Chittenden County Regional Planning Commission. While these previous connections supported me in obtaining these interviews, they may have also influenced how comfortable interviewees felt speaking to me during the interviews in both a positive and negative manner. The participants I already knew may have been comfortable speaking to me and allowed for an easier time providing answers. However, subjects may have also censored or chosen not to include specific answers or examples out of concern for how it would affect my perception of them or the existing relationship.

Additionally, my personal experiences and background shaped my perspective on various aspects of research. The state of my personal level of mobility in Burlington influenced how I thought about mobility equity in Burlington and various aspects of the built environment before and during the study. As someone who has never owned a car in Burlington, but with a physical

condition that can cause personal mobility difficulties, I have had experiences that may have created deeper personal understanding, but also potential biases, that I was aware of when working on the project.

While creating the survey and interview questions, as well as during interviews and data collection, I wanted to carefully and critically consider how my position may impact research. In qualitative research, it can be difficult or impossible to remain completely objective or eliminate your identity's influence on the research. During an early stage of conceptualizing the project, I read Jen et al. (2020), an article that made me aware of different factors that I should consider during cross-generational interviews, as well as some strategies I could employ to conduct research. I took great care to avoid creating any "leading" questions in both the surveys and interviews, ensuring that I would not project my personal experiences onto the responses of others. However, I still used the mobility inequities I have faced to enhance my understanding of, and to consider, the experiences of others.

Survey Design

> *Questionnaires are useful for gathering original data about people, their behaviors, experiences, social interactions, attitudes, opinions, and awareness of events* (McGuirk and O'Neil, 2021).

I used the Qualtrics survey creation platform to create my survey and manage and monitor responses. I utilized a mix of open and closed-ended questions to explore participants' opinions and experiences with mobility in Burlington. When designing questions, my main goals were to identify what barriers to mobility exist for older adults, the severity of these barriers, and if/how winter changed these barriers or their severity. A full list of survey questions can be found in Appendix A.

The survey began with an introductory block of text introducing participants to the research project and the survey guidelines. It also clarified that survey responses were completely anonymous and that the survey would not ask for any identifying information. After this, they were met with a question confirming they were 65 years of age or older and a question confirming they resided in the city of Burlington, Vermont. These were the only two mandatory questions in the survey that could not be skipped. If a user responded no to either of these questions, they would be taken to the end of the survey screen and unable to respond to any other survey questions. After these two qualifying questions, all other questions were optional and could be skipped if a user desired. This was done to ensure participants could still complete the survey, even if a question made them uncomfortable or if they felt they did not want to answer it for any reason. The survey was twenty questions long and designed to take 10-15 minutes to complete.

The survey can be broken down into seven sections. As previously stated, the first portion of the survey verified that participants qualified for the research and then collected additional demographic information. The second section explored how often respondents were leaving their homes and how this frequency changed in the winter. The third section examined commonly utilized types of transportation and winter's impact on the rates at which different modes were used. The fourth section aimed to identify specific mobility barriers respondents experience. The fifth section explored what resources and locations participants struggled to access. In these five sections, I used both closed-ended and open-ended questions, with the objective of mutually informing each other and enriching the quality of data collected. The close-ended questions generated quantitative data while the open-ended questions allowed participants to elaborate on their responses. This generated qualitative data that offered insights and gave deeper context to the numbers.

Section six consisted entirely of open-ended questions, where respondents were invited to share their greatest mobility concerns in the winter, suggestions for improving mobility for older adults, and any additional comments they had not already provided. The final section (section seven) assessed interest in future participation and provided instructions for those interested in contacting me. At the end of the survey, a page was displayed that thanked respondents for their time and confirmed that their responses had been recorded.

When the survey was closed, there were 92 respondents. It should be noted that because not all questions were required to move on to the next question, not all respondents answered each question; there was a pattern that the further into the survey a question was, the fewer respondents answered it. This will be discussed further in the limitations section below. Respondents' ages ranged from 65 to 94, with a mean reported age of 68.7 and a median and mode age of 74.

Recruitment of Participants

I aimed to create a diverse sample population of older adults during the recruitment of participants to gain a comprehensive understanding of the mobility challenges they face. Different identities, such as socioeconomic status, race, and gender, can significantly influence mobility experiences, especially as individuals age. Since I planned on obtaining interview participants through the survey, I focused my efforts on finding different means of recruiting older residents who would be willing to complete the survey. For recruiting, I utilized two main methods of participant recruitment in attempts to do this, with varying levels of success.

Reaching out to different local organizations that may be able to connect me with older adults in their community was one way I attempted to recruit participants. I aimed to cast a wide net, contacting a variety of different organizations and groups. This list included Vermont AARP,

Age Well Vermont, Vermont People of Color Network, the Burlington YMCA, the Burlington Parks and Rec. CORE Adult Center, Cathedral Square Assisted Living, Elderwood at Burlington Nursing Home, Ethan Allen Residence (Assisted Living), Fletcher Free Library, and Converse Nursing Home.

When conducting outreach through email, I used a general email template (Appendix B), often with some variation or customization, so it pertained to the specific organization I was contacting. Phone calls in which I left a voicemail contained a similar level of information, with my email and phone number provided for them to get back in contact with me.

My most successful attempt at this form of outreach was to the Burlington YMCA, which agreed to send out my survey and information to a contact list of older members. Most other organizations either did not respond or were unable to engage with my research due to different organizational polices and bandwidth. For example, one nursing home director I spoke to expressed concern that sharing my survey might possibly violate their no-solicitation policies, so they were unable to assist me in my endeavors. Some organizations, including Cathedral Square Assisted Living and Vermont AARP, eventually got back to me and expressed interest in assisting with my research; however, due to the short timeline I was working on, we were ultimately unable to organize and collaborate.

My primary and most successful form of participation in recruitment was through a sponsored post on Front Porch Forum. I was a fall recipient of the UVM College of Arts and Sciences' APLE award. This was a $500 award, with $250 coming from the College of Arts and Sciences and $250 coming from the Department of Geography and Geosciences, intended to support the expenses of undergraduate research. I applied for this award with the intention of being able to purchase a Front Porch Forum ad campaign.

Once granted the award, I was able to run a one-week campaign from February 9th, 2025, to February 15th, 2025, with 22,000 purchased impressions. I ultimately received 47,118 impressions over the course of the week. The figures in Appendix C are from the report I received from Front Porch Forum, including a breakdown of the geographic statistics of my impressions, the types of forms that generated my impressions, and an image of what the post looked like to users.

A majority of my survey results were submitted during this ad campaign, and it proved to be a successful means of reaching participants. These approaches to recruitment yield both advantages and disadvantages that should be taken into consideration when evaluating how effectively the sample population reflects the broader older adult community in Burlington. Using a self-selected or volunteer-based population lent itself to finding older adults who were willing to share their experiences. Although I offered paper copies of the survey to local organizations, none were used, so all surveys were filled out digitally. Recruiting through a digital survey link and QR codes made the survey easier to share to a wide variety of spaces and in a variety of formats. However, this meant that all participants had access to the technology as well as the digital literacy and skills to successfully complete a survey. Additionally, these methods of recruitment relied on accessing older adults through different social networks. Consequently, older individuals without digital access or the technological skill to complete the survey, as well as those who may be more socially isolated for a variety of reasons, were unlikely to participate in the research.

Due to these factors, as well as the relatively small sample size, this data should not be extrapolated as a complete or comprehensive representation of Burlington's complete older adult population. However, it does provide insight into some of the patterns and examples of mobility inequity and experiences for at least a portion of Burlington's older adult population that can be

abstracted to a larger scale. The findings from this study should be regarded as significant not only in relation to those who did engage in research but also on broader practical and theoretical scales, while still recognizing that certain subsections of the older adult population's experiences may not have been represented.

Interviews with Older Individuals

I successfully completed two one-on-one interviews with older residents of Burlington. Interview participants were recruited through the survey phase of the study. The last question included in the survey was "Would you be interested in engaging in further research by participating in an interview about your mobility experiences in Burlington as an older adult?" with the options of "Yes", "Maybe", or "No". Respondents who selected "Yes" or "No" were then shown this section of text

> You indicated "Yes" or "Maybe".
>
> No contact information will be collected through this survey to protect the anonymity of survey participants, so I am unable to reach you through the survey. If you are interested in participating in an interview or further research please text, call, or email Sian Hernit (sian.hernit@uvm.edu) or (937)414-4070.
>
> Further details will be provided upon inquiry. Your engagement in further research is greatly appreciated! Thank you for your time, have a great day!

I had four residents reach out with interest in participating in interviews. One did not respond after I responded to their initial email, and one had a medical emergency occur while we were

coordinating times to meet and was ultimately unable to participate due to a scheduling issue. I was able to successfully meet virtually with the other two for one-on-one interviews.

As I was not compensating interview participants, I wanted to be considerate of how much time I was taking up. The interviews each lasted approximately 30 minutes and were conducted in a semi-structured format. This approach included a predetermined set of questions while allowing for flexibility to ask follow-up or clarifying questions based on the participants' initial responses.

At the beginning of each interview, I introduced myself to the participants and gave a brief introduction to the research. I then outlined the data-handling and privacy protocols in place and clarified that they were allowed to refuse to answer any question they were not comfortable answering and to choose to end the interview at any time. I then obtained their consent to record and transcribe the interview using Teams.

After consent had been obtained, I began asking the list of pre-determined questions and asking clarifying and follow-up questions as needed. A full list of the question set and flow chart can be found in Appendix D. The interview was broken into five main sections:

- Introduction
- Questions about Walking
- Question Public Transit
- Questions about Automobile Usage
- Questions inviting additional thoughts and other pieces of input.

These interview subsections were determined after identifying emerging themes found within the survey responses I had at the time. All interview participants were assigned pseudonyms to protect their identity and data.

The interviews provided valuable insights into the mobility experiences of these two older adults, revealing how they navigated and interacted with the built environment around them. Their reflections highlighted the experiences and perceptions of various means of transportation. Through our conversations, I gained a deeper understanding of how their mobility experiences were shaped by both physical spaces and their identities.

Interviews with Service Providers and Experts

To gain a comprehensive understanding of older adults' perceptions and experiences with mobility, I also aimed to explore the resources and systems currently in place that shape these perceptions. To achieve this, I conducted interviews with relevant service providers, advocates, and experts involved in Burlington's built environment and services for older adults. These discussions provided valuable insights into how mobility equity for older adults, particularly in winter, is currently being addressed in Burlington. Additionally, they highlighted the changes and interventions that are already being pursued or advocated.

To gain a better understanding of Burlington's current plan and strategies for its built environment, transportation infrastructure, and winter conditions management, I connected with Eliana Fox, a Transportation Planner at the Chittenden County Regional Planning Commission (CCRPC) and a member of the Burlington Public Works Commission. I first met Eliana while interning at CCRPC in the summer of 2024.

I also contacted the Burlington Aging Council to request an interview with one of its members. This Council was created in 2019 with the intention to "review and make recommendations regarding to the long-term provision of senior services in Burlington" (Sikyala et al., n.d.). The Council's guiding goals are to:

- Elevate the contributions of older adults in Burlington.
- Raise issues facing older adults in Burlington and the organizations that serve them;
- Make policy recommendations to the Mayor and City Council to address gaps, needs, and opportunities that impact older adults in Burlington; and
- Ensure that the voices of older adults in Burlington are at the forefront of City policy
- Create and maintaining a "Burlington Plan on Aging" to act as a guiding template for City policy and initiatives.

This council and the "Burlington Plan of Aging" document were of specific interest to me. I was connected with Andrea Viets, who is both a member of the council and the Executive Director of the Heineberg Community Senior Center. Andrea helped me gain a better understanding of the council and its plans for the future. She also provided me with useful insight and expertise on what resources exist in Burlington for older adults and what are the most common challenges they face in terms of transportation and winter conditions' impacts on mobility and quality of life in general.

Both interviews were semi-structured, but in a less rigid way than my interviews with older residents. I prepared a list of set questions and topics that I used to keep the interview on track. However, I let the conversation and the topics that emerged guide the conversation. This was effectively useful in both interviews as both experts brought up programs, policies, or aspects of mobility I was unaware of at the time. For example, Eliana Fox was able to illuminate some of the plans and strategies surrounding Burlington's infrastructure approach to public infrastructure maintenance and management, especially in the winter. Although I did not initially have questions exploring these strategies, I could explore these topics and better understand the Burlington landscape and transportation policies due to the more open format of these interviews. Both

interviews were conducted virtually, lasting about 60 minutes each. Interviews were transcribed using Teams.

I also attempted to interview a representative of AARP Vermont, as their work is incredibly relevant and impactful on how cities like Burlington approach older adult mobility equity. I attempted to contact multiple representatives through both email and phone calls; however, I was unable to establish a fruitful connection. After interviewing both Eliana Fox and Andrea Viets, they both offered to connect me with the Outreach Director; however, by the time a connection was made, there was insufficient time left in the project to schedule and analyze an interview. However, through this connection, I was able to discover resources and documents that enriched my document analysis and my understanding of AARP's important role in the community.

Document Analysis

To further enrich my understanding of the polices and resources that impact older adult mobility in the winter, I conducted a review of three documents that were recommended to me by the different experts and organizations I communicated with throughout the research process. First, I analyzed the September 2024 version of the Burlington Age Strong Plan, the final document produced by the Burlington Aging Council, which I accessed through the Burlington Aging Council page on the City of Burlington website. This document is noteworthy because it was created by experts in gerontology alongside older adults living in Burlington, ensuring that it addresses relevant local issues. It also helped me better understand the current interventions and improvements being pursued by advocacy groups. This insight allowed me to create a more

relevant and useful recommendations section, as it minimizes the likelihood of suggesting improvements that have already been identified and are in the process of being addressed.

I also analyzed the Burlington Public Works Snow and Ice Control Plan, provided by Eliana Fox, to gain a better understanding of how Burlington manages snow and ice. Understanding their current approach and policies allowed me to identify possible areas of improvement based on themes and barriers I had identified through other aspects of the research.

Finally, I analyzed the *8 80 Cities Winter Placemaking Guide*, (8 80 Cities, n.d.) which was created with support from AARP's Livable Communities Initiative. The organization "8 80 Cities" aims to "ignite action and challenge the status quo to create healthier, more equitable, and sustainable cities for all people" with the approach that cities that function well for everyone between 8 years and 80 years old should be the goal (https://www.880cities.org/). Additionally, the Age Strong Burlington plan recommends that Burlington engage with 8 80 Cities' work. AARP Vermont also offers a Winter Placemaking grant, also sponsored by the Livable Communities Initiative, which will be discussed in the findings section of this paper. I reviewed the document in full but focused my analysis on the Winter Mobility portion of the document.

Analysis

To analyze the quantitative data, I reviewed basic statistical output, including the calculation of percentages, frequency distributions, and totals, which provided a clear overview of trends and patterns within the data, offering valuable insights into participant responses. This method of analysis was also straightforward and convenient to complete, as Qualtrics automatically provided these calculations and breakdowns.

Once all data had been collected, I began my analysis to generate my findings. I chose to use textual coding (Dunn, 2021) to analyze my data. For both interviews with older residents and interviews with service providers and experts, I used Dunn's five-step approach to coding interview data, which is to:

- Develop a premium coding system
- Prepare the transcripts for analysis
- Ascribe codes to text
- Retrieve similarly coded texts
- Review the data by themes

I used a similar approach when analyzing the open-ended response survey data and the documents analyzed. In the coding process, I used both descriptive codes and analytic codes to build my themes and findings. Descriptive codes include themes that are "obvious on the surface or are stated directly by research subjects" (Cope, 2021, p. 360). One example of this would be "obstructed walking paths," which illuminates the recurring pattern of obstacles in sidewalks as an inhibitor to full mobility in a space. These types of descriptive codes helped me analyze very tangible or straightforward forms of mobility inequity. I reviewed the interview transcripts, survey data, and notes from document analysis, and identified the following categories: Walking Experience, Public Transit Experience, Car Usage Experience, Feelings, Safety Concerns, Current Effective Methods, and Possible Improvements. This analysis focuses on the categories of Walking Experience, Public Transit Experience, and Car Usage Experience. I included data that reflected participants' experiences related to various means of transportation. These three categories emerged from my structured interview approach, where I focused on different aspects of

transportation during the discussion. I found these categories to be effective in encouraging respondents to share specific examples related to particular aspects of their mobility experiences while remaining broad enough for most individuals to relate to or share their perspectives. For the Safety Concerns category, I included any data where there was discussion about concerns for safety, such as one respondent's identification of "flowerpots, other supposedly beautifications intended to slow the traffic. They are dangerous for cyclists, walkers, and cars." For the Feelings category, I included any time there was mention of how different experiences or situations made older adults feel, such as "I don't feel like I have a lot of dignity in a wheelchair" For the Current Effective Methods category, I included any time a participant noted something they felt was effective in supporting older adult mobility equity. This included general comments, such as "I feel the city does a pretty good job," as well as more specific comments like "The T-bar benches implemented at different bus stops recently have been really great." Finally, for the Possible Improvements section, I included any data that mentioned desires or interventions suggested to improve any aspect of mobility in the city such as "lower fare costs." I then identified several analytical codes after reviewing these categories and their data. These theme-based analytical codes and ideas are explored further in the findings portion. I found this method of coding effective for organizing and analyzing these multiple data sources.

Confidentiality and Data Handling

Digital data files and transcripts were kept in folders on password-protected platforms like Microsoft Teams. No names or identifying information were collected in the survey. The names of interview participants were removed from transcripts and replaced with their assigned pseudonyms.

Following the completion of the research, all data will be destroyed to ensure that no personal information about the contacts is compromised. During the research process, participants who inquired about engaging in interviews revealed their first and last names to me in both their email signatures and some email addresses. These emails will be deleted, as well as all other sensitive data, at the completion of this research process.

Limitations

Two of this study's most significant limitations were the time frame in which I had to conduct research, as well as my difficulty in reaching the older populations in Burlington, leading to a relatively small sample size.

Due to various factors, including receiving IRB approval later than initially planned, most aspects of recruitment, survey promotion, and interview scheduling and conduction took place within a two-month period. In addition, some of the time constraints were the result of my own planning. I began the thesis process later than what is typically recommended, in part due to being abroad during the spring of my junior year. Delays in my response times to IRB feedback, as well as other aspects of the research process, were caused by gaps in my time management skills and my ability to consistently dedicate and allocate time to the project while balancing other academic, extracurricular, and personal commitments and responsibilities.

These delays ultimately left an 8-week period during which I needed to conduct data collection, which restricted my ability to collaborate with local organizations and residents. The bureaucratic nature of organizing certain means of outreach limited my options in terms of means of recruiting participants for both survey responses and interview subjects. A limited timeline also

eliminated my ability to pursue recruitment methods that might have reached more marginalized or isolated sections of the older population. A majority of my survey participants came through Front Porch Forum or the YMCA, which suggests some level of digital literacy, mobility, and involvement in the community. This suggests that my data does not fully capture the experiences of certain populations that encounter the greatest mobility challenges.

Similarly, as someone who did not have an established relationship with older members of the community or with local service providers, it took longer to establish who I was and request that people engage with my research. I participate in an Irish dance team that performs at retirement homes during the St. Patrick's Day season, and while I did pursue using some of those previous connections, they were ultimately unfruitful. Someone who has had significant interaction with older adults in the community or is an older adult and a member of the community may have been more effective and efficient at finding willing participants, especially less digitally connected individuals.

Finally, my inexperience as a researcher limited the project. Although I have taken a course in qualitative research as well as have had other relevant experiences that helped prepare me to complete an undergraduate thesis, this was my first time pursuing a project of this kind and scale, especially independent of a structured course. I made multiple errors and mistakes that caused setbacks or impacted the project, largely because it was my first time attempting to navigate the various processes involved in conducting research. With more experience, I may have been able to move more effectively through the different systems and stages of research with less error.

I utilized a combination of surveys, interviews, and document analysis to answer my three research questions: In what ways do intersecting identities, such as age and ability, influence how individuals experience and navigate the built environment? How can the design of the built environment be improved to foster mobility, accessibility, and inclusion for marginalized communities? And how do winter conditions exacerbate mobility challenges for older adults in the built environment?

The surveys provided both quantitative and qualitative data on older adults' mobility experiences in general, as well as how these experiences change in the winter. Interviews with older adults offered deeper, more personal insights into daily mobility challenges. Interviews with local experts and service providers, along with the document analysis conducted, added important context on current policies, services, and gaps in existing planning efforts. Combined, these methods generated a wide range of data that helped investigate the research questions from different perspectives, aiming to build a comprehensive understanding of older adults' mobility in Burlington, both in general and during winter. These varied perspectives and sources supported the identification of potentially effective strategies and recommendations to improve mobility equity for older adults in the city.

Chapter 4 Findings

Before exploring the study's findings, I would like to recognize the scope of these findings and their applicability to older individuals. Age is one aspect of an individual's complex identity. Many other factors, such as race, gender, health, lifestyle, and class, can constrain or enhance one's mobility while intersecting with their age and other aspects of their life. Based solely on age, the level of mobility one has should not be automatically assumed. Some individuals above the age of 65 face few mobility difficulties in their daily lives, while some are almost completely immobilized for a variety of reasons, with age possibly being one of them. This paper aims to identify barriers to mobility equity that at least some populations of older adults face, and then to explore means of minimizing or eliminating these barriers.

Additionally, in this paper, I want to dispel stereotypes and stigmas that cast all older adults as “frail,” “weak,” or “unable.” Such assumptions are harmful and contribute to the perpetuation of marginalization and discrimination that many older adults face. Rather, I propose that we can create spaces that enable and empower people as their abilities change as they age. Older adults are not necessarily limited by their age, but by what the built environment permits them to do when interacting with their abilities. There should be a rejection of the notion that older age automatically equates to a decrease in independence, quality of life, and mobility, and we should prioritize designing a world that accommodates the variety that exists within populations.

Overview

Broadly, I found one of the most consistent and persistent themes that emerged in every aspect of research, including survey responses, interviews, and document review, is that levels of

mobility decrease for older adults in the winter (Fig. 1). Further, survey trends suggest older adults leave their homes less frequently in the winter (Fig. 2).

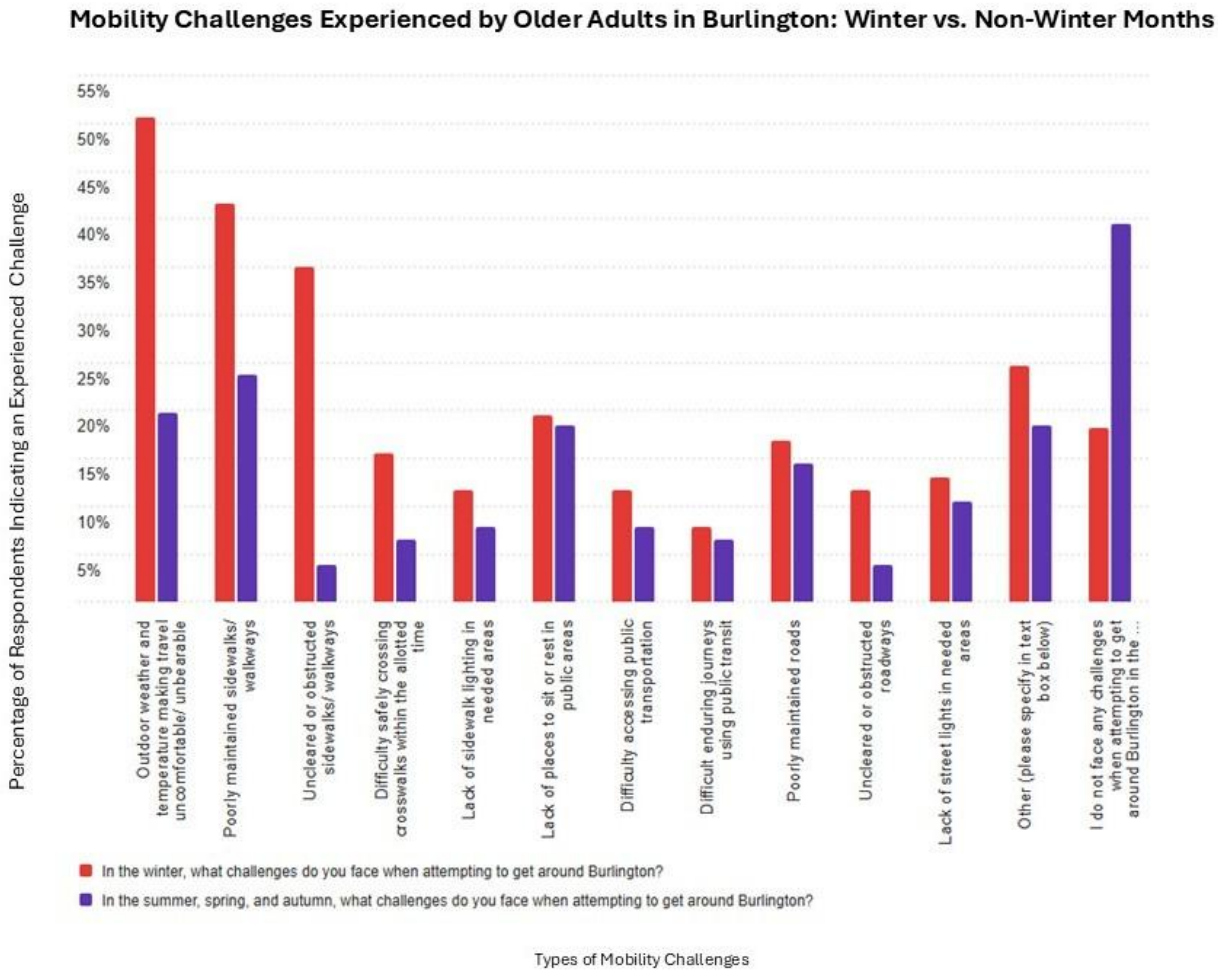

Figure 1

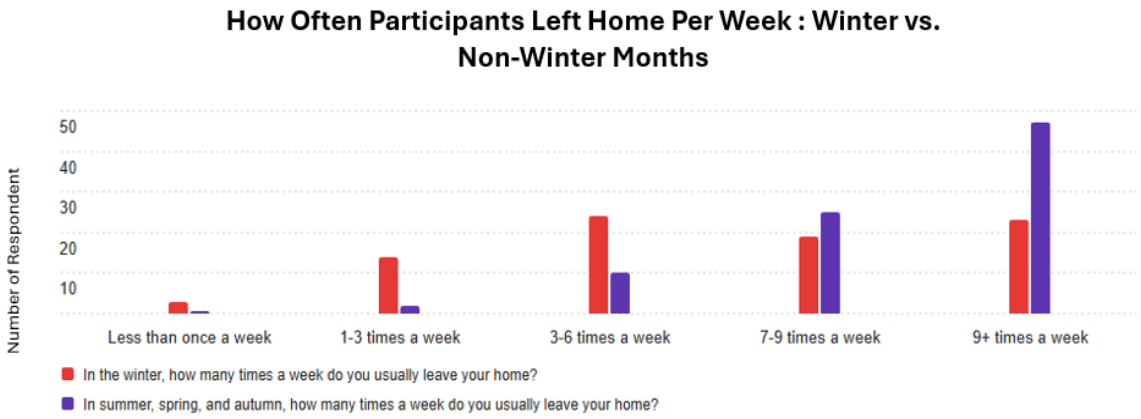

Figure 2

In the following sections, I will break down my findings into three main themes, organized around three primary modes of transportation explored in the research: Walking, Public Transit, and Car Usage. These themes emerged from the survey responses, as they were the most prominent modes of transportation used and discussed. Additionally, they were the most relevant means of transportation mentioned in both types of interviews, and the document analysis included either one or a combination of these modes of transportation in attempts to reach a desired location. However, it should be noted that I structured my interview questions around these themes.

Each section will first highlight the barriers identified in each of these areas, then discuss current solutions that effectively support older adults' mobility. In the next chapter, I will use these identified barriers and current effect interventions to propose future recommendations that could potentially create progress toward full mobility equity for older adults in Burlington, Vermont.

Walking

As individuals age, walking as a means of transportation can become increasingly challenging due to the heightened risk of health issues that can impact personal mobility. However, walking, or more generally, the act of moving on foot or with mobility aids, is part of almost every mobility experience. Even when it is not the primary method of transportation, most journeys often begin and end with a need to move "on foot;" for example, when using a car to get around, one must still walk some distance to and from where a car is parked. Barriers to walking for older adults can reduce their overall physical activity, exacerbating existing health risks and potentially leading to new health complications, which in turn creates the cyclical perpetuation of a decrease in the amount an individual is able to walk. Addressing these barriers is essential to improve both mobility and overall health outcomes for the older population.

My results reveal a significant range in the abilities, experiences, and perceptions of older adults regarding walking in Burlington, both in general and during the winter months. In the summer, spring, and fall, 85% of survey respondents reported using walking as a means of transportation. However, this decreased to 68% in the winter. Further, of those who walk as a means of transportation, respondents indicated different levels of comfort and accessibility in their walking experiences, such as one respondent stating, "the snow removal is good for people who can walk. Awful for people who are unsteady or use aids." Although a decline in walking as a mode of transportation during the winter months is predictable across all age groups, this trend highlights the impact that winter conditions have on the mobility of older adults, which is particularly concerning due to elders often having few alternatives.

My interviews with older adults further illuminated the diverse mobility experiences associated with walking as a means of transportation. Interview Participant #2 comfortably

incorporates walking as a primary mode of transport, walking multiple miles on most days, and experiencing relatively few mobility difficulties compared to peers in her age group. However, Interview Participant #1 sustained an injury in his younger years that limited the use of one leg. He now requires the use of a cane to safely walk and regularly uses a two-wheeled motorized mobility aid to complete walking journeys when needed, as well as to participate in recreation. While winter negatively impacts the overall quality of both of these respondents' walking mobility and accessibility, the severity of these effects varies greatly. My findings are presented below, organized by key challenges.

Slippery and Uneven Surfaces

Slippery and uneven surfaces were consistently identified as significant barriers to walking mobility among older adults, with 42% of survey respondents indicating that poorly maintained and uneven sidewalks created mobility challenges for them in the winter season. In both the survey and interviews, participants raised concerns and fears of falling due to slippery surfaces like icy sidewalks. These conditions both limit the safety and level of accessibility of walking for older adults, but these hazardous conditions impact the embodied experience and feelings surrounding walking. Many survey respondents reported being fearful of falling, especially because falls can be more detrimental in older ages. In response to the question, "What are your greatest concerns or frustrations regarding getting around Burlington safely and/or independently in the winter?", one survey participant stated, "it's mostly keeping the sidewalks clear of ice, which the city does a pretty good job of, but that's the biggest challenge because I walk a lot." These fears may be leading many older adults to reduce or completely avoid walking outside during the colder months.

Slippery and uneven surfaces can also inhibit the effectiveness of specific mobility aids. Interview Participant #2 explained that, as he is already prone to slipping and falling due to his leg injury, ice and slippery surfaces are especially limiting to his ability to walk from point A to point B safely while using a cane. These concerns highlight the need for more accessible, safer walking environments and infrastructure improvements to mitigate the risks associated with winter walking for older populations.

Obstructed Pathways

Another significant barrier cited by older adults and experts as negatively impacting their level of mobility accessibility, especially in the winter season, is obstructed pathways. While only 4% of respondents indicated that uncleared or obstructed sidewalks and walkways posed mobility challenges during the non-winter months, this proportion rose to 42% during the winter season.

Noted obstructions were decorative items like flowerpots and sidewalk signs, as well as uncleared or poorly cleared paths after snowfall. One commonly reported barrier was “snow berms,” which refers to the pile of snow left lining the edge of a plowed path. These berms can create an obstacle to accessing a plowed sidewalk from an intersecting driveway or walkway. Interview participant #2 felt that the city should more carefully consider the impact of berms and snow piles, stating that for her they do not cause significant issues, but in some areas toward the end of her street the city will have tall berms that she worries limit an older neighbor’s ability to access walkways.

These barriers can have differing levels of severity in the amount they limit an individual's ability to continue a journey, depending on the individual's ability to navigate around the obstacle. Some elders may have little difficulty walking around a barrier, while those who use mobility aids

or have stability struggles may be inconvenienced or completely dissuaded by an obstacle in their pathway. For example, Interview Participant #1, who uses a cane, described how moving around an obstacle can be both difficult and dangerous. An obstructed path may completely halt those who use mobility aids with wheels if they cannot navigate on and off the path to move around the barrier. This is especially challenging in winter, when avoiding a barrier may mean walking through snow. Even when possible, walking through snow can lead to discomfort for the remainder of the journey, as wet and cold clothing or footwear cause lasting irritation Those who experience visual challenges also are at a greater risk of being endangered by obstacles, as they may have difficulty identifying a barrier, which can lead to a greater concern of tripping or falling.

Other Impediments to Walking

In addition to the more frequently cited challenges, there were several other aspects of walking infrastructure that created barriers to mobility. These included inadequate lighting, extreme temperatures, long distances, and the lack of accessible public restrooms. While these factors were mentioned less frequently, their inclusion and consideration are important, as they can still create significant barriers for the individuals they do affect. Even if fewer older adults experience them, every individual's mobility needs matter and deserve consideration in planning efforts. In the same way, I argue that older adults are entitled to have their mobility needs met, despite those with more limited mobility being a minority within the general population; I also argue that this principle applies within the older population itself. Older adults with the greatest mobility challenges, even if they represent a minority, still deserve to be considered and have their needs met in planning efforts.

Current Effective Programs and Strategies

Survey respondents, both the older residents and the experts who were interviewed, all recognized the city for its efforts to salt icy walkways and minimize slippery surfaces. The city of Burlington has a Snow and Ice Management Plan that places the responsibility of clearing and salting sidewalks and roads upon the city. This policy alone does a great deal in protecting walking mobility equity for older adults and all Burlington residents in general. Some cities have Snow and Ice policies where clearing and salting sidewalks is the responsibility of the nearest property owners, or some variation where the city does not take responsibility for addressing winter-impacted walkways. Andrea Viets also cited various successful methods and resources the Heineberg Senior Center offers that are helping address concerns surrounding slipping and falling, especially in the winter. They recently received an AARP Winter Place-making grant that helps fund an initiative to provide winter trekking poles and Yaktrax traction cleats (that can be attached to any shoe) to older individuals who have concerns about falling in slippery winter conditions and want to walk in the winter safely.

Interview participants also highlighted specific examples of effective snow removal. Interview Participant #1 specifically mentioned the approach used to plow the pedestrian-only Church Street Marketplace as effective in minimizing snow as an obstacle. He had observed that on Church Street, all the snow in the marketplace is plowed into piles, and then these piles are removed from the area. The trekking poles and snow cleats that the Heineberg Community Senior Center offers also support older adults' abilities to safely navigate around objects in the winter if they do need to exit the sidewalk or move around a barrier.

Public Transit

When exploring the role public transit infrastructure and policies play in the mobility of older adults, I found that it was the least utilized by older adults for a variety of reported reasons. For that reason, it is perhaps not surprising that transit was the only means of transportation for which reported rates of use did not decrease in the winter. When asked, "In the winter, what modes of transportation do you regularly use?" only 13% selected "Public Bus," which is significantly lower than other modes such as walking and driving. Further, the proportion using buses did not increase or decrease when asked about transportation use in the summer, spring, and fall. This pattern continued to emerge in my interviews with both older residents and experts. The older adults I interviewed very rarely, if ever, used public transit in Burlington at any time of year. While interviewing Andrea Viets, she gave a perceived estimate that about 80% of the seniors who engage with the Senior Center drive and rarely, if ever, use the bus. Low rates of public transit use among older adults could be interpreted in more than one way. For some individuals, particularly those with access to personal vehicles, supportive social networks, or the financial resources, automobiles may simply be more convenient and preferable. However, for others, especially those with limited mobility, lower fixed incomes, or fewer support systems, low usage may reflect barriers within the public transit system itself. These barriers include physical inaccessibility, infrequent routes, cost of transit, or discomfort using the system. It is important to consider both sides of the spectrum, as the meaning and impact of low transit use vary based on an individual's specific circumstances and level of privilege.

This section will explore what elements are creating such low rates of public transit usage among older adults and how different elements, policies, and winter conditions limit the older adults who do use public transit. It will then highlight what about Burlington's approach to public transit is currently working well to serve older populations.

Infrequent Routes and Lack of Stops in Desired Locations

With public transit being the least used mode of transportation compared to the other modes explored, combined with the nature of the survey questions themselves, there was a lack of qualitative data that could help contextualize the quantitative findings. However, a prominent recurring theme regarding barriers to public transit use for older adults in Burlington was the overall inconvenience of the system. The current bus network did not meet their practical, day-to-day transportation needs either because buses did not come frequently enough or because the stops were not located near places they needed to go.

In my survey, 12% of older adults reported experiencing "Difficulty accessing public transportation (e.g., lack of nearby stops, buses not accessible for mobility aids, etc.)" during the winter months, with this number decreasing to 8% in non-winter seasons. Similarly, 8% reported "Difficulty enduring journeys using public transit (e.g., lack of places to sit or rest at bus stops or on buses, available routes take too long to complete)," a figure that remained nearly unchanged, dropping slightly to 7% in non-winter seasons (see Fig. 1 for visual representation). However, these data points are difficult to interpret with certainty. It is unclear if individuals who find public transit inconvenient, possibly due to these issues, would still identify as having difficulty accessing or enduring transit if they are able to avoid using it altogether.

Additionally, there were relatively few open-ended responses addressing public transit, possibly because the survey questions invited respondents to reflect on transportation modes they actively use. If respondents avoid public transit entirely due to inconvenience, they may not have felt prompted to share this information due to the wording of relevant questions, creating a potential gap in the data. The only open-ended response that directly referenced inconvenience

came in response to the question, “What are your greatest concerns or frustrations regarding getting around Burlington safely and/or independently in the winter?” One respondent wrote: “The bus from the hospital to downtown is not on a convenient schedule now. I stopped riding it.”

I identified inconvenience as a prominent barrier, largely because the relative inconvenience compared to other modes of transportation was the main reason both older individuals whom I interviewed did not regularly, if ever, use public transit. Both individuals had access to personal vehicles, and Participant #2 could walk to most desired locations, providing them with more control over transportation and, ultimately, more convenience. When asked about the reasons he did not use public transit, Interview Participant #1 stated, “I can use a vehicle to get to where I need to go. Especially in my situation, and the hours. No public transportation. It wouldn't go where I need it to go.”

For these two individuals, inconveniences related to Burlington's public transit system did not necessarily limit their mobility, as they had access to alternative modes of transportation. However, for those who do not have access to other means of transportation and rely on public transit in their daily lives, these inconveniences represent a form of inaccessibility and inequity in their overall mobility experiences. These inequities should be considered and addressed.

Physical Impact and Experiences of Public Transit

Using public transit can be a physically demanding experience for some older adults throughout the entire process of getting to, waiting for, and boarding the bus, and during the ride itself. Additionally, certain aspects of the built environment can contribute to inaccessibility, especially for individuals who use mobility aids or have lower levels of physical stamina and ability. When asked, “What changes or improvements would you recommend to make it easier for older adults to

get around the city in the winter?," one survey participant responded, "Cleared walks to access public transportation." Another participant responded: "Reinstall sitting areas at or between bus stops. We are bus-dependent yet can't get to the buses."

Winter Impacts

Although minimal data was collected regarding winter's impact on the frequency of buses or the location of bus stops, this does not mean that winter does not influence these factors. In response to the question "What are your greatest concerns or frustrations regarding getting around Burlington safely and/or independently in the winter?" the only comment from both the open-ended survey responses and interviews with older adults that specifically addressed the impact of winter on the public transit experience was "The bus stops are not cleared, high snowbank, sidewalks icy." However, because relatively few participants reported using public transit regularly at *any* time of year, it is difficult to fully assess how winter conditions impact the experiences of those who do rely on it. Both older adults interviewed stated that they had few opinions on winter's impact on this means of transportation because they simply do not use it at any time of year. My limited data here does not necessarily mean that winter has minimal effects on older residents' use of public transportation; instead, it suggests that bus riders are underrepresented in this sample. It is important not to conflate the absence of widespread mention with the absence of impact.

Lack of Information Regarding Transit Options

Burlington residents are eligible for the Chittenden County Older Adults and Persons with Disabilities (O&D) Transportation Program. This program was brought to my attention during my

interview with Eliana Fox, as the Chittenden County Regional Planning Commission (CCRPC) helps facilitate this program, which aims to fill “gaps in existing transportation services for older adults age 60 and above as well as individuals with disabilities as defined by the Americans with Disabilities Act (ADA)” (State of Vermont Agency of Transportation, n.d.). In Chittenden County, the program is run through contracts between Green Mountain Transit (GMT) and the Special Services Transportation Agency (SSTA). Neither of the older residents interviewed had ever used this service. However, the SSTA was mentioned multiple times in survey responses. For example, in response to the question “What changes or improvements would you recommend to make it easier for older adults to get around the city in the winter?” one participant responded, “SSTA availability for older adults who are not handicapped” Although SSTA services *are* available to older adults, it may not be clear to all older residents. This confusion or lack of awareness about the available transportation services can limit older adults' mobility, possibly highlighting a need for improved community outreach and awareness strategies to ensure they can fully access the resources intended to support them.

Lack of Affordability

Another limiting factor to older adults' levels of accessibility to public transit is the financial cost of rides. The cost of Green Mountain Transit bus rides and SSTA services was mentioned five times in the open-ended survey responses. In response to the question "What specifically made it difficult for you to access the locations you selected above?” one participant responded that the “cost of bus or SSTA now exceeds having food delivered and is beyond what I can pay to visit friends ($8.00 round trip.)” Another said, “cost is more prohibitive than physical

conditions around Burlington." Andrea Viets also stated that the reintroduction of transit fares to GMT bus rides has limited the access of some older individuals.

While policies related to public transit fares are not directly tied to the physical built environment, they play a significant role in shaping mobility equity. Socioeconomic status can significantly impact whether older adults are able to afford and regularly access public transportation, regardless of how physically accessible the infrastructure may be. These comments made by my research participants reveal how financial barriers to access may be restricting mobility in tandem with the built environment. Affordability can determine whether transit systems are truly supportive of all older adults, particularly those on fixed or limited incomes.

Current Effective Programs and Strategies

Burlington has implemented several effective strategies that support mobility equity for older adults, demonstrating a commitment to inclusive transportation. The existence of the Older Adults and Persons with Disabilities (O&D) Transportation Program, the SSTA, and Green Mountain Transit should be acknowledged, especially considering that many cities lack any public transportation organizations or programs like these. Additionally, Green Mountain Transit offers a discounted rate of $1 per ride to those over the age of 60, compared to the standard $2 it costs for a single fare. The daily and monthly fare caps are also adjusted accordingly to this 50% discount. Andrea Viets also recognized that GMT bus drivers are generally accommodating and well-trained in assisting riders who use mobility aids. There is also an encouraged culture of offering seats to those who need them most through signs requesting bus riders reserve certain seats and, case of crowding, forfeit their seats to others with limited physical abilities.

Although the quality of infrastructure and accessibility varies between bus stops, some Burlington bus stops already include features like accessible pavement slabs, benches, and shelters. These create better waiting and loading experiences for users. Recently, some locations that do not have spaces for fully accessible bus shelters on paved areas have had simple wooden benches or T-bar benches implemented. Although this may not make the stop completely accessible to all potential users, it does impact the quality of mobility for those who benefit from having a place to rest or lean while waiting.

Finally, Andrea Viets discussed different outreach and educational workshops the Heineberg Senior Center has provided in the past that effectively support seniors looking to use public transit more often for a variety of reasons. These workshops have even included bus cards with a certain number of free rides, helping to enhance ride use and even temporarily removing the final cost barrier for bus fares. Green Mountain Transit also offers additional resources like the Bus Buddy program, aimed at creating more accessibility for those wanting to use public transit but experiencing different challenges.

Car Usage

As individuals age, their ability to drive may decline due to factors such as health issues, vision impairment, or reduced reaction times. However, many older adults continue to drive for as long as possible, as it remains one of the most convenient and comfortable modes of transportation, especially in a car-dependent area like Burlington and surrounding Chittenden County. Driving, unlike other forms of transportation, requires the least amount of time spent outdoors in harsh weather conditions, which is attractive to older adults, both during the winter months (when it is cold, dark early, and often icy) and increasingly in summer with extreme heat

events and flooding. Many older adults largely equate the ability to drive with independence. Examining how older adults interact with driving as a mode of transportation and how it affects mobility equity requires an analysis of both their access to driving in Burlington and the factors that influence their driving experiences. The extent to which older adults can access and use driving as a transportation mode shapes not only their individual mobility but also the broader community's mobility equity.

In my research, I found that the majority of older adults in Burlington continue to drive after the age of 65. Survey results show that most respondents drove a private vehicle both in the winter and the other seasons, and both interview participants confirmed that they drive regularly. Andrea Viets, Executive Director of the Heinberg Community Senior Center and member of the Burlington Aging Council, estimated that approximately 80% of older adults in the area drive, suggesting that the general perception of experts is that most older adults remain active drivers. However, it is important to recognize that the study's sample size and diversity were limited, potentially leading to an underrepresentation of non-drivers. The study's reliance on digital recruitment may have unintentionally excluded individuals with limited technological access, literacy, or physical abilities. The factors causing these limitations may also contribute to an inability or lack of access to driving, potentially underrepresenting non-drivers. Additionally, the recruitment strategy did not sufficiently prioritize the equitable inclusion of older adults and individuals with marginalized identities, among whom non-driving could potentially be more prevalent.

Winter, of course, affects driving conditions, especially in a northeastern city like Burlington. However, through analysis of surveys, interviews, and document reviews, factors impacting *parking* also emerged as a barrier to mobility. Indeed, the survey respondents' two most

commonly mentioned concerns or barriers to driving were poorly maintained roads and a lack of access to adequate parking, both of which are exacerbated in the winter.

Quality of Road Conditions

When asked, "In the summer, spring, and fall, what challenges do you face when attempting to get around Burlington?" 14% of survey respondents selected "poorly maintained roadways," with the number increasing to 17% when asked the same question, as pertaining to winter. For the same question, 4% selected uncleared or obstructed roadways as a challenge in the summer, spring, and fall, but this increased to 12% when the question pertained to winter (see clarifying chart found in Appendix E). Although these were not the most frequently selected challenges, these statistics still reveal how there are concerns surrounding the quality of road conditions among some older adults, and winter does exacerbate these conditions to some degree. However, when asked about challenges surrounding driving, neither older adult I interviewed focused on road conditions as a barrier, with both focusing on how parking accessibility impacted the driving experience. Poorly maintained roadways, especially in the winter, can present stressors for older adults as well as create hazardous conditions that discourage and limit the mobility of even those who drive.

Parking Accessibility

One of the most frequently cited barriers to high-quality mobility experiences when it came to driving was handicap-accessible parking. This was not a factor I had initially considered as a possible limitation, so it was not a listed option in the question set of "In the summer, spring, and autumn, what challenges do you face when attempting to get around Burlington?" However, a lack of access to adequate parking was mentioned numerous times in open-ended survey responses and

was a recurring theme brought up by both the older interviewees and the experts. Among the parking concerns raised in the data, three key issues emerged as patterns: difficulty qualifying for accessible parking permits, a shortage of accessible parking spaces, and the impact of winter conditions on both the availability and accessibility of these spaces.

Two survey respondents mentioned that a challenge they face in Burlington is having difficulty finding parking within a comfortable walking distance to their desired location, but not being able to use handicapped parking spots because they do not qualify for the permit. As the survey responses were anonymous, we are unable to fully understand the full context of these individuals' situations and why they are unable to qualify for accessible parking permits. Using a spatial definition of disability, I would argue that parking spaces that are too far from an individual's destination create a disabling environment. In an equitable scenario, they should be eligible for an accessible parking permit. However, equity is not currently being achieved, as something is preventing these individuals from accessing a resource meant to ensure equitable mobility.

The next pattern that emerged was a lack of accessible or adequate parking spaces available to those who *do* qualify for accessible parking permits. Responses like "Downtown parking is frequently a problem, even with a handicap tag" and "Not enough handicapped spots to park" reveal that there are not enough spots in the preferred locations to accommodate the number of people who need to use them. Interview Participant #1 also discussed their experiences with using handicap parking. He felt that he typically was able to find accessible parking spaces close enough to his desired location; however, in instances where he could not, options like parking in a garage a few blocks away from the desired location were too far for him to comfortably walk. He did note that Burlington has a policy where those who qualify for accessible parking do not have to pay at

metered parking, which expands his parking options, and minimizes how often he is unable to find adequate parking for free. Andrea Viets also discussed how important adequate parking is for older adults, especially in a largely car-dependent community like Burlington. One specific factor that limited the number and quality of accessible spots was winter conditions like snow build-up and ice, creating barriers and hazards. Eliana Fox and Andrea Viets both highlighted how handicapped parking spots can be snowed in or made inaccessible, both by storms and snow maintenance practices that create snow berms around spots.

Aging in Car-Dependent Places

Another important consideration when examining how driving as a mode of transportation impacts the mobility equity of older adults is recognizing the experiences of those who are unable to drive due to a variety of circumstances. Two survey responses recognized how influential the ability to drive is in allowing the respective participant to access necessities and thus mobility. In response to the question “In summer, spring, and/or autumn, do you have difficulty reaching any of the following places due to challenges with getting around or lack of transportation?” one participant commented "no problems if I have a car and can drive. Very difficult if I have to use public.” Another relevant response was “I don’t because I still drive. If I didn’t drive, I could not access most medical appointments” under the “other” text box option of the question “In the winter, do you have difficulty reaching any of the following places due to challenges with getting around or lack of transportation?”

These responses, alongside other similar ones, reveal how influential access to cars is to mobility and how the loss of the ability to drive can be potentially detrimental to an individual's quality of life. Interviews revealed similar levels of importance as Interview Participant #1 uses

driving as his primary mode of transportation. When asked how often he used a car driven by either him or someone else as a means of transportation, he said, “Almost all the time. The only time I wouldn't get around by vehicle is when I walk a short distance.”

These findings highlight the need to ensure that mobility systems account for those who cannot or will not always be able to drive, as well as those who choose not to, such as Interview Participant #2, who stated she only used a car about 2-3 times a week with maybe a slight increase in frequency in the winter, having also stated earlier in the interview, “most of the time when getting around Burlington, I mostly walk.” She explained she began choosing to walk more in her 30s, because she wanted to age healthily. So, although she currently has the ability and means to drive, she still often prefers to walk. This ability to choose is also an important factor to consider in creating genuine, equitable mobility experiences. Creating access to multiple modes of transportation empowers individuals to pursue the lifestyle they choose. Aging should not take away a person’s ability to make those choices. Additionally, aging brings potential changes in health, vision, and cognitive or physical ability; an overreliance on personal vehicles as the primary mode of transportation creates a fragile foundation for mobility.

Effective Interventions and Strategies

Similar to the walking portion of the findings section, the presence of a city Snow and Ice control program should be acknowledged as a positive step toward enhancing mobility equity. While there is still room for improvement, the existence of such a program establishes a clear protocol for developing well-maintained, accessible roads and sidewalks. Not only does the plan aim to clear roads in a prioritized manner, but it also includes a section addressing handicapped parking space maintenance. The protocol is to begin with clearing handicapped parking spots

downtown and working their way to the outskirts of the city. Further, the Department of Public Works provides a phone number residents can call if a parking area needs specific attention to increase its priority. Similarly, the city of Burlington has a SeeClickFix program where residents can report a variety of maintenance concerns, including parking space concerns. Although this program is applicable and potentially effective in improving all means of transportation explored in this paper, it was only ever mentioned by survey respondents and interviewees in relation to its effectiveness in reporting potholes and snowed-in handicapped-accessible parking spots. While the Burlington Snow and Ice management plan offers a number that can be used to request maintenance of winter-impacted handicapped parking spots, SeeClickFix does not have a phone call option and does require users to have a certain level of online access and abilities.

Lastly, the program highlighted by interview participant #1, providing free parking in Burlington for drivers with handicap-accessible parking permits, demonstrates another effective policy in supporting mobility equity by helping to create a more financially equitable mobility experience for those who require parking as close as possible to their destinations.

Chapter 5 Recommendations

In addition to analyzing my findings, I wanted to generate realistic recommendations that directly address the barriers identified during research. This chapter outlines a set of recommendations that have the potential to improve transportation equity for older adults in Burlington. These recommendations draw upon survey responses, expert interviews, and document analysis.

General Recommendations

One recommendation that was applicable to every mode of transportation, across the board, was the importance of continuing and expanding currently effective programs and services. Social equity can move in both directions. In the same way small changes that create progress can lead to significant improvements, seemingly minor changes that reduce accessibility can have a compounding effect, creating even greater barriers for those impacted. In order to achieve greater levels of mobility equity for older adults, we must first protect the privileges and resources that currently exist. It is imperative to continue investing in these programs and resources that effectively support older adults' mobility. However, especially in the current political climate, many government agencies and initiatives that promote diversity, equity, and inclusion are facing threats of disinvestment or elimination. Great efforts should be made to preserve programs and resources, as they not only benefit older adults but also the mobility rights of all community members. One survey respondent highlighted how decreases in mobility access can shape the lives of older adults, stating, "As I age, I want to live here, but will need to rely more on public transportation just at the time that services are being cut." Before improvements can be made to

these various modes of transportation, we must first ensure that their current levels of mobility access are maintained and prevent backslides in progress.

Another recommendation is that, in general, older adults' mobility issues should be further investigated and evaluated, with the voices and opinions of older adults at the forefront of change and with their ideas and options prioritized. Additionally, all relevant agencies and organizations, like the City of Burlington, Burlington Public Works, and Green Mountain Transit, should ensure that all policies and infrastructure strategies consider older adults and those with different mobility abilities, and this should be explicitly stated in these documents. This not only ensures that older adults are being considered but explicitly stating how those with different abilities are being supported allows for future evaluation, accountability, and ongoing improvements to these strategies. One policy document that should be revised is the City of Burlington's Snow and Ice Management Plan, which impacts every mode of transportation. Specific recommendations for what could be included in this amendment are further explored in the respective transportation sections.

This recommendation is based on different calls to action throughout the Burlington Age Strong Plan, with a specific focus on amendments to various winter management policies. Some calls to action from this plan include: "Work with GMT, DPW, and other relevant agencies on processes and funding needed to support a standardized bus stop amenity plan that addresses winter maintenance (apply a similar process to handicapped parking spaces)" as well as "Require PlanBTV to incorporate a comprehensive strategy to prioritize the needs of older adults in elements of community design, including sidewalks, winter maintenance, etc." Additionally, all winter and mobility-related recommendations in the Burlington Age Strong Plan align with my

findings, and I strongly recommend that the city adopt the plan and develop a clear, actionable strategy for its implementation, as the plan was created by qualified local experts and older adults who have an intimate understanding of the struggles older adults face in the community and what ways to effectively create progressive change in the city.

Finally, although it does not fall under the category of improvements to mobility through changes in the built environment and policies, efforts should be made to create more inclusive and compassionate community and cultural ideas surrounding aging and disability. The root of every barrier identified stems from those with different mobility abilities not being prioritized or having their needs met effectively, leading to marginalization and oppression. Additionally, stigmas surrounding age only encourage the perpetuation of cycles that reinforce this marginalization and devaluation of older adults in spaces. Community outreach and advocacy, as well as awareness campaigns, should be prioritized to work on creating a paradigm shift that helps dismantle these harmful stereotypes and ways of thinking.

Understanding and Evaluating Barrier Severity and Experience

The emerging theme I found is that mobility accessibility exists on different levels. Deeming a space or route as allowing for mobility or causing complete immobility does not accurately account for the quality of mobility one can obtain in a specific space. Just because an individual can, in theory, successfully travel to a desired location does not mean that they are experiencing mobility equity.

When people have to exert excessive energy, struggle, or worry about their safety just to complete a journey, it creates a different, less equitable experience compared to someone who can travel the same route without difficulty. For example, if there is an obstacle obstructing a curb cut at a crosswalk, the degree to which it impacts different individuals' abilities to cross the street, and the ease and safety with which they can do so, depends on a variety of factors. Someone who can step on or off curbs easily may be slightly inconvenienced by having to walk around this obstacle, but overall, it minimally affects their quality of mobility. Someone who experiences difficulty stepping on or off a curb may have their quality of mobility affected by this barrier; although they may be able to successfully complete the task, it may consume more energy than what is comfortable, and it may create stress due to concerns about their ability to safely move around the obstacle. These difficulties may also cause feelings of frustration and negative ideas about their difficulty in completing a task that many would deem as “easy.” In a third scenario, someone who uses a mobility aid like a wheelchair may be rendered fully immobile by the obstacle. If they cannot safely get themselves and their wheelchair on and off the curb to avoid the obstacle, they may not be able to cross the street and ultimately not be able to access their desired destination. This may not only impede their ability to complete this task, but it can also be discouraging to attempt similar journeys, leading to increased isolation and a decrease in their perception of their ability to achieve certain tasks independently.

Thus, the experience of mobility is not just about the ability to physically move from one place to another; it is also about how much effort, stress, and physical or emotional strain is involved in that journey. If someone needs to plan their route meticulously, carry concerns about their safety, or physically exert themselves far beyond what is reasonable, that cannot be considered mobility equity.

Adopting A Social Model of Disability Approach to Evaluating Mobility Equity

In an ideal world, achieving social equity and inclusion would be as simple as identifying all areas of inequity and fixing them. However, the reality of improving a community and striving for equity and inclusion often involves prioritizing the order of what areas and spaces are addressed, allocating resources to different forms of intervention and maintenance, and sometimes having to settle for progress toward equity over perfection temporarily (Thelen, 2003). Scholars and disability rights advocates like David Pettinicchio and Jane Richards recognize that comprehensive, fully inclusive solutions are often not the most realistic or immediately achievable. They emphasize that an approach focused on continuous, incremental improvements, even if each step only achieves partial accessibility, can, over time, create meaningful impact and lasting social progress (Pettinicchio, 2019; Richards, 2021).

My original intention was to develop a framework and assessment scale that evaluated the quality of accessibility in space, using a three-tiered level system to rank how accessible a space was. I was unable to find one in any scholarly sources that fit well into the context of this research. I wanted to create a scale that is fairly general, making it applicable to a variety of spaces that impact mobility in an urban setting. Additionally, I wanted a scale that could consider the wide range of mobility difficulties that older adults are at a higher risk of experiencing. A tiered scale like this would support the kind of incremental, flexible approach advocated by scholars, such as Pettinicchio and Richards, allowing accessibility to be measured along a spectrum, rather than as a binary of accessible or inaccessible**.** However, while researching pre-existing scales outside of the scholarly context, I discovered Roll Mobility, an app dedicated to accessibility community mapping, which already had a model nearly identical to what I had imagined (Roll Mobility Accessibility Scale found in Appendix F).

Roll Mobility is a community-driven accessibility tool that provides users with an app that facilitates community mapping, ranking the level of wheelchair accessibility of different spaces. Their 3-tiered mobility accessibility scale allows you to designate a space as Red, for completely inaccessible, Yellow, for partially accessible, and Green for fully accessible. Although Roll Mobility's scale focuses on barriers wheelchair users face, I feel the scale could be easily applied to assess levels of accessibility for any form of mobility challenge.

I recommend that Burlington participate in community-driven mapping, where different locations are tagged with their level of accessibility, and different geographical points hold additional information that can benefit users, using the Role Mobility App model. This map not only has the potential to benefit those with mobility challenges, as it can help them plan routes, but it can also assist planners and organizations in easily identifying high-priority areas that require intervention due to high levels of reported inaccessibility. Another way to implement this model is to create a Transit Infrastructure Accessibility Inventory, which could be maintained by a variety of agencies like the Chittenden County Regional Planning Commission (CCRPC). Similar to other mapped infrastructure inventories, like the Vermont Culvert Inventory, the city of Burlington or CCRPC could use this scale to create a map that inventories different aspects of transit infrastructure, like crosswalks, bus stops, and accessible parking spaces, where the level of accessibility in each location is recorded. Inventories like these help planners prioritize what pieces need intervention, and at what level. The SeeClickFix program could also be incorporated into this system.

A combination of both approaches could also be considered, where community members are invited to help contribute to and maintain an inventory that planners and government agencies use to make decisions. This both empowers community members and helps reduce the need for

many resources to be spent on maintaining such a complex dataset. Although there is potential for different challenges using this model and creating an inventory or community map using these systems, such as barriers caused by media literacy challenges, this scale and model have great potential to create innovative and efficient approaches to pursuing mobility equity not only for older adults, but for everyone who faces any form of mobility challenge.

Mode-Specific Transportation Recommendations

When considering recommendations for solutions and interventions for each respective transportation method, I focused on survey responses that suggested specific forms of improvement and the detailed recommendations made by the older individuals I interviewed, as they were specifically asked about ways they thought the city could effectively enhance the accessibility of each method. Additionally, I utilized document analysis and my interviews with local experts and service providers to understand the current processes that shape the state of the built environment and what experts are already advocating for Burlington to adopt.

Walking Infrastructure

One specific amendment I would recommend for the Snow and Ice Management plan is a more comprehensive approach to the snow berm created by sidewalk and road plowing, as well as an evaluation of where snow piles are generated by plows and how they affect the accessibility of a space. Ideally, no snow berm would be left at the end of any driveway or walkway; however, with the current snow management technology the city uses, this would require many additional hours to the amount of time it takes to plow sidewalks, as well as many additional paid hours of labor.

Another consideration the Snow and Ice Management plan could address to create a more comprehensive and inclusive plan is a more strategic approach to sidewalk maintenance between snow events. Oftentimes, after plowing, snow from surrounding snowbanks can blow onto pathways, creating a thin slick layer of snow. This layer can create slick conditions that may endanger those with stability concerns. Some survey respondents noted that poor-quality plowing jobs create a similar layer of slick, smooth snow on paths. Finally, uneven sidewalks or holes in sidewalks can create pools of water that then freeze in winter conditions. These sidewalks should be repaired, as sidewalk unevenness and holes are hazardous on their own; however, in the meantime, they should be temporarily addressed in winter to minimize large sheets of ice. Intervening with less permanent but cheaper and easier-to-implement strategies like sand filling would improve safety and accessibility in winter.

Additionally, an expansion of investments in resources and programs offered to older individuals could allow them to address walking concerns caused by winter conditions on a more individual level. Interview Participant #2 noted that there used to be "sandboxes" on street corners where people could throw sand on slick areas to help themselves and others using the path. I was unable to verify or find more information about these boxes or why they no longer exist. However, providing citizens with the resources to help combat icy conditions could help the city quickly and effectively address areas of need. Similarly, encouraging and facilitating community support and volunteers to help the older population is another possible means of reducing levels of inequity. Connecting older individuals to neighbors who may be willing to shovel driveways or at least help shovel snow berms could also be an effective strategy to improve conditions for impacted individuals.

Public Transit

To increase mobility equity for older adults through public transit, the user experience must be made more convenient, comfortable, and accessible. The Age Strong Burlington plan calls for an expansion of bus stops and an increase in the frequency of buses. Additionally, the plan calls for relevant organizations to create a standardized amenity plan for bus stops as well as a plan that addresses bus stop accessibility and improves winter maintenance. The plan also recommends that new developments consider and review public transit amenities in the permitting and construction processes to ensure public transit infrastructure and capacities continue to grow as the city is developed. Finally, the plan calls for fares to be income sensitive and decreased or eliminated for older adults.

The findings of my research support these recommendations. At the time of research, these recommendations come as Green Mountain Transit faces budgetary struggles and is having to reduce services across the service areas of Central and Northwestern Vermont, which is the most populous in the state. The City of Burlington and the State should prioritize funding Green Mountain Transit and agencies that support accessible public transit.

Ideally, all bus stops are fully accessible, all lines have frequent buses and minimal wait times, bus rides should be free, and lines have service to every location older adults seek to access. However, these idealized goals do not offer a pragmatic or realistic approach to achieving mobility equity, especially in the context of budgetary restraints on public transit in Burlington. I once again argue that the city, as well as all relevant organizations, should continue striving for progress in mobility accessibility and the quality of the mobility experience. Creating changes like adding T-bar benches and other seating is a great example of improving stops in a cost-effective way.

Although programs like Tilley Drive Service provide transit to some healthcare facilities, there should be a greater investment in providing public transit to healthcare facilities, as there is still a gap in the resources currently available and the needs that exist. Three different surveys indicated that respondents noted that without a car, they would not be able to access needed healthcare facilities, and 18% of survey respondents indicated they struggle to access the hospital/doctor's office in the winter. Similarly, 16% of survey respondents indicated struggles accessing grocery stores in the winter, exposing another gap in the resources and needs that exist. So, although many GMT routes connect to various grocery stores, an increase in accessibility, possibly through more lines, stops, and frequency, should be considered.

Even if there cannot be an increase in frequency at all times for lines that serve the stops, more frequent service on one or two days a week may allow older adults to plan their schedules accordingly and have an improved mobility experience with shorter wait times. Green Mountain Transit should consider eliminating fares for older adults, similar to how students do not have to pay fares. Andrea Viets recommended this in order to remove financial barriers to public transit, recognizing that other cities and countries have senior bus passes where, after a certain age, you do not need to pay. If GMT is unable to currently fully eliminate bus fare for all older adults at all times, different approaches like offering free rides to older adults on certain days of the week should be considered.

Currently, the Burlington Public Works Snow and Ice Control Plan leaves winter maintenance up to Green Mountain Transit (City of Burlington Department of Public Works, 2024). However, collaboration among multiple agencies on winter maintenance and upkeep of bus stops may make stops more accessible in the winter. As GMT has to close certain stops due to the buildup of snowbanks on green belts (between the sidewalk and street) that make users unable to

load or exit the bus, Burlington Public Works should considers the ways in which it can team up with GMT in bus stop maintenance in the winter in order to increase accessibility. This collaboration could look like a number of things, such as Burlington Public Works taking responsibility for stops on certain routes, especially if they are already servicing the area. This would allow more stops to be serviced in a shorter amount of time.

Finally, investment should continue in public transit education and outreach for older adults. It should be made clear how to access and use public buses, as well as how to access resources like SSTA. Workshops and resources helping new users learn how to ride buses should continue to be provided to the community.

Car Recommendations

Creating realistic recommendations for better road maintenance, particularly in winter, is challenging. The current systems in place are eventually effective in ensuring road maintenance; however, in the immediate aftermath of a storm, a scarcity of resources can leave various locations in the built environment in hazardous states for extended periods of time. Interview Participant #2 noted that her only real concern related to driving in the Winter is if she were to need something urgent, like a prescription, after a snowstorm, and the roads not yet being plowed. One way to possibly create improvements is to complete more community awareness and outreach about the SeeClickFix program and ensure the program continues to yield good response times to reported problems. This program can help empower older adults who want their needs to be considered and have a specific area that is limiting their mobility. Furthermore, options that require less technological literacy, like a phone number incorporated into the program, may be beneficial in making the process easier for some older adults. The city should also explore ways of creating

more accessible parking for older adults. One area of potential improvement is reevaluating who "qualifies" for handicapped parking permits and tags. Some older adults have expressed frustration as they struggle to walk comfortably from general parking spots to their desired location, but they are identified as not qualifying for disability parking. I would again argue that their environment is not meeting their mobility needs; therefore, they should, in theory, qualify for accessible parking spaces. The city should investigate why these gaps in service exist and consider amending the application process to more effectively serve older adults. One possible barrier is that to successfully obtain a permit, you must apply and be evaluated by a doctor. However, for those who do not have easy access to a doctor due to a variety of potential reasons, including mobility limitations or financial barriers, they may struggle to obtain a permit even if their physical condition qualifies them for one. Investing in programs that make healthcare more accessible to older adults on all levels would potentially help address this barrier, as well as improve the quality of life for those impacted in many other ways. Other approaches to reserving the nearest proximity spots for older adults with mobility limitations should also be considered, like creating a specific senior parking designation in more locations or extending the removal of metered parking to all older adults.

I also found that even for many older adults who do qualify for accessible parking permits, there are not enough handicapped parking spaces in key areas. The simplest and most straightforward recommendation is to increase the number of accessible spaces in the city to more effectively serve those with mobility challenges. A variety of restrictions and constraints means that creative, alternative approaches to increasing parking spaces in key areas should be explored. Interview Participant #1 suggested that the city could consider how Manhattan's newly implemented congestion relief policies limit the number of people using cars by financially

discouraging those who can access the city without a car. This creates more available potential spaces for those for whom using a private vehicle may be their only accessible form of transportation.

The City of Burlington could explore ways to discourage people from driving, perhaps including congestion pricing in some downtown areas; this may be effective in freeing up enough parking spaces for those who need to park close to their locations. Similarly, the city could expand current incentives for the use of other means of transportation, such as improved public transit, walking and bicycling infrastructure, and better publicizing of existing incentive programs. The city could also explore even more creative approaches to address the inaccessibility surrounding parking. For example, parking garages could potentially have airport-style shuttles that help deliver those most in need closer to their desired location if they are forced to park farther away due to a lack of available closer parking. Additionally, programs that use volunteers or help provide rides to older adults who no longer drive could also help improve individuals' quality of life, which is often impacted by the inability to drive.

The city and relevant organizations should also explore means of making the city less car-dependent overall and invest in alternative means of transportation for older adults. Investment in making walking and public transit more accessible and reliable is a great step toward mobility equity.

Supporting aging in place requires intentional investments in mobility infrastructure and services. While older adults may rely on a variety of transportation modes, their ability to navigate Burlington safely and independently relies on careful planning, accessible design, and inclusive systems that take their needs seriously. These recommendations offer both short-term and long-

term strategies that not only create more equitable mobility experiences for older adults but also improve mobility for all residents.

Chapter 6 Conclusion

This research was guided by three research questions: In what ways do intersecting identities, such as age and ability, influence how individuals experience and navigate the built environment? How can the design of the built environment be improved to foster mobility, accessibility, and inclusion for marginalized communities? How do winter conditions exacerbate mobility challenges for older adults in the built environment?

To explore these questions, I used a multi-methods approach with my methods including a survey of older adults living in Burlington, interviews with experts and service providers as well as some older residents, and a document analysis. I also analyzed existing community resources and tools. Together, these methods provided a well-rounded view of older adults' mobility experiences that allowed me to identify areas of mobility inequity and propose a variety of recommendations that could improve mobility experiences for older adults.

In response to the first question, this study found that mobility for older adults is shaped by both personal identities and the physical and social environments they move through. Participants frequently described facing barriers that would not affect people with fewer mobility needs. Uneven sidewalks, missing curb ramps, and a lack of benches at transit stops made everyday travel more difficult. These findings support the Social Model of Disability, which argues that many limitations come not from an individual's abilities but from the way spaces are designed. In this case, aging itself was not the source of reduced mobility. Instead, it was the failure of the built environment to accommodate a range of physical conditions that created the most significant barriers.

The second question focused on identifying how the built environment could be improved to better support mobility equity. Although Burlington has made some efforts, such as offering paratransit services and maintaining sidewalks in select areas, these resources were described as inconsistent and sometimes difficult to access. This reflects patterns seen in the literature, where improvements often concentrate in high-traffic areas or serve drivers more than pedestrians (Wilmut & Purcell, 2021; Sundling & Jakobsson, 2023). Participants also described challenges with understanding or navigating transit systems, especially during the winter months. These experiences suggest that mobility equity requires not only physical infrastructure improvements but also better communication and system design that takes into account a wider range of needs.

The third question looked at how winter conditions affect mobility for older adults. While past research has acknowledged environmental influences, this study offers a closer look at how winter conditions specifically limit access and participation. Participants described how icy surfaces increased their fear of falling, snow berms blocked sidewalks and parking spots, and other issues. These seasonal conditions changed how people moved through their neighborhoods and whether they left home at all. Drawing on Soja's concept of the socio-spatial dialectic (1980), this study shows that environmental design and behavior are constantly interacting, and that these relationships shift throughout the year in ways that deserve more attention.

To address these ongoing challenges, this research explored the potential of a three-tiered accessibility scale. Rather than classifying environments as either accessible or inaccessible, this model offers a more flexible way to assess and improve spaces over time. It encourages recognizing partial progress and helps prioritize next steps. Inspired by community tools like Roll Mobility, this model reflects the work of scholars such as Pettinicchio (2019) and Richards (2021),

who advocate for gradual, sustained improvements that are rooted in lived experience. A scale like this offers practical value for planners and communities working to make mobility more inclusive.

This project confirms key ideas from the relevant scholarly literature and discourse. It also contributes new insights about Burlington, Vermont's status as an age-friendly city, pushing for more realistic and inclusive approaches to planning. The findings also support the idea that access to mobility is shaped by the design and maintenance of environments, not just by individual bodies. Contributing to existing research by showing how location specifics, like the severity of winter conditions, disproportionately impact already marginalized communities. Finally, it introduces a more flexible way to think about accessibility, one that allows for long-term improvement instead of rigid, all-or-nothing thinking.

To create truly inclusive cities, we must prioritize the inclusion of older adults in community design. Accessible infrastructure not only benefits everyone, but it also acknowledges the fundamental right of older adults to mobility justice. Aging is a universal and unavoidable process; instead of perpetuating fear and stigmas around growing older, which leads to the marginalization and oppression of older adults, we have the ability to build a better world for all, no matter what age.

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Appendix A

Survey Questions

Q1. Are you 65 years of age or older?

• Yes

• No

Q2. Do you live within the city of Burlington, Vermont?

• Yes

• No

Q3. How old are you?

(Open-ended response)

Q4. Gender

• Female

• Male

• Non-Binary (with write-in option)

• Prefer not to say

Q5. In the winter, how many times a week do you usually leave your home?

• Less than once a week

• 1–3 times a week

• 3–6 times a week

• 7–9 times a week

• 9+ times a week

Q6. In summer, spring, and autumn, how many times a week do you usually leave your home?

- Less than once a week
- 1–3 times a week
- 3–6 times a week
- 7–9 times a week
- 9+ times a week

Q7. In the winter, what modes of transportation do you regularly use? (Please select all that apply)

- Walking
- Bicycle
- Public Bus
- Public Shuttle Service
- Private Shuttle Service
- Car - Driven by you
- Car - Driven by someone else (including ride share apps like Uber or Lyft)
- Other (Please specify)

Q8. In summer, spring, and autumn, what modes of transportation do you regularly use? (Please select all that apply)

- Walking
- Bicycle
- Public Bus
- Public Shuttle Service

• Private Shuttle Service

• Car - Driven by you

• Car - Driven by someone else (including ride share apps like Uber or Lyft)

• Other (Please specify)

Q9. In the winter, what challenges do you face when attempting to get around Burlington? (Please select all that apply)

• Outdoor weather or temperature making travel unbearable

• Poorly maintained sidewalks/walkways

• Uncleared or obstructed sidewalks/walkways

• Difficulty safely crossing crosswalks within the allotted time

• Lack of sidewalk lighting in needed areas

• Lack of places to sit or rest in public areas

• Lack of accessible ramps

• Difficulty accessing public transportation

• Difficult enduring journeys using public transit

• Poorly maintained roads

• Uncleared or obstructed roadways

• Lack of street lights in needed areas

• Other (please specify)

• I do not face any challenges when attempting to get around Burlington in the winter

Q10. In the summer, spring, and autumn, what challenges do you face when attempting to get around Burlington? (Please select all that apply)

• Outdoor weather and temperature making travel uncomfortable/unbearable

• Poorly maintained sidewalks/walkways

• Uncleared or obstructed sidewalks/walkways

• Difficulty safely crossing crosswalks within the allotted time

• Lack of sidewalk lighting in needed areas

• Lack of places to sit or rest in public areas

• Lack of accessible ramps

• Difficulty accessing public transportation

• Difficult enduring journeys using public transit

• Poorly maintained roads

• Uncleared or obstructed roadways

• Lack of street lights in needed areas

• Other (please specify)

• I do not face any challenges when attempting to get around Burlington in the summer, spring, and autumn

Q11. In the winter, do you have difficulty reaching any of the following places due to challenges with getting around or lack of transportation?

• Grocery Store

• Hospital / Doctors Office

• Parks/ Outdoor Recreational Spaces

• Social Gathering Spaces (community centers, etc.)

• Local friends or family members' homes

• Other (please specify)

• I do not struggle to access any of these locations due to mobility barriers

Q12. What specifically made it difficult for you to access the locations you selected above?

(Open-ended response)

Q13. In summer, spring, and/or autumn, do you have difficulty reaching any of the following places due to challenges with getting around or lack of transportation?

- Grocery Store
- Hospital / Doctors Office
- Parks/ Outdoor Recreational Spaces
- Social Gathering Spaces (community centers, etc.)
- Other (please specify)
- I do not struggle to access any of these locations due to mobility barriers

Q14. What specifically made it difficult for you to access the locations you selected above?

(Open-ended response)

Q15. What are your greatest concerns or frustrations regarding getting around Burlington safely and/or independently in the winter?

(Open-ended response)

Q16. What changes or improvements would you recommend to make it easier for older adults to get around the city in the winter?

(Open-ended response)

Q17. Is there anything else you would like to share that you feel would be relevant to this research?

(Open-ended response)

Q18. Would you be interested in engaging in further research by participating in an interview about your mobility experiences in Burlington as an older adult?

- Yes
- Maybe
- No

Appendix B

Outreach Email Template

“Hello {Organization or Contact Name},

I hope you are doing well! My name is Sian Hernit, and I am a student at the University of Vermont writing my senior thesis on how winter conditions and Burlington's infrastructure and built environment affect older adults' mobility and ability to move through the city. I am passionate about advocating for the equity and the inclusion of older adults, especially in public design and transportation infrastructure.

As part of my study, I am gathering insights from older adults (ages 65+) who live in Burlington to understand the barriers they face when navigating the city during the winter months. The survey will take 10-15 minutes to complete and could be taken online or on paper. At the end of the survey, participants will be asked if they are willing to participate in the project's next stage by allowing me to interview them about their experiences. These interviews (approx. 30-45-minutes) are optional and not required to participate in the survey portion of the research.

I was wondering if you would be willing to help me share my survey and search for interviewees with your community/organization.

I'd be happy to provide the survey link as well as flyers or an info blurb for a community email listserv, bulletin, or announcement etc. I am happy to provide whatever would make sharing most convenient and effective for you. If not, I understand.

Please let me know your thoughts and questions. I am looking forward to hearing back from you and hopefully working with your community.

Sincerely,

Sian Hernit

Department of Geography and Geosciences

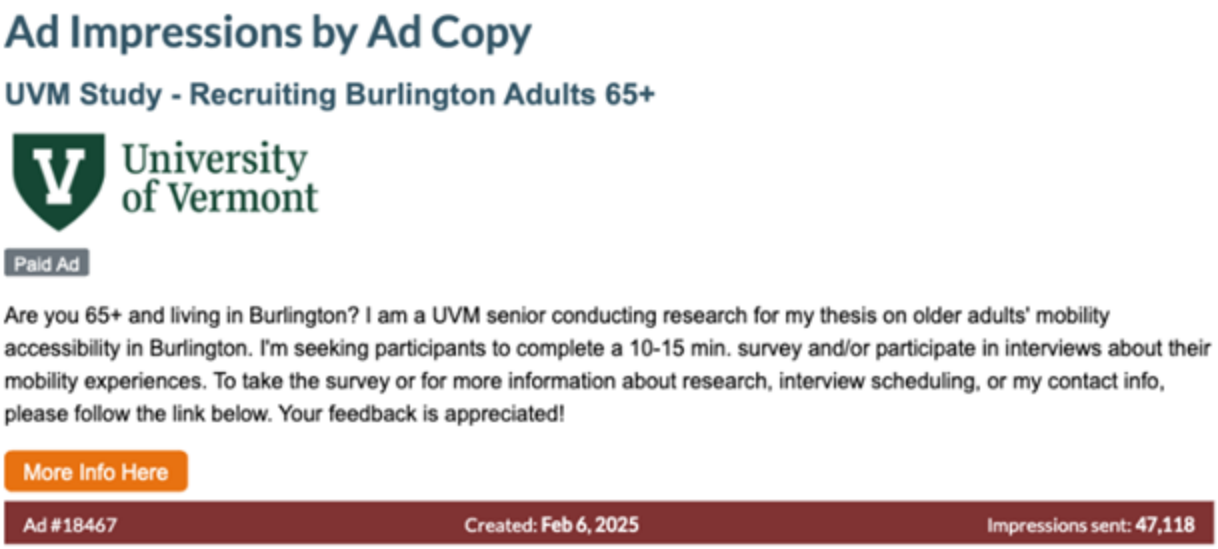
University of Vermont

sian.hernit@uvm.edu

(937)414-4070

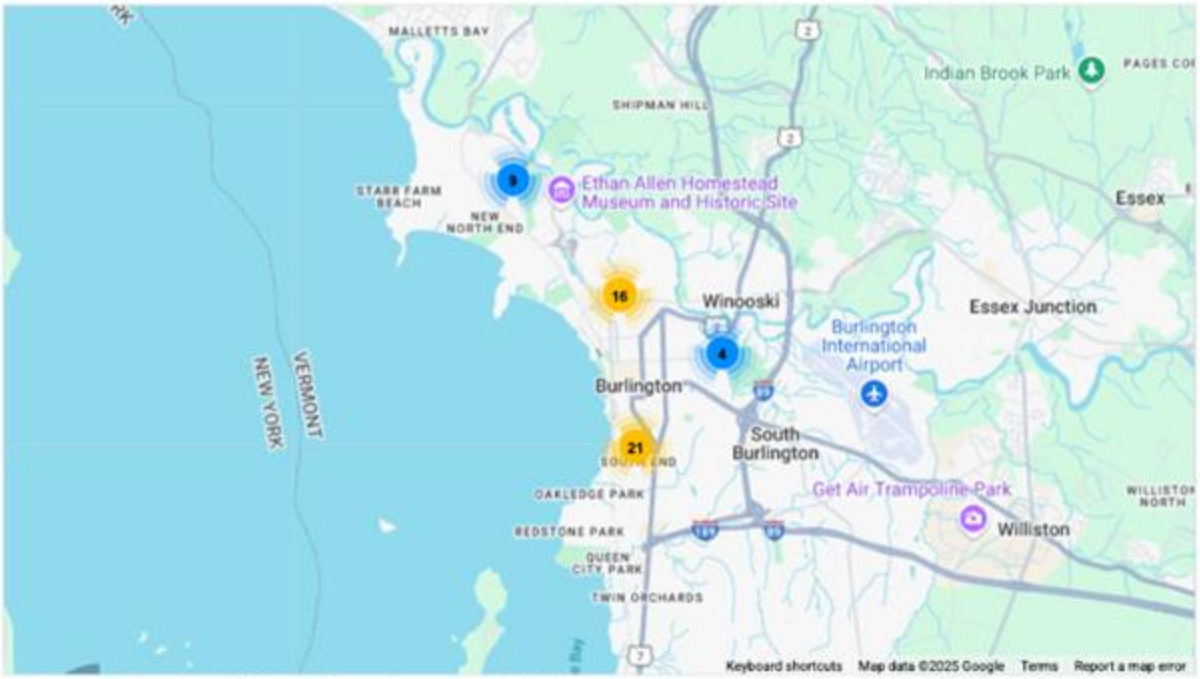
Appendix C

Front Porch Forum Report



(orange button linking to my survey page)

Ad Impressions by Geography



Map counts are shown by 1,000 impressions and are rounded, which may result in inaccuracies.

Ad Impressions by Media

Email and Website impressions are viewed on mobile phones, tablets, and laptop and desktop computers. Mobile app impressions are viewed on mobile phones and tablets.

Appendix D

Interview Question Set for Interviews with Older Adults

Introduction

- How old are you?
- How long have you been living in Burlington?
- Is there anything you'd tell me a little about yourself before we begin the next sections that you feel might be relevant to providing context to your answers about your personal mobility experience?

Walking

- How often do you walk as a means of transportation in general?
- Does this frequency change during the winter months?
- When walking in the winter, what are the biggest concerns, inconveniences, or barriers you experience? *These can be related to winter conditions or other factors.*
- What does the city currently do that makes walking more accessible for you, either in general or specifically during the winter?
- What could the city do to make walking easier and safer for you in the winter?
- As you've gotten older, has your experience with walking changed?
- Has the way you interact with or think about walking as a form of mobility evolved?

Public Transit

- How often do you use public transit as a means of transportation in general?

- Does this frequency change during the winter months?
- When using public transit in the winter, what are the biggest concerns, inconveniences, or barriers you experience? *These can be related to winter conditions or other factors.*
- What does the city currently do that makes public transit more accessible for you, either in general or specifically during the winter?
- What could the city do to make public transit easier and more accessible for you in the winter?
- As you've gotten older, has your experience with public transit changed?
- Has the way you interact with or think about public transit as a form of mobility evolved? If so, how?

Car Usage

- How often do you use a car or personal vehicle as a means of transportation, either driven by you or by someone else?
- Do you currently drive yourself?
- Does the frequency you use your car change during the winter months?
- When using a car in the winter, what are the biggest concerns, inconveniences, or barriers you experience? *These can be related to winter conditions or other factors.*
- What does the city currently do that supports your ability to drive in the winter or in general?
- What could the city do to make driving or using a car easier and safer for you in the winter?
- As you've gotten older, has your experience with driving or using a car changed?
- Has the way you interact with or think about car use as a form of mobility evolved? If so, how?

Closing

- Is there anything else you'd like to share before we conclude the interview?

Appendix E

Clarifying Chart

In the summer, spring, and fall, what challenges do you face when attempting to get around Burlington?

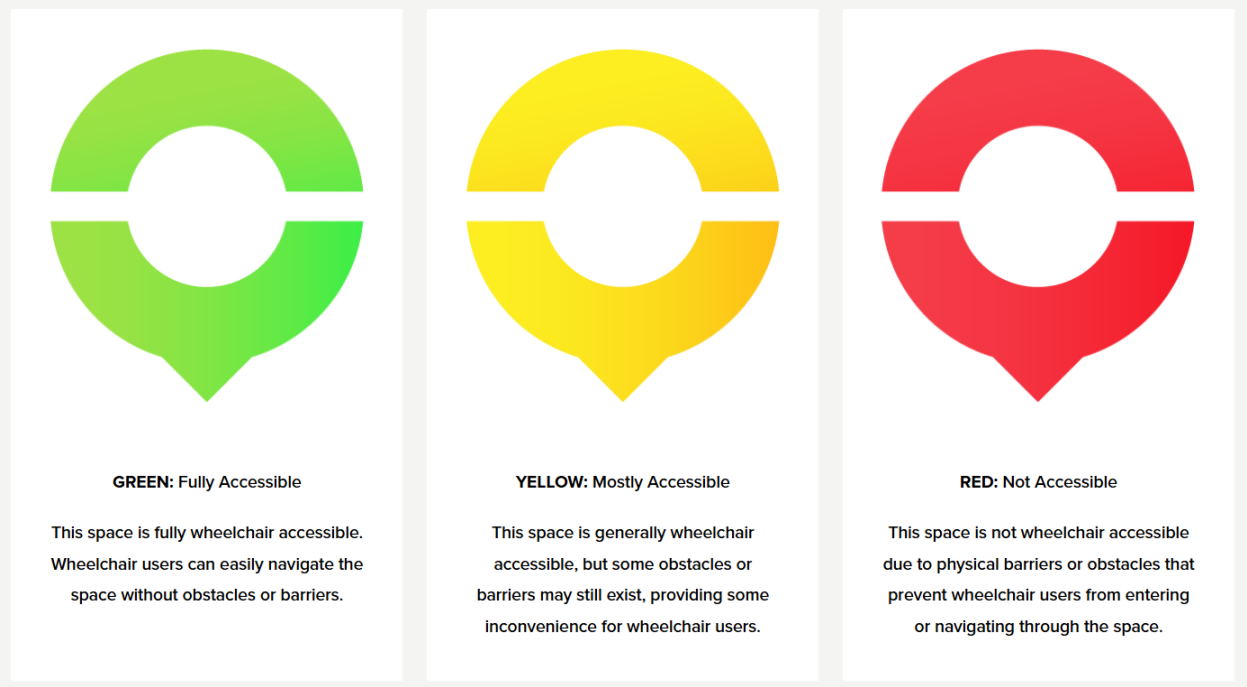
Field	Percentage of Responses
Poorly maintained roads	14%
Uncleared or obstructed roadways	4%

In the winter, what challenges do you face when attempting to get around Burlington?

Field	Percentage of Responses
Poorly maintained roads	17%
Uncleared or obstructed roadways	12%

(This chart above is indeed to provide clarity and convenience in comparing how winter impacted the rate at which “Poorly Maintained Roads” and “Uncleared or Obstructed Roadways” were selected on these two comparative questions. It does not display the set of options provided to survey participants.)

Appendix F Levels of Mobility



(*Roll Mobility*, 2025.)