Corydon Avenue, 2025

Assessing the Disability Friendliness of Winter Sidewalks in Winnipeg, Manitoba

John Nahiyin Baanbil

Master of City Planning Capstone Report

Department of City Planning

Faculty of Architecture

University of Manitoba

EXECUTIVE SUMMARY

This study assesses the disability friendliness of winter sidewalks in Winnipeg, Manitoba, focusing on the challenges faced by PWDs. The research employed a structured accessibility audit and interviews with participants from disability organizations. The audit covered 22 streets across different urban and suburban neighbourhoods, assessing sidewalk conditions, curb cuts, pedestrian signals, and transit stops. Findings indicated that 77% of sidewalks remained covered in ice, 64% had obstructive snow piles, and 91% of transit stops were inaccessible, making mobility dangerous for PWDs. While major streets receive priority for snow clearing, sidewalks in many neighbourhoods remain neglected, reinforcing social and mobility inequities. Interviews revealed that inaccessible sidewalks disproportionately affect PWDs, seniors, and caregivers with strollers, limiting their ability to travel safely. Many respondents reported that their members avoid outdoor activities during winter, leading to increased reliance on costly alternatives such as paratransit and ride-hailing services. The inaccessibility of winter sidewalks contributes to social isolation and mental health challenges, with participants expressing feelings of neglect and frustration toward city authorities. Advocacy efforts, including the Snow-Plow Campaign, have raised awareness and pressured city authorities to prioritize sidewalk maintenance. However, budget constraints and inconsistent enforcement of snow-clearing policies continue to hinder improvements. Potential solutions included increased funding for snow removal, the implementation of heated sidewalk technology and the expansion of Winnipeg's skywalk system. To address these challenges, the study recommends outsourcing snow removal, offering grants to local businesses, launching neighbourhood volunteer programs, and running public awareness campaigns. A comprehensive, inclusive snow-clearing strategy is essential to support safe, year-round mobility for all residents.

ACKNOWLEDGMENTS

I thank God for His divine mercies and guidance during my studies. His protection and grace have made this research a reality.

A hearty appreciation to my supervisor, Dr. Orly Linovski, for her guidance and support. Your insight and feedback were pivotal in producing this research. I would also like to thank my course instructor, Dr. Rae Bridgman, for her continuous assistance and for providing me with the knowledge and tools necessary to complete this research. My sincere appreciation goes to my external supervisor, Sarah Manteuffel, for her constructive feedback and for challenging me to think critically and improve my work. I am thankful to all the lecturers in the Department of City Planning for their dedication and for imparting their wisdom and knowledge, which have been crucial in my academic development.

A special thanks to Mr. Rosenberg Owusu Adokoh Esq., who has been a father to me for many years now and has been instrumental in my coming to Canada to offer this program. A hearty appreciation goes to the University of Manitoba for the financial assistance through the International Graduate Student Scholarship Fund, the Shirley Bradshaw Scholarship Fund, and the Price Industries Limited Faculty of Architecture Recruitment Award.

Lastly, I thank all the interview participants who avail themselves in contributing to this study. Your participation has been essential in making this study a reality. A warm thank you all for your support.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ACRONYMS

ACA	Accessible Canada Act
ADA	Americans with Disabilities Act
BIZ	Business Improvement Zone
MLPD	Manitoba League of Persons with Disabilities
PDF	Portable Document Format
PWDs	Persons With Disabilities
TA	Thematic Analysis
UK	United Kingdom
UN	United Nations
WHO	World Health Organization

LIST OF DEFINITIONS

All forms of barriers: This includes any form of impedance to mobility in the built environment that obstructs safe and convenient mobility. These include barricades, snow piles, uneven sidewalks, and steep curb cuts.

Disabled: This refers to an individual or group of people who have physical impairment(s) and cannot access the built environment because of some physical barriers within the built environment. Disabled people in this context include people who use walkers, wheelchairs, canes and people who are deaf. (WHO, 2013).

Disability-friendly: In this research, disability-friendly refers to the level of accessibility of the built environment including winter sidewalks for Persons With Disabilities (PWDs), specifically people who use mobility devices such as wheelchairs, walkers and canes.

Mobility-related disability refers to any form of disability that negatively affects one's mobility. This definition is similar to the understanding provided by (Walker et al., 2020) which sees mobility-related disability (MRD) as a person or people who are unable to walk or climb due to a disability (p.21).

Marginalized group: This refers to equity-deserving or vulnerable groups, including PWDs, seniors, caregivers, and people who generally have difficulty using winter sidewalks.

Non-disabled: This refers to an individual or group of people with no physical impairment that hinders their participation in the built environment. This includes people who do not use assistive devices to get around their communities.

Pedestrian Infrastructure: In this research, pedestrian infrastructure refers to any active mode of transportation infrastructure meant to promote safe, convenient, and equitable walking. This

infrastructure includes sidewalks, crosswalks, intersections, footpaths, trails, and other signage or devices such as tactile pads, handrails, and crossing signals that aid mobility (Gamache et al., 2020).

Winter sidewalks: These refer to sidewalks that are experienced during the winter season. They are often covered with snow piles, obstructing pedestrians' mobility.

Persons With Disabilities (PWDs): refer to individuals who have one or more disabilities that hinder their participation in daily life activities.

Note: *These definitions are provided to help external readers understand the terminology used throughout the document.*

1.0 INTRODUCTION

1.1 Background

Many cities in the northern hemisphere, including Canadian cities, face mobility challenges, especially during the winter season (Morales et al., 2014), making it difficult for various groups of individuals such as Persons With Disabilities (PWDs) to comfortably and conveniently get around their communities. Making winter sidewalks disability friendly in Winnipeg is very important for ensuring equitable access to public places, social, and economic opportunities irrespective of people's physical ability. The long winter months in Winnipeg with heavy snow and icy conditions pose a challenge to the safe mobility of PWDs. Over the years, the City of Winnipeg has taken pragmatic measures including the development of the *Snow Clearing and Ice Control Policy* to serve as a framework for maintaining streets, sidewalks and active transportation routes to make them safe and accessible for various road users and pedestrians. The policy classifies streets and sidewalks into three priority levels, with priority one and two sidewalks, especially those along major streets to be cleared within 36 hours after snowfall of 5cm or more (City of Winnipeg, 2021).

Despite the policy measures on winter streets and sidewalks maintenance, people with mobility challenges still struggle to get around during winter. Media reports show that the City of Winnipeg has focused on clearing streets while neglecting sidewalks, making it dangerous and unsafe for mobility device users. For instance, a resident in Winnipeg expressed frustration over the disparity in snow clearing, stating that while 100% of priority one streets were cleared, only 8% of sidewalks and other pathways received the same attention within the same timeframe (Thompson, 2021).

PWDs as an equity deserving group are constantly reaching out to public officials to include their specific needs in the overall functioning of their communities. The *Canadian Human Rights Act* (1977), provides a legislative framework for addressing the specific needs of PWDs in Canada, especially in employment, accessibility, and barrier-free physical environment. Efficient transportation necessary in addressing poverty and social outcomes by enhancing access to essential services and facilities like schools, health facilities, markets, jobs and recreation that are important to the wellbeing of everyone (Rittner & Kirk, 1995; Wagner, Shirgaokar, & Marshall, 2024).

PWDs share equal fundamental rights with non-disabled persons in accessing mainstream services, including healthcare, education, employment, recreational facilities and services, and social protection. The world's population with disability is about 15% with projected future increase (WHO, 2023), making it important to factor the needs of PWDs into planning and policy decisions. According to the Canadian Survey on Disability (2023), over eight million (27%) Canadians aged 15 years and above were found to have one or multiple disabilities that limits their active engagement in life (Statistics Canada, 2023a). In a space of five years, from 2017 to 2022, Canada saw a 5% rise in the number of PWDs, with youth who had a disability increasing over 7%, a significant change from 13% in 2017 to 20% in 2022. Additionally, 29.2% of Manitobans live with one form of disability or the other (Statistic Canada, 2023a). According to Statistics Canada (2023a), challenges regarding the design of sidewalks found in public spaces were most experienced (56%) by persons with disabilities. The Canadian Survey on Disabilities identifies the Canadian population as having a disability with mobility (10.6%), seeing (7.4%) and hearing (5.6%) (Statistic Canada, 2023a). People with these types of disabilities often face challenges with mobility, as current transportation options are primarily designed to better meet or address the

needs of non-disabled persons, neglecting the specific travel and accessibility requirements of those with disabilities (Ong et al., 2024).

1.2 Problem Statement

The Accessible Canada Act (2019) aims to eliminate and prevent barriers across seven domains, which include streets, sidewalks, buildings and parks. The *Accessibility for Manitobans Act* (2013), which predates the *Accessible Canada Act,* was implemented as a legislative milestone to remove barriers affecting people with disabilities and many others within the province. The *Act* provides the Government of Manitoba the legislative framework and process for developing and implementing accessibility standards.

Winter conditions in Winnipeg, Manitoba present significant challenges for individuals with disabilities who rely on sidewalks for mobility. Snow accumulation, ice formation, and inconsistent maintenance can create hazardous conditions, limiting accessibility and increasing the risk of injury. While municipal policies exist for sidewalk clearing, the effectiveness of these measures in ensuring disability-friendly pathways remains uncertain. This study assesses the disability friendliness of winter sidewalks, identifies the challenges PWDs face when using winter sidewalks and evaluate the potential solutions available to making Winnipeg's winter sidewalks more accessible for people with disabilities, identifying key barriers and evaluating current snow removal and maintenance practices. The findings will inform recommendations for improving winter sidewalk accessibility to promote inclusivity and safety.

1.3 Research Questions

The study seeks to explore the disability friendliness of sidewalks in Winnipeg during winter and the ways these sidewalks can be enhanced to facilitate the easy and safe mobility of individuals with mobility-related impairments.

1. How accessible are sidewalks in Winnipeg during winter, specifically for PWDs?
2. What challenges do PWDs face when using winter sidewalks?

1.4 Research Contribution/Significance

This research aims to inform policy makers and the City of Winnipeg on the challenges faced by (PWDs) within the city when using winter sidewalks. It will highlight the need to effectively implement and enforce existing legislations regarding mobility challenges of PWDs and their need to access friendly pedestrian infrastructure. This will enhance policymakers' understanding of the need for inclusivity, especially for PWDs, in accessing mainstream services and opportunities.

Again, this study will reach out to several stakeholders, like land use and transportation planners, urban designers, road contractors, and transportation policymakers, to ensure that pedestrian infrastructure (sidewalks) meets the needs of all members of society, without leaving anyone behind, especially PWDs.

This research will contribute to the current literature on challenges PWDs living and working in Winnipeg face. It will provide empirical evidence on the development of accessible pedestrian infrastructure (sidewalks) and their disability friendliness.

1.5 Research Context

Like many Canadian cities, the City of Winnipeg faces harsh winter weather conditions lasting over many months that affects the city's infrastructure, including sidewalks. For people with disabilities, getting around becomes even harder due to snow buildup, ice, and lack of proper maintenance. These barriers not only make it hard to move but also increase the chances of injuries, limiting the independence and daily activities of those with mobility challenges. The Manitoba League of Persons with Disabilities (MLPD) has spoken about these challenges, calling for better snow-clearing policies that consider current experiences and the widespread nature of the issue. MLPD's efforts stress that the problems caused by slushy and poorly kept sidewalks is a citywide concern and needs to be resolved quickly (Woelk, 2024). Individuals with disabilities face many challenges when using sidewalks. These barriers not only risk the safety of individuals living with disabilities in Winnipeg but also restrict them from enjoying the benefits of actively moving from one place to the other. Limited movement of people leads to multiple inequalities, including reduced access to healthcare and recreational activities, as well as fewer job prospects (Eisenberg et al., 2022; Hammel et al., 2015), potentially resulting in issues of social inclusion (Bascom & Christensen, 2017), and difference in health outcomes (Krahn et al., 2015).

Research indicates that inadequate sidewalk maintenance during winter significantly impacts PWDs, affecting their ability to move freely in public areas (Li et al., 2012). While municipal governments throughout Canada, including Winnipeg, have implemented snow-clearing policies, the effectiveness of these initiatives in creating accessible sidewalks for people with disabilities remains a vital topic for further exploration. Studies have revealed that irregular snow removal, and the absence of universal design principles in winter urban planning leading to social exclusion and heightened safety concerns (Chapman et al., 2019). Therefore, it is crucial to assess

how well winter sidewalks in Winnipeg meet the needs of disabled individuals to promote a more inclusive and fair urban landscape.

1.6 Organization of the Research

This study is organized under six sections. The first section includes the introduction, which presents the study's background, the problem statement, research questions, and the study significance. The second part reviews relevant literature including gaps and challenges. The third part discusses the methodology covering data collection methods including structured accessibility audit and semi-structured interviews, data analysis and presentation, and the study's limitations. The fourth part presents the results and analysis. The fifth part discusses the data, and the sixth part concludes with a summary of future research directions and recommendations.

2.0 LITERATURE REVIEW

2.1 Introduction

As reported in the 2022 Canadian Survey on Disability, 8 million individuals, representing 27% of the population aged 15 and older, recognized themselves as having one or more disabilities. This reflects a 5% increase of PWDs from the 2017 rate of 22% (Statistics Canada, 2023b). PWDs form part of the world's marginalized group (Agmon et al., 2016). Being part of a marginalized group can lead to stigmatization and all forms of unfair treatment. PWDs are seen as the world's most dominant minority, representing more than 1.3 billion (16%) of the world's population, which is still on the increase (WHO, 2023). As the largest minority group, it is important to include PWDs during the planning, design, and engineering of physical infrastructure projects including sidewalks and buildings. To incorporate their specific needs, it is important to bring them to the decision-making table to share their ideas and perspectives regarding transportation and other infrastructure development.

The literature review section of this report summarises and documents the body of work or writing (Knopf, 2006) on the topic, assessing the disability friendliness of winter sidewalks in Winnipeg, Manitoba. This literature review synthesizes research on the accessibility of the built environment especially in North American cities, emphasizing the identification of gaps and challenges present in the current literature. Even though there appear to be a dearth in literature on winter sidewalks, the review focuses on disability and the built environment and how winter conditions serve as barriers to people with mobility challenges.

2.2 Disability and Built Environment

Disability is a human condition that nearly anyone can be susceptible to, and they may experience short- or long-term disability (WHO & World Bank, 2011). The *Accessible Canada Act* (2019) considers disability to include all forms of disablement, whether bodily or sensory, that may be temporary or permanent and may affect a person's participation in social processes (Government of Canada, 2019). According to Petasis (2019), disability can be conceptualized using the three medical, social and biopsychosocial models (p. 42). The medical models consider disability to be a pathology or a medical condition that requires medical professionals to diagnose and treat (Bingham et al., 2013). The social module on the hand conceptualizes disability as negative societal attitudes and poor social, cultural and ideological constructs (Nuwagaba & Rule, 2016 & Wise, 2016). Biopsychosocial models seek to integrate both the social and biological forms of disability by, recognizing that disability is influenced by individual impairments as well as poor social issues (Penney, 2013).

The contemporary definition of disability is not limited to medical models only but focuses on social aspects as well. Today, disability is seen as the relationship between social and environmental factors (WHO & World Bank, 2011). According to Altman (2014), disability can happen at three stages: reduced activity like not being able to move around; impairment in body functioning; and limitation in physical engagement like not being able to work. People can be affected with one or more of these levels of disability which affects their general ability to engage in life activities either temporary or permanently.

Studies have been conducted on disability and related policies on removing barriers in the built environment particularly those that impede mobility for PWDs (Wagner et al., 2024). However, the ableist nature of the built environment skill pose obstacles to the physical

accessibility of PWDs (Imrie & Kumar, 1998). The mobility of PWDs can be obstructed because of a dysfunctional built environment they use roads, sidewalks and pathways in accessing spaces and places (Clarke et al., 2008), while an inaccessible built environment has little to no consequences on the movement of individuals with mild or no disability (Clarke & George, 2005). Despite international policies like the United Nations Convention on the Rights of Persons with Disabilities (UNCRPD), the built environment is yet to address accessibility issues, highlighting the need to remove and prevent all forms of barriers that impede the disability friendliness of the built environment (Jackson, 2018).

2.3 Gaps in Understanding the Accessibility of Winter Sidewalks for PWDs

Research investigating accessible pedestrian infrastructure especially winter sidewalks have been limited. Sidewalks are very important in connecting various neighbourhoods and services, however, they have received limited attention leading to various accessibility issues especially for PWDs (Müller et al., 2023).To promote mobility equity, Eisenberg et al. (2022) argue that some neighbourhoods and communities are taking pragmatic steps to design and construct more inclusive pedestrian infrastructure by producing plans to remove barriers impeding active pedestrian mobility. Notwithstanding the studies on the built environment and how to make transportation infrastructure accessible to all, PWDs still perceive mobility inequality within their neighbourhoods and active community spaces (Hwang, 2022).

Existing studies have indicated that winter conditions on sidewalks can significantly worsen mobility issues for individuals with disabilities, primarily due to the accumulation of snow, formation of ice, and insufficient maintenance (Lemaire et al., 2010; Lindsay & Yantzi, 2014). Evidence suggests that inconsistent snow removal and ice accumulation create physical obstacles, complicating navigation for those using wheelchairs, mobility scooters, or canes (Giesbrecht et al.,

2024; Ripat et al., 2020). Additionally, these challenges heighten the likelihood of slips and falls, even among those without mobility limitations with some sustaining injuries (Roseman & Yeoman, 2024). Nevertheless, much of the current research on winter sidewalk accessibility tends to concentrate on the general urban population, often overlooking the specific requirements of disabled individuals. For example, while (Yang et al., 2020) investigate overall pedestrian mobility in winter, they do not specifically consider how these barriers affect PWDs, including those with visual and physical impairment.

In addition to physical obstacles, the presence of inaccessible sidewalks can lead to considerable social and psychological effects. According to Lindsay and Yantzi (2014) individuals with disabilities frequently face increased social isolation during the winter months due to challenges in mobility (Lindsay & Yantzi, 2014, p. 5). They study further revealed that these individuals encounter multiple vulnerabilities that hinder their involvement in social and recreational activities. These challenges include physical obstacles that contribute to social exclusion, concerns regarding health and safety, and psychosocial factors like anxiety, feelings of isolation, and reliance on others. A further study by Kapsalis et al. (2024) also highlights the wider consequences of unsafe pathways, particularly those caused by uneven or narrow sidewalks. These conditions reduce individuals' motivation to go outside and negatively impact their self-esteem. This hesitance to participate in outdoor activities can lead to social isolation and a reduced community interaction (Kapsalis et al., 2024, p.613).

Municipal regulations and snow removal standards are essential for maintaining accessible sidewalks. Research conducted in other cities with cold climates indicates that efficient snow-clearing methods can greatly enhance accessibility (Giesbrecht et al., 2025). Although these regulations exist, there is a scarcity of studies assessing how well they meet the specific

requirements of pedestrians with disabilities. However, a significant issue identified in the literature is the absence of comprehensive assessment tools designed to evaluate the disability-friendliness of sidewalks in winter conditions (de Deijn & Bukralia, 2024). Although accessibility audits are available, very few take into account winter-specific factors, including how snow and ice affect tactile paving and curb cuts (World Institute on Disability, 2022). This shortcoming highlights the necessity for localized and seasonal assessments that consider the specific needs of PWDs.

Consequently, effective urban planning that is inclusive needs to take into consideration the active involvement of disabled communities to understand their experiences and priorities. Although participatory methods are increasingly acknowledged as best practices in urban design (Arnstein, 1969), there is still a significant gap in research that includes disabled residents of Winnipeg in conversations regarding winter sidewalk accessibility. Research by Tewdwr-jones & Wilson (2022), emphasizes the importance of co-designing accessibility solutions, but such approaches remain underutilized in the context of winter mobility.

Although current research has explored multiple facets of sidewalk accessibility, there is a dearth of studies that focus on the barriers presented by winter weather conditions and mobility (Ripat et al., 2024). This lack of studies in the literature highlights an important area that remains insufficiently investigated, especially regarding how snow and ice affect pedestrian movement and safety. Similarly, most of the research that have examined sidewalk accessibility in urban areas have often overlooked seasonal changes. For example, studies on pedestrian access in Latin American cities focus on overall sidewalk conditions, failing to consider the extra barriers posed by winter weather conditions (Stefanidis & Bartzokas-Tsiompras, 2024).Limited research on winter sidewalk accessibility reveals a significant gap in the existing literature. It is crucial to fill

this gap to create effective strategies that guarantee safe and accessible walking routes throughout the winter season.

2.4 Challenges/Barriers to Accessing Winter Sidewalks for PWDs

Even though many commuters in Canada travel by car (Statistics Canada, 2023c), sidewalks and other pedestrian infrastructure are a means of getting around whether on foot or with mobility devices which allow people to access different places and activities including places of work, school, recreational spaces and grocery shops (Padilla, 2019). Despite the growing need to make pedestrian infrastructure including sidewalks disability friendly, it is still difficult for PWDs to navigate their neighbourhoods with ease due to some barriers like broken walkways, narrower width and steep curb ramps and cuts (Eisenberg et al., 2020). The general barriers on sidewalks do not only make it difficult for PWDs but also for non-disabled persons to get around (Li et al., 2024). This implies that improving and making sidewalks accessible is important for the public to enjoy equitable access to places and opportunities.

Poor clearance of accumulated snow and ice on sidewalks is one of the key barriers to accessing winter sidewalks. Winter conditions make it difficult for people who reply on mobility aids to comfortably and adequately participate in everyday life (Ripat et al., 2015). Snow and ice on sidewalks make them slippery, which causes people, especially PWDs, to fall and suffer serious injuries (Roseman & Yeoman, 2024). Snowfall during the winter season contributes greatly to the inaccessibility of winter sidewalks forcing people to use alternative means of transportation such as wheelchair transportation services including taxis an Uber to get around (Alan & Marilyn, 2007; Lindsay et al., 2015), which have cost implications. Also, steep curb cuts and invisible pedestrian markings pose a significant barrier to using sidewalks especially for PWDs. Additionally, poor condition or absence of pedestrian signals such as push buttons, lights and tactile pads make it

difficult for PWDs to use sidewalks (Tajgardoon & Karimi, 2015). Tactile surfaces and ramps may be covered with snow, which can be a challenge for people who use mobility devices, especially canes (Wee & Paterson, 2009).

2.5 Summary

The population of PWDs continues to grow globally, with the increasing need to factor the specific needs of PWDs into the designing and construction of infrastructure projects in the built environment. Sidewalks, as a form of mobility infrastructure that aids people to move around, are still plagued with barriers that inhibit the easy movement of PWDs. Even though there have been international, national and provincial policies on removing transportation-related barriers that impede the accessibility of social and economic spaces, there is still much to be done. Politicians, urban and transportation planners, transportation engineers, contractors, and other relevant stakeholders all have a key role to play in making winter sidewalks accessible. Accessible (winter) sidewalks can improve the lives of PWDs by increasing their social participation and independent mobility and ensuring that equity and inclusion are achieved on the part of PWDs.

3.0 METHODS

3.1 Introduction

This section covers data collection sources and methods, data analysis and presentation, and the study's limitations.

3.3 Data Collection Sources and Methods

Two main methods and instruments were deployed to adequately gather relevant data within Winnipeg, Manitoba, including a structured audit and semi-structured interviews. A structured audit was used to gather field data on the conditions of winter sidewalks in Winnipeg. In contrast, a semi-structured interview was used to gather qualitative data regarding the accessibility of winter sidewalks and the barriers PWDs face when using these sidewalks.

Data was obtained mainly through a structured accessibility audit and semi-structured interviews with people who work with disability organizations in Manitoba, whilst secondary data was gathered from published reports, academic papers and institutional websites. The *Accessible Canada Act (2019)* was also reviewed to obtain information on the general transportation needs of PWDs including the integration of the needs of PWDs into the fabric of the urban built environment.

3.3.1 Structured Audit

To address the first research question, a structured accessibility audit was used as a tool to gather field data on the conditions of winter sidewalks in Winnipeg. According to Mullarkey (1984) a structured audit is characterized by a significant framework, where various aspects of the audit are distinctly interconnected. It follows a set procedure and adheres to a clear organizational pattern. A structured audit guide (*see Appendix B*) was developed using the *Americans with*

Disabilities Act and the *Accessible Canada Act.* Five different neighbourhoods in Winnipeg were visited to look at and record the state of sidewalks during the winter season, paying attention to aspects like snow buildup, ice, and surface texture. The neighbourhoods considered for this research are South Portage, Broadway-Assiniboine, Corydon, Linden Woods and Southdale.

These neighbourhoods (urban and suburban) were selected to cater to Winnipeg's varying urban mix as they feature mature and recent neighbourhood characteristics. The criteria for selecting the neighbourhoods were a) Presence of a sidewalk: To qualify, there had to be at least a sidewalk on one side of the street in both the urban and suburban neighbourhoods. b) Accessibility to public transit: for a neighbourhood to qualify for selection, it needed to be accessible to public transit with buses being available within 5 and 30 minutes for urban neighbourhoods and suburban neighbourhoods, and c) Population Density: this criterion was used as a way of determining the demand for accessibility, as denser neighbourhoods rely on walking and public transit. A population density of 2,000 per km^2 and above was used as a yardstick in selecting neighbourhoods that required sidewalks for daily mobility and access to services. Table 1 below shows the various neighbourhoods, their population and selection criteria.

Table 1: Neighbourhood Selection Criteria

Neighbourhood	**Population**	**Presence of a Sidewalk**	**Accessible to Public Transit**	**Population Density (per km^2)**
Broadway-Assiniboine	6,075	√	√	15,452.2

Corydon	14,000	√	√	3,725.7
South Portage	2,330	√	√	2,823.2
Linden Woods	9,410	√	√	2,685.1
Southdale	6,410	√	√	2,123.1

Source:(City of Winnipeg, 2021)

A standardized checklist was developed to evaluate accessibility features, including curb cuts, ramps, and tactile surfaces. A formal structured accessibility audit was conducted based on established guidelines, using the Accessible Canada Act (ACA) and the Americans with Disabilities Act (ADA). The criteria developed were narrowed to only winter accessibility features of sidewalks as opposed to existing accessibility audit checklists which are usually broad in nature. The checklist was strictly developed using the above-mentioned *Acts,* as there are varying accessibility legislations and guidelines within different jurisdictions. Photography was also used to capture and record findings.

The audited streets were selected based on their level of business and priority. Priority one and two streets are usually busy and are supposed to be cleared on time according to the City's *Snow Clearing and Ice Control policy.* All the audited streets in the urban neighbourhoods were priority one streets, while those in the suburban neighbourhoods were priority two streets.

3.3.2 Semi-structured Interviews

Relevant information was gathered from leaders and individuals working with disability organizations in Winnipeg using semi-structured interviews. This method was used to find comprehensive information and understand the subject matter by asking interviewees questions

based on the topic and predetermined questions (Knott et al., 2022). To this effect, an interview guide (*see Appendix B*) was developed to elicit qualitative data. Potential interview participants were identified and recruited by searching publicly available information online. The online sources comprised publicly available contact information for persons with disability organizations' websites. After identifying possible participants, I contacted potential participants via email, bearing in mind the privacy of prospective participants.

Eight (8) interviews were undertaken for this research project to understand PWDs' challenges in navigating sidewalks during winter. The interviews were conducted to understand what has been done so far to enhance the mobility of individuals who use wheelchairs, walkers and canes during winter and what they think are some of the practices that city authorities and other relevant stakeholders have to adopt to make winter sidewalks more disability friendly. The semi-structured interviews enabled me to ask probing questions of the interviewee where necessary. Probing questions were used to clarify an interviewee's answer, as needed. Interviews took place over the University of Manitoba's licensed Zoom platform. They were audio-recorded (after seeking consent from participants in a signed consent form), which were later transcribed. The interviews lasted between 30 and 60 minutes.

3.5 Data Analysis and Presentation

Four main steps were considered to analyze the audit data for the first research question. These are 1) Review of Audit Data: this includes the manual computation of audit results and data review of all entries to ascertain accuracy and reliability, 2) Identification of Accessibility Issues: after the data was carefully reviewed, all accessibility issues about the research were identified including the accessibility of crosswalks, curb cuts and tactile surfaces, 3) Categorization of Issues

into Themes: all the accessibility issues identified in the second step were put under various themes, harmonizing all the issues under their unique umbrellas, and 4) Report Writing: the final step saw the writing of a report base on all the identify issues and their themes as seen in section 4.1.2 below.

A qualitative data analysis method was used for this study to examine especially the data that was obtained with the semi-structured interviews. Information gathered from participants was sorted through transcription, data cleaning (removing errors) and processing, which included coding and editing before entering the data. The first step involved converting audio recordings from the field into text using the transcription feature in Zoom and Microsoft Word 365.

Because of the qualitative form of the data, a thematic analysis (TA) was applied using inductive and deductive approaches which influence data coding and analysis. In conducting the TA, six processes proposed by Braun and Clarke (2006), were adopted as follows; 1) Data familiarization: this involved converting data into text and thoroughly examining it multiple times while jotting down note, 2) Developing Codes: involved reading through all the transcripts and identifying information that are related to a specific code, 3) Identifying Themes: organizing codes under possible themes and collecting all data associated with the themes, 4) Examining Themes: evaluating and examining themes to make sure they cover relevant codes, 5) Naming Themes: involved the examination of each theme by double checking all the details of each theme and assigning a title, and 6) Report Writing: choosing striking and engaging extracts, conducting a thorough analysis of these selections, connecting the findings back to existing studies and the research questions and writing a report.

The text from the interview transcripts were coded to generate themes according to the steps of the TA framework by Braun and Clarke (2006). The codes and themes were generated using inductive and deductive approaches. For the inductive approach, codes and themes were generated from the interview results, while the deductive approach took the form of pre-determined codes and themes.

3.7 Limitations of the Study

The harsh weather conditions made it extra challenging to conduct the accessibility audit. No matter the winter clothing I wore before going out, it was usually too cold to stay out for up to 20 minutes. To mitigate this limitation, I had to run into nearby stores to avoid the freezing nature of the weather as it was very difficult to record the findings with gloves on. I had to take pictures of the sidewalk conditions, run into a building, and record my findings in the structured audit guide.

Due to course time constraints and ethics review processes (PWDs are regarded as a vulnerable population), a focus group discussion and personal interviews involving PWDs were not conducted. However, to address this limitation, leaders and other individuals working with disability organizations were interviewed to solicit relevant information regarding the winter mobility experience of PWDs. During the interviews, some participants were identified as PWDs, which played a key role in understanding the live experiences of PWDs.

4.0 RESULTS AND ANALYSIS

The findings of the study are presented under the primary data collection methods employed in the study. Section 4.1 summarizes the results from the structured accessibility audit in the five main neighbourhoods within Winnipeg to answer the first research question. Section 4.2 uses a thematic-based approach by Braun and Clarke (2006) to present the findings of the data obtained from the interviews, which addressed the second research question about PWDs' challenges when using winter sidewalks.

4.1 Structured Audit

A total of 22 streets with sidewalks were assessed. The average weather condition for the five (5) days combined was -5° C (It feels like -8.8C). The names of the streets that were assessed, the state of the weather, and the time of the day for all five days are shown in Table 2 below. Maps of all the streets assessed can be found in *Appendix C*.

Table 2: Assessed Streets, Weather Condition and of Time of Day

Day/Date	**Streets Assessed**	**Weather Condition**	**Time**
Friday-27th December, 2024	Main St, Portage Ave, Saint Mary's Ave, York Ave, Garry St, Graham St	-1° (feels like -7°)	10:13 am to 1:45 pm
Saturday-28th December, 2024	Broadway, Assiniboine Ave, Donald St, Smith St, Edmonton St, Carlton St, Kennedy St	1° (feels like -4°)	10:05 am to 2:15 pm

Monday-30th December, 2024	Corydon Ave, Stafford St, Arbuthnot St, Hugo St	-3° (feels like -9°)	10:20 am to 2:50 pm
Thursday- 2nd January, 2025	Beaverhill Blvd, Lakewood Blvd, Vermillion Rd,	-8° (feels like -13°)	10: 35 am to 12:20 pm
Friday-3rd January, 2025	Lindenwoods Dr, Victor Lewis Dr	-4° (feels like -11°)	11:03 am to 1:12 pm

Source: Field Data, 2025

4.1.1 Summary of Accessibility Audit Data

Table 3 below summarizes the accessibility audit data on sidewalk accessibility during winter, focusing on physical barriers, surface conditions, and access to essential pedestrian features. Many sidewalks (64%) were covered by snow piles, reducing their width. Additionally, 77% of sidewalks had ice and slippery conditions, making them very dangerous for pedestrians. Uneven surfaces due to snow accumulation were present on 41% of sidewalks, while 73% with curb cuts and ramps were inaccessible due to snow and ice. Tactile surfaces at curb cuts and ramps were also covered by snow in 91% of cases, reducing accessibility for visually impaired individuals. Crosswalks mainly were free of snow (77%), but many were covered in water, posing additional challenges.

Furthermore, pedestrian buttons were inaccessible (86%) primarily due to snow accumulation at crossing poles. Sidewalk slopes were steep due to snow and ice, making mobility difficult for mobility device users (68%). While 82% of sidewalks had sand or salt applied, especially in the urban neighbourhoods, only 27% of sidewalks leading to building entrances were

cleared. The situation was even worse at bus stops and shelters, where only 9% were fairly accessible for individuals using mobility devices.

Table 3: Results of Accessibility Audit

Accessibility Criteria	***Yes (%)***	***No (%)***	***Observations and Remarks***
Are there any obstructions such as snow piles, garbage heaps, and sand that reduce the clear width of the sidewalk (less than 36 inches)?	14 (64)	8 (36)	There were no garbage heads or sand. However, most of the sidewalks had snow piles along the sidewalks
Is the sidewalk surface free of ice and slippery conditions?	5(23)	17(77)	Almost all the sidewalks were covered with snow.
Is any part of the sidewalk with an uneven surface due to snow piles?	9(41)	13(59)	More than half of the sidewalks had uneven surfaces because of snow piles
Are curb ramps and cuts free of snow and ice, and clear for access?	6(27)	16(73)	Most of the ramps and curb cuts were not free of snow.
Are tactile surfaces present and clear of snow/ice at curb cuts and ramps?	2(9)	20(91)	Even though there are tactile surfaces at the curb cuts of most of the sidewalks, they were covered with snow

Are crosswalks free of snow and ice, making them accessible to people who use wheelchairs, canes and walkers?	17(77)	5(23)	Most of the crosswalks were free of snow. However, they were covered with water.
Access to pedestrian buttons clear of snow?	3(14)	19(86)	Not all the streets had pedestrian buttons. However, most of them were not accessible, as there were piles of snow at the foot of the pedestrian crossing poles.
Are the sidewalk slopes shallow enough for mobility device users?	7(32)	15(68)	The snow and ice on the sidewalks made them less shallow for mobility device users
Has sand or salt been applied where needed on the sidewalk?	18(82)	4(18)	Most of the sidewalks especially in the urban neighbourhoods had salt/sand applied
Are sidewalks leading to building entrances clear of snow?	6(27)	16(73)	Most building entrances, especially storefronts had their sidewalks cleared
Are nearby bus stops, shelters, and transit access points clear of snow and accessible for people using mobility devices?	2(9)	20(91)	Almost all the bus stops and shelters assessed were inaccessible for people using mobility devices.

Source: Field Data, 2025

4.1.2 Assessment Criteria Grouping

The assessment criteria used in the audit have been grouped into four main categories: sidewalk condition and surface safety, curb cuts, ramps, and crosswalk accessibility, pedestrian infrastructure and mobility support, and public transit and connectivity.

4.1.2.1 Sidewalk Condition and Surface Safety

The presence of snow piles reduced the clear width of the sidewalks and served as an obstruction to the mobility of persons who rely on mobility devices like wheelchairs, walkers, and canes. The assessed sidewalks were covered with snow and ice (64%), creating uneven surfaces and reducing their width, with some of them looking like walking paths, as seen in figures 1 and 2 below.

Figure 2: Sidewalk covered with snow with sand applied - Edmonton Street

Figure 1: Sidewalk with Slippery Conditions – Lakewood Boulevard

4.1.2.2 Curb Cuts, Ramps and Crosswalk Accessibility

All the streets with crosswalks were cleared of snow and ice with patches of water. However, the curb cuts and ramps of most of the streets were not cleared. Table 4 below shows the streets' priority levels, the number and percentage of the streets with cleared and uncleared curb cuts and ramps.

Table 4: Level of Priority with Cleared and Uncleared Curb Cuts and Ramps

Level	Total	Cleared Curb Cuts and Ramps (%)	Not Cleared Curb Cuts and Ramps (%)	Total (%)
Priority One	17	3 (18)	14 (82)	100
Priority Two	5	1(20)	4(80)	100

Source: Field Data, 2025

Source: Field Data, 2025

Figure 4: Ice covering a tactile surface - Beaverhill Boulevard

Figure 3: Snow-free crosswalk with patches of water – Carlton Street

4.1.2.3 Pedestrian Infrastructure and Mobility Support

Out of the 22 streets, 6 (27%) were observed to have accessible sidewalks leading to building entrances as there was little to no snow or ice on them. These sidewalks were mostly in front of storefronts or businesses that had their sidewalks cleared to the pavement. However, the entire stretch of the sidewalks in these areas was not cleared. This can be seen in figures 5 and 6 below.

Figure 6: Snow-free sidewalk leading to a shop – Corydon Avenue

Figure 5: Snow-free sidewalk at a storefront - Broadway

Also, not all the streets had pedestrian buttons, as they were found on major streets. Only 5 (23%) of the streets assessed had pedestrian buttons. None of the pedestrian buttons on these streets were accessible as they were significant piles of snow and ice at the foot of the poles (see figure 7), making them difficult for especially people using wheelchairs to easily access them. Additionally, most sidewalk slopes are designed to be gentle for people using mobility devices. However, snow piles make these slopes steeper, making it harder for these devices to move easily as seen in figure 8 below.

Figure 8: Pedestrian button pole with snow pile at the foot - Lindenwoods Drive

Figure 7: Steep curb cut due to snow pile - York Street

4.1.2.4 Public Transit and Connectivity

Out of the 22 streets assessed, 9 (41%) had bus shelters. According to the City of Winnipeg Street classification for snow and ice clearing, all 9 streets are within the priority one and two categories. However, none of the 9 streets had accessible bus shelters.

Table 5: Streets and Level of Accessibility

Streets	**Number**	**Percentage (%)**
Streets with shelters	9	41
Streets with only stops	13	59
Streets with fairly accessible stops	2	9
Streets without fairly accessible stops	20	91

Source: Field Data, 2025

During the audit, it was discovered that bus shelters were mostly found on major streets, with the less busy streets having just stops. Only 2 streets, representing 9%, had fairly accessible bus stops as these stops were clear of snow (see Figure 9). However, 20 out of the 22 streets, representing 91%, had inaccessible bus stops due to significant quantities of snow piles, as seen in Figure 10.

Figure 10: Snow-free bus stop – Lakewood Boulevard

Figure 9: Inaccessible bus stop – Corydon Avenue

Note: The researcher took all images during the accessibility audit.

4.1.3 Difference/Similarities Between Urban and Suburban Areas from the Audit

More urban (priority one) streets had more cleared sidewalks than the suburban neighbourhoods. The cleared sidewalks on these streets were usually found in front of buildings and storefronts. Even though a few cases of this situation were observed in the suburban neighbourhoods more were found in the urban areas with examples on Broadway, Portage Avenue and Corydon Avenue. The sidewalks, especially on Broadway and Portage Avenue, were relatively better cleared due to their function and the number of people who use those street as compared to other priority one streets like Edmonton and Carlton streets, which were observed to have huge piles of snow.

Another interesting observation was that most bus shelters were found on the priority one streets in the urban neighbourhoods. However, none of these shelters were cleared as snow was

seen to cover in the entrances of the shelters. Interestingly, a couple of bus stops in the suburban areas were found to be cleared of snow, a phenomenon that was expected to be seen in the urban areas. These cases were seen on the Beaverhill and Lakewood Boulevards. A common feature observed was that a significant number, 18 (82%) of both priority one and two sidewalks in the urban and suburban areas had sand/salt applied on them.

4.2 Semi-structured Interview Results

Assessing the disability friendliness of winter sidewalks in Winnipeg is a social phenomenon, and as such, a qualitative approach in the form of semi-structured interviews was needed. This approach helped to gain an understanding and perspectives of the challenges PWDs face while using winter sidewalks and some of the possibilities available to make winter sidewalks more accessible.

Leaders and individuals who work with disability organizations were interviewed as they are seen as people familiar with the day-to-day experiences of PWDs. Eight (8) individuals were interviewed from different organizations. Out of the eight individuals who were interviewed, six (6) were females, and two (2) were males. Five (5) participants were PWDs, while three (3) were not.

4.2.1 Coding and Generating Themes from Interviews

Table 5 illustrates the codes and themes generated from the text of the interview transcripts. Five main themes were generated through the coding process. These themes are mobility challenges of using winter sidewalks, impact on social and economic participation, emotional and mental health impacts, advocacy work, and potential solutions.

Table 6: Codes and Themes

Themes	**Main Code**	**Sub-Code**	**Number of Participants**
Mobility Challenges of Using Winter Sidewalks	People most impacted by winter sidewalks	Persons with disabilities disproportionally affected	8
		Everybody	5
		People with babies who use strollers	2
		Seniors	3
		People with sight loss	2
	Complaints using sidewalks	Uneven sidewalks	4
		Holes and cracks	4
		Snowbanks	3
	Concerns about City authorities snow clearing	Better cleared sidewalks in some communities	4
		Privatize sidewalk clearing	2
	Where are sidewalks easier or hard to use	Few sidewalks are relatively accessible including those around the Downtown BIZ	2

		Most sidewalks are inaccessible	6
	Role of assistive devices	Cane, wheelchairs and walkers	4
		Struggle to use devices	5
		Devices get stuck sometimes	3
		Frustrating	2
Impact on Social and Economic Participation	Impact on travel to specific destinations	Grocery shopping	3
		Medical appointments	3
		Work	4
		Businesses	5
		Visit friends	3
	Alternative ways of getting to destinations	Handy vans	4
		Ride hailing	2
		Taxi services	2
		Impact of poor sidewalks on different types of modes	4
	Change In daily routine/activities	change in daily routine or activities	4
		Anxiety	3

Emotional and Mental Health Impacts	Emotional and mental health challenges	Fear	5
		Depression	3
		Isolation	5
Advocacy Work	Campaigns	Snow -plow campaign	4
		Media campaign	4
Potential Solutions	Features, policies and practices from elsewhere	No particular policies from participants. Believe timely clearing of snow will help	6
	Most pressing concern	Regular clearing of snow is the best way to go	6

Source: Field Data, 2025

4.2.2 Mobility Challenges of Using Winter Sidewalks

Inaccessible winter sidewalks affect everyone whether non-disabled or disabled. During the interviews it was pointed out that some groups of people are affected more than others when it comes to the use of winter sidewalks. People who walk, use baby strollers, wheelchair users and people who use walkers and canes all suffer the adverse effects of inaccessible sidewalks. However, four out of the eight participants *(Interview Participants 1,3,4 and 8)* indicated that PWDs were more directly affected by the inaccessibility of winter sidewalks:

> *"I would say people with mobility issues and those with disability, including members of the sight loss community because it does affect their mobility and their ease of moving around the built environment with either or no limited sight when the sidewalks are not*

adequately cleaned. There is difficulty with wayfinding because much travel depends on using the tactile sensitivity of the environment around you or what you feel under your feet with the sidewalk, whether you are traveling with a cane or a dog. So, all of that becomes obscured and more difficult when there is a layer of snow or not adequately cleaned snow". (Interview Participant 6)

Due to the issue of low budgetary allocation to snow clearing activities, the City of Winnipeg is unable to adequately clear the snow in most neighbourhoods regularly *(Interview Participant 1)*. Some participants stressed that some neighbourhoods such as the Downtown area was better cleared than others because a lot of people within the area do walk rather than drive *(Interview Participant 6)*. Additionally, these participants continued to state that some neighbourhoods were treated poorly when it comes to snow clearing because those neighbourhoods have been identified to be dominated by affluent people who own and drive cars all the time and hence, do not use the sidewalks *(Interview Participants 3,4 and 6)*. These were the responses given by some of the participants on the City authorities snow clearing activities:

"There are some areas of snow clearing that are privatized especially in the Downtown area. The city doesn't have enough budget to do the kind of snow clearing we want to see. So, they have put some of their own money as a Downtown BIZ to kind of fill that gap but I'm not quite sure where those borders are where the Downtown BIZ takes over from the city's work". (Interview Participant 3)

In terms of using assistive devices to aid mobility, more than half of the participants *(Interview Participants 2,3,4,5 and 8)* admitted the little support these devices render to their members to aid them move around. However, using these devices were not without challenges. It

was stated that people who use wheelchairs, walkers and canes struggle to use these devices during winter *(Interview Participants 4 and 5).* Wheelchairs and walkers sometimes get stuck especially when there is a lot of snow on the sidewalks *(Interview Participant 8).*

> *"Well, if you don't have good wheels, basically you're doomed. Because if you don't have the wheels that you need to actually get through the snow like I said, it becomes very difficult to get to even somewhere that's very close to you". (Interview Participant 5)*

4.2.3 Impact on Social and Economic Participation

Some PWDs change their daily routines during winter to stay away from the harsh weather conditions and the inaccessible nature of the sidewalks. Some of these people are referred to as "shut-ins", as they are unable to attend to their daily life activities such us visiting friends, going for grocery shopping and going to work (Interview Participant 4 and 7). When participants were asked if PWDs change their daily routine during winter, these were their responses:

> "*We're called shut-ins for a reason and we're shut-in in the winter times, be that you want to make a doctor's appointment, or you want to go see your friend. It's too difficult to manage during this time". (Interview Participant 7).*

Some interviewees *(Interview Participants 3,5 and 6)* stated that other PWDs who do not want to change their daily routine or stay home have to use alternative transportation to either go to work, school or to visit friends, with some resorting to the use of paratransit, taxi and ride hailing services. However, these services can sometimes be costly especially taxis and ride-hailing services. These vehicles are mostly not disability friendly, but they still have to use them because it is the only means through which they can get to their schools or places of work.

"Well, they go anywhere and everywhere. I mean, like anybody else in the community, they want to get out and be active so they can go anywhere from the gym to restaurants to malls. If they're students, they're navigating to class. Anywhere you would imagine any other member of the community going, that's where members of our community would go, and if they're unable to go there through walking or conventional transit. They would use the paratransit system or taxi which sometimes can be unreliable". (Interview Participant 6)

Some PWDs use different means to obtain their daily sustenance, including sending people on errands or using online shopping systems, as one participant stated.

"I would say so. Personally, in terms of grocery shopping, now that we can do it online, I usually do my grocery shopping online and they come, and they drop off my groceries and then all I have to do is put them away". (Interview Participant 2)

4.2.4 Emotional and Mental Health Impacts

Five out of eight of the participants *(Interview Participants 2,3,4,6 and 7)* expressed how staying indoors for a prolonged period of time had on the emotional and mental health of some of the people they work with. Participants stressed that there is always fear, anxiety, isolation and depression because of either using winter sidewalks or staying indoors all winter.

"Oh, I would imagine, yes, of course there are. Like I was saying earlier, there are people that don't go out of their homes all winter. You can imagine the effect it has on people's mental health. And just speaking for myself I know when I'm trying to navigate and the sidewalks are not clear, it sure starts to feel like the city doesn't care about me. The city doesn't care about my safety, and what I need to do". (Interview Participant 3)

Interviewees also discussed how some PWDs slip and fall which causes injuries and therefore deter them from going out during the wintertime *(Interviewee Participants 2,6 and 7*). In responding to the question on whether there are emotional and mental health challenges PWDs face when they have difficulty accessing winter sidewalks, some of the participants remarked:

> *"Oh, absolutely. Like, I mean if blindness isn't your only concern than if you have mobility issues, there's fear and anxiety, risk of falling, depression, isolation, the inability to leave your house when you want to do the activities you want to do all of those things". (Interview Participant 6)*

4.2.5 Advocacy Work/Efforts

Participants were asked if they are involved in any form of advocacy on behalf of their members and what the response have been like especially from relevant stakeholders including City authorities. Out of the eight participants, four of them were directly involved in advocacy work on winter sidewalk maintenance. *Interview Participants (1,2,3 and 6)* are currently working together on the *snow-plow campaign* which is seeking to create awareness and the platform for people to be able to take pictures of poor winter sidewalks and post them on their Facebook and Instagram pages. It was indicated that City authorities have been doing their best to address some of the winter sidewalk concerns however, they are unable to adequately address these issues due to financial challenges *(Interview Participants 1,2 and 3)*.

> *"Yeah. So last year, I initiated what we're calling the Snow-plow campaign, which is a collaboration of different disability and seniors organizations trying to encourage the city and operators to do a better job clearing sidewalks. That campaign basically is urging people to send their photos and stories of improper snow clearing to us, then share that*

information with the city. The city told us they find that very helpful. We've also done a lot of media about it, like today for example, we found out that the pilot that the city was proposing in their budget to wait till roads were at 15 centimeters before clearing that looks like that's going to get cancelled now because of public pressure so I'm very grateful to you, John, for pushing our meeting up a little bit today because I've got media calling me this afternoon and getting my input on that". (Interview Participant 3)

4.2.6 Potential Solutions

In terms of potential solutions including policies and practices from elsewhere that the City of Winnipeg could adopt, six out of the eight participants did not really have any practices from elsewhere to share. However, *Interview Participant (1)* mentioned Russia and how the City of Winnipeg could adopt new technologies like hydronic and electric systems that are used to melt ice on sidewalks especially at the busiest parts of the City. Additionally, it was also found out that, extending the skywalk system in the Downtown area could help make that section of the City more accessible since these skywalks are covered from snow *(Interview Participant 1)*. Also, two *Interview Participants (1 and 4)* indicated that it was important to develop a policy that allows private property owners to clear the sidewalks in front of their homes as practiced in other Canadian cities. However, the problem with this solution is that there is going to be a lot of burden on homeowners with disabilities and other equity issues with outcomes being more uneven.

"Well, I can just give you things that are talked about. Sometimes I'm hesitant to kind of point, you know, all to a thing and say this is what's going to save it all other than money. There are no silver bullets, you know, I mean, I said it's a budget item. Like many other things the more you spend on it, the faster it's going to happen for you. Like it is really that simple but in terms of like outside of that question, how can we use the money more

effectively. Well, these kinds of things I suppose would be more than Winnipeg. For example, there is no responsibility on private property owners to clear the sidewalk in front of their homes, residentially. So, in other cities, even other cities in Canada, I think Edmonton might be one of them. Regina might be one as well, private homeowners are required to clear their sidewalk right". (Interview Participant 1)

Interview Participants (2,3,5,6,7 and 8) could not point specifically to policies or practices elsewhere, however, they commented on how important it is to have a balanced snow clearing policy that is more consistent. These were the remarks of some participants:

"I don't have specifics policies. But I think that there are winter communities that have a more balanced snow clearing policy where they clear all the major roads first and then all of the minor roads and then all of the major sidewalks and then all of the minor sidewalks… If we want people to have access to services, if we want people, a majority of our population to participate economically, we need to have a more balanced look at how we clean our winter roads and sidewalks". (Interview Participant 2)

The study also sought to identify what participant felt was the most pressing concern that was needed to be addressed to make winter sidewalks disability friendly. Three out of the eight participants *(Interview Participants 6,7 and 8)* provide a similar response about timely snow clearing:

"Just cleaning the snow so travel can be safe and accessible in a timely manner so that everybody despite what abilities they have can navigate the built environment the way they choose". (Interview Participant 6)

4.3 Summary of Key Findings/Results

1. ***Sidewalk conditions and safety concerns:*** Snow piles significantly reduced the clear width of sidewalks, obstructing movement for persons using wheelchairs, walkers, and canes. Despite the application of sand, many sidewalks remained unsafe due to ice and snow piles. Uneven surfaces from snow accumulation made mobility difficult, and in some cases, sidewalks looked like narrow footpaths.
2. ***Curb cuts, ramps, and crosswalk accessibility:*** Most curb ramps and cuts were not cleared, with only 27% being free of snow. Tactile surfaces at curb cuts were often covered, affecting visually impaired individuals. While major streets like Portage Avenue and Corydon Avenue had better-maintained crossings, pedestrian buttons were largely inaccessible due to snow piles blocking access.
3. ***Public transit and connectivity issues:*** Bus shelters were found mainly on major streets, with most stops being inaccessible due to heavy snow accumulation. Only 9% of nearby transit stops were accessible for individuals with mobility challenges.
4. ***Challenges faced by PWDs during winter:*** Interviews individuals working with disability organization highlighted that sidewalks impact everyone but disproportionately affect PWDs, seniors, and caregivers with strollers. Snow-clearing services were inconsistent, with the Downtown area receiving better maintenance than suburban neighbourhoods. Assistive devices, such as wheelchairs and canes, provided limited support as they often got stuck in the snow.
5. ***Social and economic impact of inaccessible winter sidewalks:*** Many PWDs changed their daily routines during winter, while choosing online shopping and delivery services to avoid going outside to use the sidewalks. Some relied on paratransit and ride-hailing services,

though these were expensive and often not fully accessible. The inability to navigate sidewalks resulted in isolation, preventing PWDs from engaging in work, and social activities.

6. ***Emotional and mental health effects:*** Inaccessible sidewalks led to increased anxiety, depression, and fear of injury. Many PWDs felt neglected by city authorities due to poor winter sidewalk maintenance. Isolation during winter significantly impacted the overall well-being of PWDs, making it harder for them to participate in daily life.
7. ***Advocacy and potential solutions:*** Advocacy efforts, including the Snow-Plow campaign, have been pushing for better winter sidewalk maintenance. Participants suggested solutions such as requiring private homeowners to clear sidewalks, implementing heated sidewalk technology, and expanding Winnipeg's skywalk system. The most urgent request was for the city to prioritize consistent snow removal to ensure safe and accessible mobility for all residents.

5.0 DISCUSSION

This section discusses the results and analysis presented in section 4.0. It will address the two main research questions: a) How accessible are sidewalks in Winnipeg during winter, specifically for people with disabilities? and b) What challenges do PWDs face when using sidewalks in the winter?

The two research questions will be discussed under five broad headings, including physical and structural barriers, social and economic implications, psychological and emotional impacts, and advocacy efforts and potential solutions.

5.1 Physical and Structural Barriers

The accessibility audit highlights significant physical barriers that hinder pedestrian mobility, particularly for Persons with Disabilities (PWDs). Snow accumulation was a critical issue, with 77% of sidewalks covered in ice, making them extremely slippery and dangerous. According to Garvin et al. (2012) snow and ice, including windrows on sidewalks is one of the major barriers that impede the mobility of PWDs (p.379). Although 82% of sidewalks had sand or salt applied, this was not sufficient to ensure safety for pedestrians. The presence of snow piles reduced the clear width of sidewalks, limiting access for individuals using mobility aids such as canes, wheelchairs and walkers. Additionally, only 27% of curb cuts and ramps were free of snow and ice, making it difficult for PWDs to use winter sidewalks safely.

Another critical issue identified was the uneven surfaces caused by snow accumulation. The audit revealed that 59% of sidewalks had uneven surfaces, making movement unpredictable and challenging for PWDs, especially. Snow-covered sidewalks often resembled narrow footpaths rather than standard pedestrian sidewalks, increasing the danger of people falling and sustaining injuries. The presence of ice and snow in the built environment, including sidewalks, is said to be

one of the factors responsible for slips and falls in cold regions especially during the winter season (Gao & Abeysekera, 2004). The presence of water on crosswalks, despite being cleared of snow, further reduced usability and increased safety concerns for all pedestrians.

Bus stops and transit shelters were also largely inaccessible, with 91% of assessed transit points failing to meet accessibility standards. Many bus stops were completely blocked by snow piles, forcing individuals to either wait in unsafe locations or avoid public transportation altogether. This lack of accessibility in public transit infrastructure during the wintertime significantly limits mobility options for PWDs and other vulnerable groups.

The structural issues extend to pedestrian buttons at crossings, where 86% were blocked by snow, making them virtually inaccessible particularly for PWDs. This not only impacts PWDs but also affects the general pedestrian population, forcing individuals to find alternative and often riskier ways to cross streets. The presence of steep curb cuts and ramps due to snow accumulation further worsens these mobility challenges, making winter sidewalk navigation in Winnipeg quite difficult.

5.2 Social and Economic Implications

The ability of people to move from one place to another is essential to social and economic participation (Neven & Ectors, 2023). The lack of disability friendly winter sidewalks has significant social and economic implications for PWDs and other vulnerable individuals. Many PWDs change their daily routines during winter, avoiding outdoor activities such as grocery shopping, medical appointments, work, school and social visits. Some are referred to as “shut-ins” because they remain indoors for most of the winter due to “disability unfriendly” winter sidewalks.

The inability to access essential services forces many to rely on online shopping and home delivery, which can be costly and may not always be reliable.

Alternative transportation modes, such as paratransit, taxis, and ride-hailing services, are frequently used by those unable to use winter sidewalks safely. However, these options are not always reliable or affordable, which sometimes creates additional financial burdens. Research by Choi & Maisel (2022) also indicated that vehicles used for taxis and ride-hailing services are not usually accessible for wheelchair users. The high cost of ride-hailing services, together with the inaccessibility of some transit stops, significantly restricts mobility for PWDs. Moreover, the reliance on public transportation still requires accessible sidewalks to reach transit points, which remains a major challenge due to poor snow-clearing practices.

The economic impact goes beyond transportation costs. Many PWDs experience disruptions in their employment due to inaccessible sidewalks, leading to decreased productivity and potential income loss. Businesses also suffer as customers with mobility challenges avoid shopping areas with poorly maintained sidewalks. The study suggests that improving sidewalk accessibility could enhance economic participation by enabling more individuals to travel safely and engage in economic activities year-round. Beyond economic factors, limited accessibility restricts social participation. Many individuals experience isolation as they cannot visit friends, attend community events, or participate in recreational activities. This social exclusion exacerbates psychological well-being issues such as depression and anxiety, further reducing quality of life for affected individuals.

5.3 Psychological and Emotional Impacts

The inaccessibility of winter sidewalks contributes to severe emotional and psychological distress among PWDs and other affected individuals. Fear of slipping and falling is a significant concern, particularly for those with mobility impairments. Many participants reported high anxiety among members during the winter months due to the unsafe nature of sidewalk conditions. This fear often results in self-imposed isolation, further worsening mental health challenges such as depression and loneliness. This issue has been discussed in a significant number of research, highlighting the inevitable impacts of isolation, including mental health disorders and increased mortality rates (González-Sanguino et al., 2020). To protect the psychological well-being of PWDs who self-isolate during winter, removing all barriers, including snow conditions, and deterring people from engaging in outdoor activities during winter are important. Also, PWDs always feel neglected by city authorities due to inconsistent snow-clearing efforts. The perception that some neighbourhoods receive better maintenance than others, particularly affluent areas where more residents own cars, has led to frustration and a sense of inequality. Participants expressed disappointment in the city's prioritization of road clearing over sidewalk maintenance, reinforcing feelings of exclusion and marginalization.

PWDs and other groups of individuals who cannot navigate winter sidewalks tend to experience the emotional toll of isolation because of being "trapped" in their homes. "Isolation is dangerous" (Roseman & Yeoman, 2024), and capable of adversely affecting the mental health of PWDs who stay indoors throughout the wintertime. The inability to participate in everyday activities, such as gym visits, meeting friends, or simply walking, significantly impacts overall well-being. Some participants likened the experience to being "prisoners in their own homes" during winter, highlighting the urgent need to addressing this issue. Additionally, individuals with

visual impairments face unique challenges in navigating snow-covered sidewalks. Many rely on tactile surfaces to guide their movement, but these surfaces were often buried under snow, making wayfinding nearly impossible. This lack of reliable navigation increases frustration and further limits mobility independence.

5.4 Advocacy Efforts

Advocacy plays a critical role in bringing out the concerns of PWDs by highlighting their daily challenges and life experiences within their communities and neighbourhoods. PWDs have been successful in using advocacy as an effective tool or strategy in influencing national policy decisions and programs (Harris et al., 2012, p.71). In January 2025 for instance, the City of Winnipeg was planning to wait until the snow on sidewalks was 15 centimeters before clearing due to budgetary constraints. However, this proposal was not implemented due to advocacy and public outcry.

Advocacy efforts in Winnipeg have been crucial in raising awareness about the challenges of winter sidewalk accessibility. The “Snow-Plow Campaign”, led by various disability and senior organizations, has been key in calling on city authorities to improve snow-clearing practices. By collecting and sharing photos and testimonials of inaccessible sidewalks through Facebook and Instagram, advocates through these platforms can share inaccessible winter sidewalks concerns with city authorities to resolve these issues. Despite these efforts, some participants who have been engaging city authorities on these issues indicated that, even though the city is willing to do something, there is an issue of low budgetary allocation on winter sidewalk maintenance. The city’s limited budget for snow removal has resulted in inconsistent clearing practices, with some neighbourhoods receiving better maintenance than others.

5.5 Potential Solutions

Potential solutions in addressing the winter sidewalk issues in Winnipeg could include adopting new snow-melting technologies, such as hydronic or electric heating systems, like those used in Russia as pointed out by some participants. Traditionally, some cities use salt/sand on some of their sidewalks which is said to corrode and affect the durability of concrete pavement due to the chloride produced from salt (Sajid et al., 2020). However, snow melting systems tend to protect pavement materials and offer long term solutions to sidewalk maintenance (Huang et al., 2023). While these technologies may be costly, they could provide a long-term solution to recurring winter sidewalk accessibility challenges. Increasing pedestrian traffic in key areas, such as Downtown Winnipeg, could also serve as a strategy to naturally maintain and clear snow on sidewalks.

Expanding the city's skywalk system Downtown was another proposed solution aimed at providing sheltered walkways during winter. These skywalks could provide pedestrians with safe and convenient walkways connecting various buildings and retail centers (Davies, 2015), however, this solution will also require a huge capital investment which the City may not be able to afford. Additionally, participants suggested implementing policies requiring private property owners to clear sidewalks in front of their homes, a practice already in place in other Canadian cities. For instance, in 2019, the City of Kitchener in Ontario passed a by-law that required private property and business owners to clear sidewalks in front of their properties 24 hours after snowfall (Dietrich Law, 2019). However, this solution comes with some equity issues that may affect PWDs and other individuals who may not be able to abide by such a policy. These solutions are not cast in stone but give some ideas as to what other cities are doing and what could be feasible within Winnipeg’s context.

6.0 CONCLUSION, FUTURE RESEARCH DIRECTIONS AND RECOMMENDATIONS

6.1 Conclusion

The research underscores the accessibility challenges PWDs face in navigating Winnipeg's winter sidewalks. The findings from structured observations and interviews revealed that snow and ice accumulation create significant barriers, limiting mobility and increasing safety concerns. Despite applying sand or salt on 82% of sidewalks, 77% remained icy, making them dangerous for users. Additionally, 92% of bus stops were inaccessible, and 75% of curb ramps were blocked by snow, further complicating movement for those using mobility aids. These conditions contribute to physical, economic, and social barriers that disproportionately impact PWDs. Many PWDs and seniors change their daily routines, to avoid going out and relying on costly alternatives such as paratransit or online shopping, leading to increased isolation and additional financial burdens. The inaccessibility of pedestrian infrastructure not only restricts mobility independence of PWDs but also worsens their mental health due to anxiety, isolation and depression.

Advocacy efforts, including the Snow-Plow Campaign, have pushed for policy reforms to address winter sidewalk accessibility concerns. Even though city authorities have been working on addressing these issues, there is still a problem of low budgetary allocations. This research calls on city authorities, politicians, policymakers and advocacy groups within Winnipeg to prioritize winter sidewalk maintenance to ensure equitable access for all, particularly PWDs. By adopting comprehensive snow removal policies and innovative accessibility solutions, Winnipeg can create a more inclusive urban built environment that allows all residents to actively take part in social, economic, and community activities.

Making winter sidewalks disability friendly is a collective effort that requires everyone to come on board to address the challenges these sidewalks pose. Inaccessible winter sidewalks affect

everyone no matter their ability. However, PWDs are disproportionally affected by these sidewalks which makes it difficult for them to engage in active social and economic activities like their non-disabled counterparts. What may seem like a minor inconvenience to some people such as an improperly cleared sidewalk becomes a daily barrier to PWDs, denying them independence, dignity, participation and connection. This is a humble call to city authorities, advocacy groups, policy makers, and the public to start thinking and acting on making winter sidewalks disability friendly.

6.2 Future Research Directions

Several additional issues emerged during this research that warrant further investigation. First, a more detailed observation using a robust audit tool would help better understand the condition of winter sidewalks and their specific impacts on Persons with Disabilities (PWDs), as the audit conducted in this study was high-level. The structured audit was limited to daytime hours, primarily between 10 a.m. and 3 p.m. Expanding the audit to include mornings, late afternoons, and evenings would provide a more comprehensive view of how sidewalk conditions affect PWDs throughout the day. Furthermore, the literature would benefit from observational studies that examine how PWDs navigate winter sidewalks in real-time. This could be enhanced by inviting PWDs to document their daily commutes through video recordings or travel logs and share these insights with researchers to inform future studies.

Although most participants (6) in this study were Persons with Disabilities (PWDs), their number was too limited to document the range of challenges they face fully. Future studies should prioritize engaging a broader and more diverse group of PWDs through personal interviews and focus group discussions to gain deeper insights into their experiences and identify practical solutions for improving winter sidewalk accessibility. Additionally, this study was limited by a

dearth of review of accessible snow removal policy documents, hindering a comprehensive understanding of Winnipeg's historical context and progress. To better inform future efforts, subsequent research must include a thorough review of existing snow removal policies to situate the issue and guide inclusive urban planning more effectively.

6.3 Recommendations

The proposed recommendations will help address the mobility challenges associated with winter sidewalks. They will also reduce the financial burden on city authorities while encouraging proper and efficient snow clearing.

1. **Outsourcing Snow Clearing**: The City of Winnipeg currently outsources some snow removal services to various companies. However, these companies must provide proof of trained personnel and demonstrate a commitment to supervising all snow clearing activities to ensure the work is done properly. Additionally, the City should consider implementing contractual agreements that pay snow clearing contractors 50% of the cost upfront, with the remaining 50% paid only after the job has been satisfactorily completed.
2. **Snow Clearing Grants and Incentives**: The City of Winnipeg could launch a program in partnership with community groups, Business Improvement Zones (BIZs), and local businesses to support sidewalk snow removal efforts within neighbourhoods. Incentives could also be offered to residents and property owners who take part in winter sidewalk clearing. A similar initiative has been implemented in Edmonton, which includes three components: the Winter Helping Hands Incentive Program, winter kickoff activities, and an end-of-season appreciation event, all designed to recognize individuals and volunteers committed to keeping sidewalks clear (City of Edmonton, 2025).

3. **Volunteer Programs**: Neighbourhood-based volunteer programs could be introduced across the city, encouraging residents to sign up and help with sidewalk snow clearing during the winter months. This approach could help reduce the city's financial burden while addressing inequity issues and fostering a stronger sense of community involvement.
4. **Public Awareness Campaigns on Proper Sidewalk Snow Clearing**: The City should take the responsibility and lead in educating the public on the best practices for snow removal by collaborating with disability advocacy groups and snow-clearing organizations. The City could use these campaigns to promote proactive behaviour and encourage residents to clear sidewalks and driveways promptly.

For these recommendations to be effective, all relevant stakeholders must be actively involved since most of the issues are intertwined and universal. Even though the City of Winnipeg already has a snow clearing schedule, effectively implementing the existing schedule alone can ensure the fair accessibility of winter sidewalks.

References

Agmon, M., Sa'Ar, A., & Araten-Bergman, T. (2016). The person in the disabled body: A perspective on culture and personhood from the margins. *International Journal for Equity in Health*, *15*(1). https://doi.org/10.1186/s12939-016-0437-2

Alan, M. J., & Marilyn, J. F. (2007). Transportation Patterns and Problems of People with Disabilities. *In The Future of Disability in America* (pp. 519–560). National Academies Press. https://www.ebsco.com/terms-of-use

Altman, B. M. (2014). Definitions, concepts, and measures of disability. *Annals of Epidemiology*, *24*(1), 2–7. https://doi.org/10.1016/j.annepidem.2013.05.018

Arnstein, S. R. (1969). A Ladder of Citizen Participation. *Journal of the American Planning Association*, *35*(4), 216–224. https://doi.org/10.1080/01944366908977225

Bascom, G. W., & Christensen, K. M. (2017). The impacts of limited transportation access on persons with disabilities' social participation. *Journal of Transport & Health*, *7*, 227–234. https://doi.org/10.1016/J.JTH.2017.10.002

Bingham, C., Clarke, L., Michielsens, E., & Van De Meer, M. (2013). Towards a social model approach? British and Dutch disability policies in the health sector compared. *A Journal of People, Work, and Organisations*, *1*(1), 613–637. https://doi.org/10.1108/PR-08-2011-0120

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, *3*(2), 77–101. https://doi.org/10.1191/1478088706QP063OA

Chapman, D., Nilsson, K. L., Rizzo, A., & Larsson, A. (2019). Winter city urbanism: Enabling all year connectivity for soft mobility. *International Journal of Environmental Research and Public Health*, *16*(10). https://doi.org/10.3390/ijerph16101820

Choi, J., & Maisel, J. L. (2022). Assessing the Implementation of On-Demand Transportation Services for People with Disabilities. *Transportation Research Record*, *2676*(5), 437–449. https://doi.org/10.1177/03611981211067976/FORMAT/EPUB

City of Edmonton. (2025). Community Assisted Snow Removal Grant. *City of Edmonton*. https://www.gov.edmonton.ab.ca/programs_services/funding_grants/community-assisted-snow-removal-grant

City of Winnipeg. (2021). Census Information: Alphabetical Neighbourhood Listing. https://legacy.winnipeg.ca/census/2021/Alpha/default.asp

Clarke, P., Ailshire, J. A., Bader, M., Morenoff, J. D., & House, J. S. (2008). Original Contribution Mobility Disability and the Urban Built Environment. *American Journal of Epidemiology*, *168*(5), 1–8. https://doi.org/10.1093/aje/kwn185

Clarke, P., & George, L. K. (2005). The Role of the Built Environment in the Disablement Process. *American Journal of Public Health*, *95*(11), 1933–1939. https://doi.org/10.2105/AJPH.2004.054494)

Davies, W. K. D. (2015). Winter Cities. In *GeoJournal Library* (Vol. 112, pp. 277–310). Springer Science and Business Media B.V. https://doi.org/10.1007/978-94-017-9655-2_8

de Deijn, R., & Bukralia, R. (2024). Image Classification for Snow Detection to Improve Pedestrian Safety. https://doi.org/https://doi.org/10.48550/arXiv.2407.00818

Dietrich Law. (2019). Property Owners and Municipalities are obligated to clear Ice and Snow. Dietrich Law. https://www.dietrichlaw.ca/post/blog/property-owners-obligations-to-clear-ice-and-snow

Eisenberg, Y., Heider, A., Gould, R., & Jones, R. (2020). Are communities in the United States planning for pedestrians with disabilities? Findings from a systematic evaluation of local government barrier removal plans. *Cities*, *102*. https://doi.org/10.1016/j.cities.2020.102720

Eisenberg, Y., Hofstra, A., Berquist, S., Gould, R., & Jones, R. (2022). Barrier-removal plans and pedestrian infrastructure equity for people with disabilities. *Transportation Research Part D: Transport and Environment*, *109*, 103356. https://doi.org/10.1016/J.TRD.2022.103356

Gamache, S., Routhier, F., Morales, E., Vandersmissen, M. H., Boucher, N., McFadyen, B. J., & Noreau, L. (2020). Methodological Insights into the Scientific Development of Design Guidelines for Accessible Urban Pedestrian Infrastructure. *Journal of Urban Technology*, *27*(1), 87–105. https://doi.org/10.1080/10630732.2019.1632677/ASSET/6F64DE23-A6BC-4BFF-BF1E-F6B82828C4BE/ASSETS/IMAGES/CJUT_A_1632677_ILG0001.GIF

Gao, C., & Abeysekera, J. (2004). A systems perspective of slip and fall accidents on icy and snowy surfaces. *Ergonomics*, *47*(5), 573–598. https://doi.org/10.1080/00140130410081658718/ASSET/402A8074-9D2E-4698-A5BA-E4DD209D23D3/ASSETS/IMAGES/TERG_A_10060158_O_TERG_A_10060158_O_F1.GIF

Garvin, T., Nykiforuk, C. I. J., & Johnson, S. (2012). Can we get old here? Seniors' perceptions of seasonal constraints of neighbourhood built environments in a northern, winter city. *Geografiska Annaler, Series B: Human Geography*, *94*(4), 369–389. https://doi.org/10.1111/geob.12004

Giesbrecht, E., Ripat, J., Borisoff, J., & Harrison, K.-L. (2025). Initial validation and feasibility of a Standardized Navigation of Winter Mobility & Accessibility Network (SNOWMAN) course for wheelchairs. *Disability and Rehabilitation: Assistive Technology*, *20*(3), 644–651. https://doi.org/10.1080/17483107.2024.2403669

González-Sanguino, C., Ausín, B., Castellanos, M. Á., Saiz, J., López-Gómez, A., Ugidos, C., & Muñoz, M. (2020). Mental health consequences during the initial stage of the 2020 Coronavirus pandemic (COVID-19) in Spain. *Brain, Behavior, and Immunity*, *87*, 172–176. https://doi.org/10.1016/j.bbi.2020.05.040

Government of Canada. (1977). Canadian Human Rights Act. *Justice and Law*. https://laws-lois.justice.gc.ca/eng/acts/H-6/page-3.html#docCont

Government of Canada. (2019). The Accessible Canada Act. *Government of Canada*. https://www.canada.ca/en/employment-social-development/programs/accessible-canada/act-summary.html

Hammel, J., Magasi, S., Heinemann, A., Gray, D. B., Stark, S., Kisala, P., Carlozzi, N. E., Tulsky, D., Garcia, S. F., & Hahn, E. A. (2015). Environmental Barriers and Supports to Everyday Participation: A Qualitative Insider Perspective From People With Disabilities. *Archives of Physical Medicine and Rehabilitation*, *96*(4), 578–588. https://doi.org/10.1016/J.APMR.2014.12.008

Harris, S. P., Owen, R., & De Ruiter, C. (2012). Civic Engagement and People with Disabilities: The Role of Advocacy and Technology. *Journal of Community Engagement*, *5*(1), 70–83. https://doi.org/https://doi.org/10.54656/AWPE1856

Huang, C., Tan, J., Gan, S., & Xiao, H. (2023). Experimental study and numerical simulation of sidewalk electrical heating for deicing and snow melting. *International Journal of Pavement Engineering*, *24*(2). https://doi.org/10.1080/10298436.2022.2088752/ASSET/8B4F7543-2F30-451A-BD95-B75CCA273E5E/ASSETS/GRAPHIC/GPAV_A_2088752_F0018_OC.JPG

Hwang, J. (2022). A factor analysis for identifying people with disabilities' mobility issues in built environments. *Transportation Research Part F: Traffic Psychology and Behaviour*, *88*, 122–131. https://doi.org/10.1016/j.trf.2022.05.016

Imrie, R., & Kumar, M. (1998). Focusing on disability and access in the built environment. *Disability and Society*, *13*(3), 357–374. https://doi.org/10.1080/09687599826687

Jackson, M. A. (2018). Models of Disability and Human Rights: Informing the Improvement of Built Environment Accessibility for People with Disability at Neighborhood Scale? *7*(10). https://doi.org/10.3390/laws7010010

Kapsalis, E., Jaeger, N., & Hale, J. (2024). Disabled-by-design: effects of inaccessible urban public spaces on users of mobility assistive devices–a systematic review. *Disability and Rehabilitation: Assistive Technology*, *19*(3), 604–622. https://doi.org/10.1080/17483107.2022.2111723/ASSET/96CB73E0-C98A-4E0C-83BE-7810CD9C6168/ASSETS/GRAPHIC/IIDT_A_2111723_F0007_C.JPG

Knopf, J. W. (2006). Doing a Literature Review. *PS, Political Science & Politics, 39(1)*, 127–132. https://doi.org/10.1017/S1049096506060264

Knott, E., Rao, A. H., Summers, K., & Teeger, C. (2022). Interviews in the social sciences. *Nature Reviews*. https://doi.org/10.1038/s43586-022-00150-6

Krahn, G. L., Klein Walker, D., & Correa-De-Araujo, R. (2015). Persons With Disabilities as an Unrecognized Health Disparity Population. In *American Journal of Public Health | Supplement* (Vol. 2, Issue S2).

Lemaire, E. D., O, P. A., Desrosiers, M. M., & Gordon Robertson, D. (2010). *Wheelchair Ramp Navigation in Snow and Ice-Grit Conditions*. https://doi.org/10.1016/j.apmr.2010.07.215

Li, C., Ma, K., Saugstad, M., Fujii, K., Delaney, M., Eisenberg, Y., Labbé, D., Shanley, J. L., Snyder, D., Thomas, F. P., & Froehlich, J. E. (2024). "I never realized sidewalks were a big deal": A Case Study of a Community-Driven Sidewalk Audit Using Project Sidewalk. *Conference on Human Factors in Computing Systems - Proceedings*. https://doi.org/10.1145/3613904.3642003

Li, Y., Hsu, J. A., & Fernie, G. (2012). Aging and the Use of Pedestrian Facilities in Winter-The Need for Improved Design and Better Technology. *Journal of Urban Health: Bulletin of the New York Academy of Medicine*, *90*(4). https://doi.org/10.1007/s11524-012-9779-2

Lindsay, S., Morales, E., Yantzi, N., Vincent, C., Howell, L., & Edwards, G. (2015). The experiences of participating in winter among youths with a physical disability compared with their typically developing peers. *Child: Care, Health and Development*, *41*(6), 980–988. https://doi.org/10.1111/CCH.12220

Lindsay, S., & Yantzi, N. (2014). Weather, disability, vulnerability, and resilience: Exploring how youth with physical disabilities experience winter. *Disability and Rehabilitation*, *36*(26), 2195–2204. https://doi.org/10.3109/09638288.2014.892158

Morales, E., Gamache, S., & Edwards, G. (2014). Winter: Public Enemy #1 For Accessibility Exploring New Solutions. *Journal of Accessibility and Design for All*, *1*(4), 29–51.

Mullarkey, J. (1984). Case for the structured audit. 73–084. https://egrove.olemiss.edu/dl_proceedings

Müller, S. A. P., Dorneles, G. V., Ruiz-Padillo, A., & Romano, V. F. (2023). Sidewalk Assessment from the Perspective of Accessibility: A Systematic Literature Review. *Journal of Urban Planning and Development*, *149*(3). https://doi.org/10.1061/JUPDDM.UPENG-4412

Neven, A., & Ectors, W. (2023). "I am dependent on others to get there": Mobility barriers and solutions for societal participation by persons with disabilities. *Travel Behaviour and Society*, *30*, 2214–2367. https://doi.org/10.1016/j.tbs.2022.10.009

Nuwagaba, E. L., & Rule, P. N. (2016). African Journal of Disability. *African Journal of Disability*, 1–10. https://doi.org/10.4102/ajod

Ong, F., Loa, P., & Habib, N. (2024). Ride-sourcing demand in Metro Vancouver: Looking through the lens of disability. *Transportation Research Part A*, *181*, 103984. https://doi.org/10.1016/j.tra.2024.103984

Padilla, C. (2019). Evaluating How the Quality of Pedestrian Infrastructure Affects the Choice to Walk Final Report. https://orcid.org/0000-0003-3315-5028

Penney, J. N. (2013). The Biopsychosocial model: Redefining osteopathic philosophy? *International Journal of Osteopathic Medicine*, *16*(1), 33–37. https://doi.org/10.1016/j.ijosm.2012.12.002

Petasis, A. (2019). Discrepancies of the Medical, Social and Biopsychosocial Models of Disability; A Comprehensive Theoretical Framework. *The International Journal of Business Management and Technology*, *Volume 3*(4). www.theijbmt.com

Ripat, J. D., Brown, C. L., & Ethans, K. D. (2015). Barriers to Wheelchair Use in the Winter. *Archives of Physical Medicine and Rehabilitation*, *96*, 1117–1139. https://doi.org/10.1016/j.apmr.2015.01.020

Ripat, J., Giesbrecht, E., Borisoff, J., Morales, E., & Harrison, K. L. (2024). Development of the Standardized Navigation of Winter Mobility & Accessibility Network (SNOWMAN) course. *Frontiers in Rehabilitation Sciences*, *5*. https://doi.org/10.3389/fresc.2024.1330507

Ripat, J., Sibley, K. M., Giesbrecht, E., Curtis, B., Touchette, A., Borisoff, J., Ethans, K., Li, Y., & Morales, E. (2020). Systematic Review Winter Mobility and Community Participation Among People Who Use Mobility Devices: A Scoping Review Archives of Rehabilitation Research and Clinical Translation. *Archives of Rehabilitation Research and Clinical Translation*, *2*, 100018. https://doi.org/10.1016/j.arrct.2019.100018

Rittner, B., & Kirk, A. B. (1995). Health care and public transportation use by poor and frail elderly people. *Social Work (New York)*, *40*(3), 365–373. https://doi.org/https://doi.org/10.1093/sw/40.3.365

Roseman, S. R., & Yeoman, E. (2024). Enunciating outrage: Sidewalk mobility injustice and activism. *Mobilities*, *19*(4), 625–645. https://doi.org/10.1080/17450101.2024.2316111/ASSET/2C5F6C36-AB28-44F1-9450-12CD7A167AF7/ASSETS/GRAPHIC/RMOB_A_2316111_F0007_C.JPG

Sajid, H. U., Kiran, R., Qi, X., Bajwa, D. S., & Battocchi, D. (2020). Employing corn derived products to reduce the corrosivity of pavement deicing materials. *Construction and Building Materials*, *263, 120662*. https://doi.org/10.1016/j.conbuildmat.2020.120662

Statistics Canada. (2023a). Canadian Survey on Disability, 2017 to 2022. *Statistics Canada.* https://www150.statcan.gc.ca/n1/daily-quotidien/231201/dq231201b-eng.htm

Statistics Canada. (2023b). Reports on Disability and Accessibility in Canada. https://www150.statcan.gc.ca/n1/pub/89-654-x/89-654-x2024001-eng.htm

Statistics Canada. (2023c). Canadians' commutes: Still car-heavy, but some lighter footprints. https://www.statcan.gc.ca/o1/en/plus/3798-canadians-commutes-still-car-heavy-some-lighter-footprints

Stefanidis, R. M., & Bartzokas-Tsiompras, A. (2024). Pedestrian Accessibility Analysis of Sidewalk-Specific Networks: Insights from Three Latin American Central Squares. *Sustainability 2024, Vol. 16, Page 9294*, *16*(21), 9294. https://doi.org/10.3390/SU16219294

Tajgardoon, M., & Karimi, H. A. (2015). Simulating and visualizing sidewalk accessibility for wayfinding of people with disabilities. *International Journal of Cartography*, *1*(1), 79–93. https://doi.org/10.1080/23729333.2015.1055646/ASSET/F37096DC-9C58-4DAF-9DD8-90CE7EAF4057/ASSETS/IMAGES/TICA_A_1055646_F0009_C.JPG

Tewdwr-jones, M., & Wilson, A. (2022). Co-Designing Urban Planning Engagement and Innovation: Using LEGO® to Facilitate Collaboration, Participation and Ideas. *Urban Planning*, *7*(2), 229–238. https://doi.org/10.17645/UP.V7I2.4960

The City of Winnipeg. (2021). Snow Clearing and Ice Control Policy. https://legacy.winnipeg.ca/publicworks/snow/snow-clearing-policy.stm

Thompson, S. (2021). City's Focus on clearing Streets Over Sidewalks Frustrating for Winnipeggers with Mobility Issues. *Global News*. https://globalnews.ca/news/8374271/winnipeg-focus-clearing-streets-sidewalks-mobility-issues/?utm_source=chatgpt.com

Wagner, M., Shirgaokar, M., & Marshall, W. (2024). Understanding Everyday Travel Experiences and Transportation Infrastructure Challenges of People with Disabilities in Denver, CO. *Transportation Research Record*, *2678*(2), 454–468. https://doi.org/10.1177/03611981231174400/FORMAT/EPUB

Wagner, M., Shirgaokar, M., Misra, A., & Marshall, W. (2024). Navigating ADA Compliance: How Practitioners' Experiences Reveal Challenges and Opportunities for Improving Accessibility of Transportation Infrastructure. *Journal of the American Planning Association*. https://doi.org/10.1080/01944363.2024.2343661

Walker, L., Chen, Y., Kang, S., & Becker, H. (2020). Behavioral Risks among Reproductive-Age Women and Men with Mobility-Related...: *EBSCOhost*. Texas Public Health. https://web-p-ebscohost-com.uml.idm.oclc.org/ehost/pdfviewer/pdfviewer?vid=4&sid=89151b0f-efd2-4f2a-98cc-20edac05442c%40redis

Wee, J., & Paterson, M. (2009). Exploring How Factors Impact the Activities and Participation of Persons with Disability: Constructing a Model Through Grounded Theory. *The Qualitative Report*, *14*(1), 165–200. https://doi.org/10.46743/2160-3715/2009.1399

WHO. (2013). Disability Report by the Secretariat. *World Health Organization, Sixty-Sixth World Health Assembly*. https://apps.who.int/gb/ebwha/pdf_files/WHA66/A66_12-en.pdf#:~:text=Disability%20is%20neither%20purely%20a%20biological%20nor%20a,participation%2C%20such%20as%20exclusion%20from%20school%20or%20work.

WHO. (2023). Disability and Health. https://www.who.int/news-room/fact-sheets/detail/disability-and-health

WHO, & World Bank. (2011). World Report on Disability. *World Health Organization*. https://iris.who.int/bitstream/handle/10665/44575/9789240685215_eng.pdf?sequence=1&isAllowed=y

Wise, J. B. (2016). Deepened Ecological Model: A Fresh Perspective on the Experience of Disability. *Therapeutic Recreation Journal*, *50*(3). https://doi.org/10.18666/trj-2016-v50-i3-7156

Woelk, D. (2024). Slush in Winnipeg is more than a clearing issue, there are mobility challenges too. *Global News*. https://globalnews.ca/news/10253616/winnipeg-slush-challenges-mobility-snow-clearing-policy/amp/?utm_source=chatgpt.com

World Institute on Disability. (2022). Winter Accessibility Woes. https://wid.org/winter-accessibility-woes/?utm_source=chatgpt.com

Yang, B., Wang, S., Yu, S., & Olofsson, T. (2020). Soft-mobility in a winter-dominant city: A case study by comparing Nordic and non-Nordic residents in Umeå. *102*. https://doi.org/10.1016/j.cities.2020.102727

Appendix A: Ethics Documents

University of Manitoba

Participant Informed Consent Form

Study Title: Assessing the Disability Friendliness of Winter Sidewalks in Winnipeg, Manitoba.

Student Principal Investigator: John Baanbil

Master's Student

Department of City Planning

Email: baanbilj@myumanitoba.ca

Student Advisor: Rae St. Clair Bridgman

Professor

Department of City Planning

Email: rae.bridgman@umanitoba.ca

Conflicts of Interest and Undue Influence: There is no conflict.

You are being invited to participate in a research study. This consent form, a copy of which you can download or print, is only part of the process of informed consent. If you want more details about something mentioned here, or information not included here, feel free to ask any of the people named above. Please take the time to read this document and any accompanying information carefully. It is very important that you understand:

- what is being asked of you,
- what the risks and benefits of participation are, and
- how the information you provide will be used and stored.

Purpose of the Study

I am doing this research for my capstone project under the supervision of Rae St. Clair Bridgman. This research study is about assessing the disability friendliness of winter sidewalks in Downtown Winnipeg, Manitoba. The aim of this research is to investigate and assess the challenges winter sidewalks pose for Persons With Disabilities (PWDs) in navigate Winnipeg's downtown and the measures available to improve their mobility.

Study Procedures

If you decide to take part in the study, we will meet for a 0.5 to 1 hour interview through UM Zoom. With your consent, I will audio record our meeting. After your interview, you will have the chance to review the transcript (the document of what you said). You can add, change, or delete information from the transcript as you see fit. I will email you a copy of the transcript and you will have 2 weeks to respond. If I don't hear from you after 2 weeks, I will assume that you are okay with the transcript as it is.

Study Risks

This survey is minimal risk, meaning that the risks are no greater than what you might encounter in your daily life.

Study Benefits

There are no direct benefits to you by participating in this study, but we hope to learn more about your experience and knowledge about winter sidewalk accessibility so we can develop a better understanding about ways we can improve these sidewalks to make them more disability friendly. The aim of this study is to investigate and find solutions that are feasible and can be used to improve the accessibility of winter sidewalks for PWDs in Winnipeg. Through this research, participants will have the opportunity to share their experiences and perspectives on how winter sidewalks can be improved. The final Capstone Projects will contribute to planning knowledge and may result in new strategies or policy directions to address sidewalk accessibility issues and challenges for persons with disabilities.

Compensation

There is no compensation for this study.

Use and Storage of Information

All the information you provide as a participant in this study is confidential which means we as the research team must keep it safe. We will do our best, however, it is not possible to guarantee absolute confidentiality. We will only share your personal information if required (court order or law).

Your information will be stored on a secure platform approved by the University of Manitoba. We will have a file that links your name and contact information to your research information using a code. We will keep the file with your name, contact information, and code separate from the research information you share with us. When we share the results of this study, we will combine everybody's responses. This means no one will see your answers, name, or contact information.

Dissemination

The study results will be shared through 1) the publication of a capstone report and poster, and 2) journal publications and/or presentations in relevant academic fields.

Withdrawing

Your participation in this research study is voluntary. You can choose to do only the activities and/or answer only the questions that you are comfortable with. You may withdraw from the study for any reason. You do not have to explain why. You will not be penalized in any way. Should you withdraw partway through the study, all of your information will be destroyed unless you have consented to allowing us to keep it. You may withdraw from the study until January 31, 2025. After this date, we will start to analyze the information so it may not be possible to withdraw your information. To withdraw, please contact John Baanbil (baanbilj@myumanitoba.ca) or Rae St. Clair Bridgman at rae.bridgman@umanitoba.ca or 204-474-7179.

Questions or Concerns

Designated University of Manitoba personnel may check that this study is being done safely and properly. To do this, they may visit the study site or review the research records. We will tell you if someone outside the research team will be there while you are participating. If this makes you uncomfortable, please tell a member of the research team, who will ask the personnel to return at another time.

This study has been reviewed and approved by a Research Ethics Board at the University of Manitoba. However, this does not mean that participation is risk-free. If you have questions about your rights as a research participant, you may contact the Office of Human Research Ethics at humanethics@umanitoba.ca or 204-474-7122.

If you have any questions, concerns, or complaints about this study, you may contact any members of the research team listed on the first page or the Office of Human Research Ethics.

Consent

By signing this document, I agree that:

- I have read the above information or had it read to me.
- I have had the opportunity to ask and have answered all of my questions.
- I understand what is being asked of me.
- I will be taking part in a research study.
- I may freely stop or leave the research study activities at any time.
- My information may be shared outside the University of Manitoba.
- I do not waive my legal rights by participating in the study.

Notice Regarding Collection, Use, and Disclosure of Personal Information

Your personal information is being collected under the authority of The University of Manitoba Act. The University of Manitoba is committed to preserving your right to privacy. The information you provide will be used by the University to support our research. Your personal information will not be used or disclosed for other purposes, unless permitted by The Freedom of Information and

Protection of Privacy Act or The Personal Health Information Act. If you have any questions about the collection of personal information: Ph: 204-474-9462 or Email: fippa@umanitoba.ca

I agree to participate in this study.	☐YES ☐ NO

_____ _____ _____

Name of Participant Participant's Signature Date

Summary of Results

A summary of the study will be available on the Department of City Planning website at https://umanitoba.ca/architecture/department-city-planning/student-work, at study's end. Capstone projects will be made available on this platform by the end of August 2025.

Other Consent Statement

I agree to be audio-recorded in this study.	☐YES ☐ NO
I agree to have (check one): ☐ a general descriptor used instead of my name when results are shared for this study. ☐ a pseudonym (fake name) used when the results are shared for this study. I would like my pseudonym to be: _____	

I would like to receive a copy of the research report. If yes, provide your email or mailing address here_____	☐YES ☐ NO

Protocol Approval

University of Manitoba | Research Ethics and Compliance

Human Research Ethics - Fort Garry
66 Chancellors Circle
Winnipeg, MB R3T 2N2
humanethics@umanitoba.ca

PROTOCOL APPROVAL

Effective: December 9, 2024 Expiry: December 8, 2025

Principal Investigator:	John Baanbil
Advisor(s):	Rae Bridgman
Protocol Number:	HE2024-0330
Protocol Title:	*Assessing the Disability Friendliness of Winter Sidewalks in Downtown Winnipeg.*

Liz Millward, Chair, REB2

Research Ethics Board 2 has reviewed and approved the above research. The Office of Human Research Ethics (OHRE) is constituted and operates in accordance with the current *Tri-Council Policy Statement: Ethical Conduct for Research Involving Humans- TCPS 2 (2022).*

Please note the following important information about your protocol approval:

i. Approval is granted for the research and purposes described in the protocol only.

ii. Any changes to the protocol or research materials must be approved by the OHRE **before implementation**.

iii. Any **deviations** to the research or **adverse events** must be reported to the OHRE immediately through an **REB Event**.

iv. This approval is valid **for one year only.** A Renewal Request must be submitted and approved prior to the above expiry date.

v. A **Protocol Closure** must be submitted to the OHRE when the research is complete or if the research is terminated.

vi. The University of Manitoba may request to audit your research documentation to confirm compliance with this approved protocol, and with the UM *Ethics of Research Involving Humans* policies and procedures.

Email Script for Interviews

Subject Title: Research Study Seeking Participants – Assessing the disability friendliness of winter sidewalks in Downtown Winnipeg, Manitoba

Dear_____,

I am a Master's student registered in the graduate capstone research project in the Department of City Planning at the University of Manitoba, taught by Dr. Rae Bridgman. I am exploring the disability friendliness of winter sidewalks in downtown Winnipeg, Manitoba.

I am interested in interviewing you about your experiences and perspective on sidewalk conditions during winter and their accessibility for persons with disabilities. Participation in this study is completely voluntary and involves your consent. Your participation should take no more than half an hour to an hour of your time.

Research confidentiality will be maintained, and I would like to assure you the study has been reviewed and received ethics clearance through the University of Manitoba Research Ethics Board (REB 2). If you have questions for the Ethics Board, you can contact humanethics@umanitoba.ca or telephone 204-474-7122.

If you have any questions about the study, please let me know. Or if you would like additional information to assist you in reaching a decision about participation, please also feel free to contact Dr. Rae Bridgman (email: rae.bridgman@umanitoba.ca; telephone: 204-474-7179).

[Participant replies.]

If Yes:

“Thank you for agreeing. I truly appreciate it. Please keep in mind you can decline to participate in the study at any point whatsoever, without any negative reaction from anyone involved in the study.

When would be most convenient for us to meet?”

[Participant replies.]

“Thank you. I look forward to our meeting and to providing you with more information about the study. If you are unable to meet as planned for some reason, you may reach me via email at baanbilj@myumanitoba.ca”

If No:

“I certainly respect your decision. Thank you for your time. Have a wonderful day.”

Appendix B: Interview Guide and Structured Accessibility Checklist

Semi-Structured Interview Guide

My name is John Baanbil, a Master of City Planning Student at the University of Manitoba. My capstone research is assessing the disability friendliness of winter sidewalks in Winnipeg, Manitoba. I would be grateful if you could help me answer a few questions.

Prior to the interview beginning, I will explain the project, review the consent form and make sure the participant is knowledgeable about and comfortable with the interview process, knows about their right to withdraw at any time during the interview, and can withdraw from study up to January 31, 2025. I will also inform participants about recording the interview and ask for their permission. The interview will not begin until I have received a copy of the signed consent form.

1. Can you tell me about your role and the organization you work with?
2. In your experience, who is impacted by winter sidewalk issues the most and how?
3. Do you often get complaints from PWDs regarding winter sidewalks? If yes, what are some of these complaints?
4. Have you been involved in any advocacy on winter sidewalk maintenance?
    i. If yes, what has your advocacy focused on?
    ii. If yes, what has been done so far by city authorities to address these issues?
5. What role do assistive devices, such as wheelchairs, canes, or walkers, play in the challenges PWDs face when navigating sidewalks during winter?
6. Where are some of the places members of your organization go to during the week and how do they find their way there in winter?

7. During winter, do they change their daily activities or routes due to winter sidewalks? If yes, how do they find their way?
8. How well do city authorities manage snow on sidewalks in downtown during and after snowfall?
    i. *Are there specific times of day or days of the week when winter sidewalks are more difficult or easier to use in terms of accessibility?*
    ii. *Which areas do you find more difficult or easy to navigate in downtown during winter?*
9. Are there emotional and mental health challenges Persons With Disabilities (PWDs) face when they have difficulty accessing sidewalks during winter?
    I. If yes, could you please explain how?
10. Do you have examples of features, policies, or practices from elsewhere that the City of Winnipeg could adopt to make winter sidewalks more accessible?
11. Are there any organizations, services, or resources your members rely on for assistance with navigating winter sidewalks in Downtown Winnipeg? If so, how do they help?
12. What do you think is the most pressing concern that must be addressed to improve winter sidewalk accessibility for PWDs in downtown Winnipeg?
13. Are there any final thoughts you would like to share?

Accessibility Audit Checklist

WINTER SIDEWALKS STRUCTURED AUDIT CHECKLIST

This winter sidewalk accessibility audit tool was created based on the Accessible Canada Act (ACA) and the Americans with Disability Act (ADA) policy guidelines. This tool is meant to identify and assess the disability friendliness of winter sidewalks.

General Information

Audit Date/Time: …….....

Auditor's Name: ……

Specific route: ……...

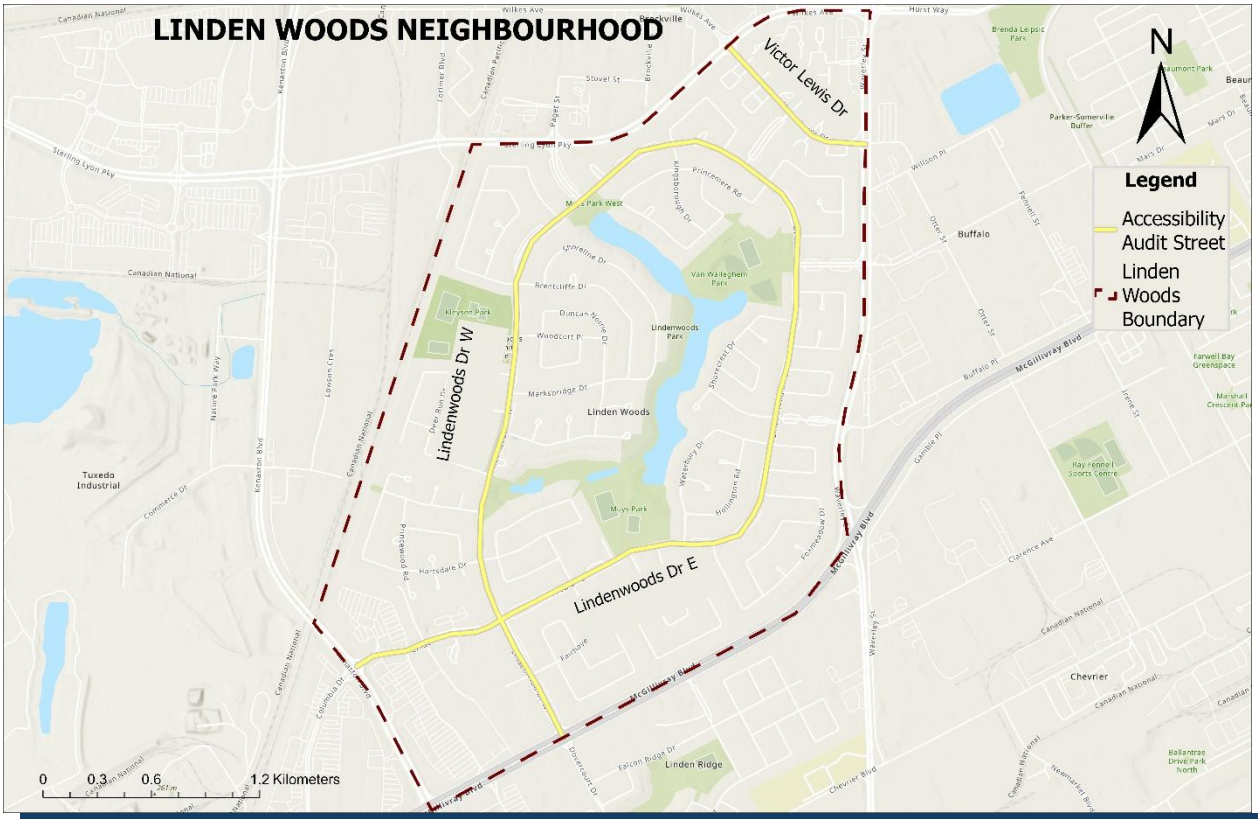
Weather condition: ……

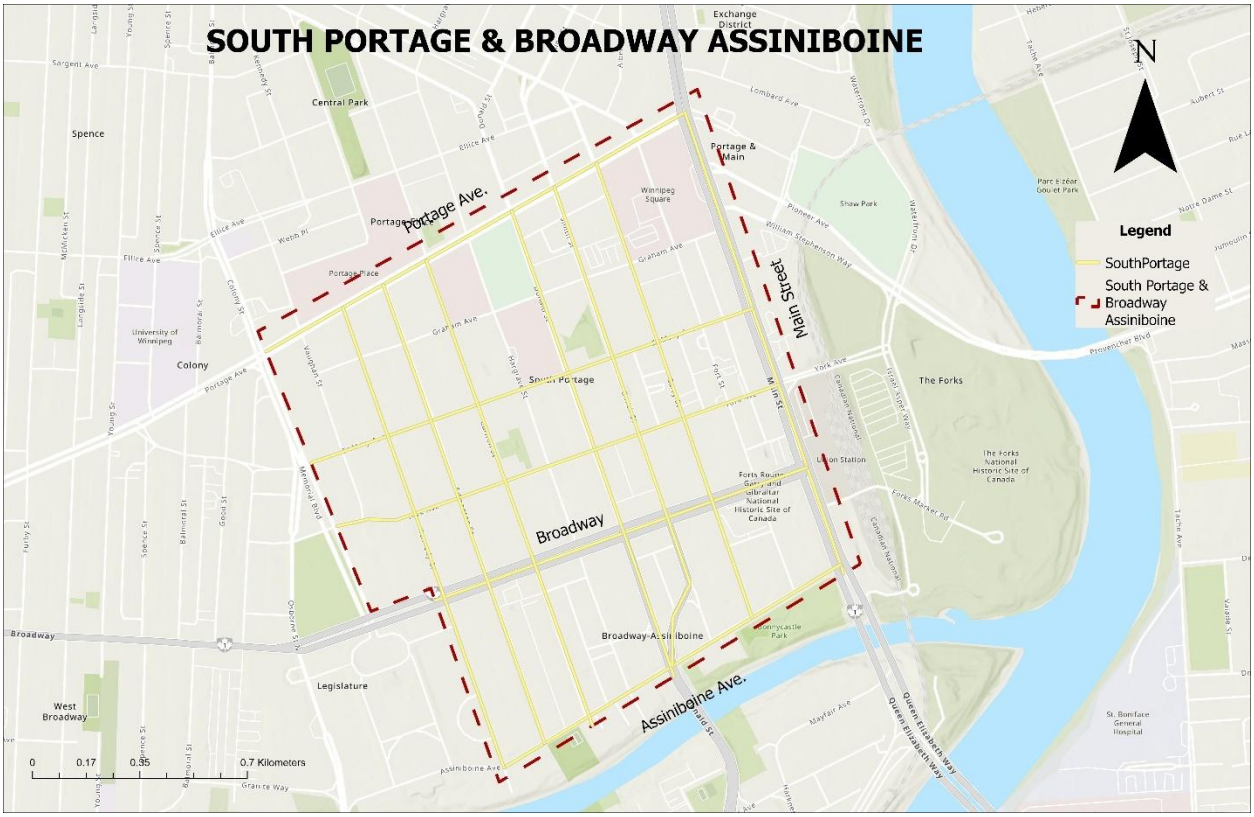
Assessment	***Response***	***Remarks***
1. Are there any obstructions such as snow piles, garbage heap, sand, that reduce the clear width of sidewalk (less than 36 inches)?	☐ Yes ☐ No	

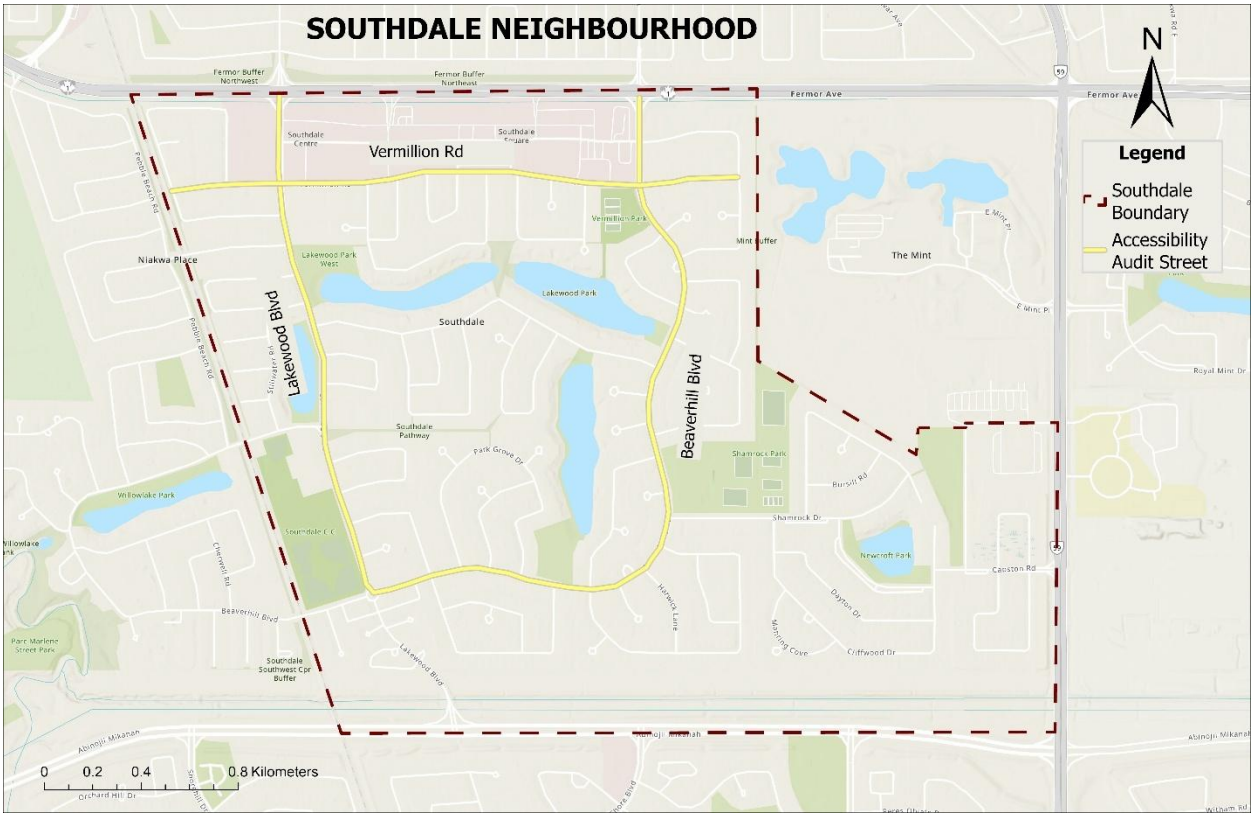
2. Is the sidewalk surface free of ice and slippery conditions?	☐ Yes ☐ No	
3. Is any part of the sidewalk with an uneven surface due to snow piles?	☐ Yes ☐ No	
4. Are curb ramps and cuts free of snow and ice, and clear for access?	☐ Yes ☐ No	
5. Are tactile surfaces present and clear of snow/ice at curb cuts and ramps?	☐ Yes ☐ No	
6. Are crosswalks free of snow and ice, making them accessible to people who use	☐ Yes ☐ No	

wheelchairs, canes and walkers?		
7. Access to pedestrian buttons clear of snow?	☐ Yes ☐ No	
8. Are the sidewalk slopes shallow enough for mobility device users?	☐ Yes ☐ No	
9. Has sand or salt been applied where needed on the sidewalk?	☐ Yes ☐ No	
10. Are sidewalks leading to building entrances clear of snow?	☐ Yes ☐ No	
11. Are nearby bus stops, shelters, and transit access points clear of snow and accessible for people using mobility devices?	☐ Yes ☐ No	

Appendix C: Neighbourhood Maps




SOUTH PORTAGE & BROADWAY ASSINIBOINE
N
Legend
SouthPortage
South Portage & Broadway Assiniboine
Portage Ave.
Main Street
Broadway
Assiniboine Ave.
Central Park
Spence
Portage & Main
Winnipeg Square
Colony
The Forks
Broadway-Assiniboine
Legislature
West Broadway
0 0.17 0.35 0.7 Kilometers


SOUTHDALE NEIGHBOURHOOD
N
Legend
Southdale Boundary
Accessibility Audit Street
Vermillion Rd
Fermor Ave
Niakwa Place
Lakewood Blvd
Beaverhill Blvd
Southdale
The Mint
0 0.2 0.4 0.8 Kilometers

Appendix D: Summary of Interview Data

Themes	Main Code	Sub-Code	# of Participants	Description/Quotes from Transcripts		
Mobility Challenges of Using Winter Sidewalks	People most impacted by winter sidewalks	Persons with disabilities disproportionally affected	8	"Well, the reason we're here is certainly because people with disabilities are disproportionately affected than anybody... I really like talking about accessibility in the classroom because everybody's accessibility is being negatively impacted in the wintertime". (Participant 1, 10th January, 2025)	"We hear a lot from the disability community that many folks don't come out in winter because of improperly cleared snow on the sidewalks. The same can be said for seniors and people with small children. It impacts a lot of people and their ability to participate in the community in the wintertime". (Participant 3, 16th January, 2025).	"I would say people with mobility issues and those with the lived experience of disability, including members of the sight loss community because it does affect their mobility and their ease of moving around the built environment with either or no limited sight when the sidewalks are not adequately cleared. There is difficulty with wayfinding because a lot of travel depends on using the tactile sensitivity of the environment around you or what you feel under your feet with the sidewalk, whether you're traveling with a cane or a dog. So, all of that becomes obscured and more difficult when there's a layer of snow or not adequately cleaned snow". (Participant 6, 17th January, 2025)
		Everybody	5			
		People with babies who use strollers	2			
		Seniors	3			
		People with sight loss	2			
	Complaints using sidewalks	Uneven sidewalks	4	"Since we've started our Snow Way campaign, which began in 2024 and now we're continuing it in 2025, people have brought more complaints to our attention and it	"Yes, we do. The most complaints I think we get sometimes on the policy side and some on the operators that clear the snow. Often when we do have snow	
		Holes and cracks	4			

		Snowbanks	3	centers around inadequately cleaned sidewalks or inadequately cleaned streets, pathways to businesses, blocked or ramps for access and mobility not being adequately cleaned or having snow piled up". (Participant 6, 17th January, 2025)	clearing, there end up with what are called wind rows which are like these bumps of snow that happen. Know when you have sidewalk clearing happening in one direction and happening in a different direction. It creates a bump that's hard to get over with". (Participant 3, 16th January, 2025)	
	Concerns about City authorities snow clearing	Better cleared sidewalks in some communities	4	"There are some areas of snow clearing that are privatized especially in the downtown area. The city doesn't have enough budget to do the kind of snow clearing we want to see. So they've put some of their own money as a Downtown BIZ to kind of fill that gap but I'm not quite sure where those borders are where the downtown biz takes over from the city's work". (Participant 3, 16th January, 2025)	"The downtown area gets cleared better than any other community though the sidewalks there are sometimes not accessible. There is a stigma against communities like the Fort Garys and St James because of the cost of living there and, they drive and have access to vehicles The sidewalks in these communities do not get cleared. So, our downtown has barriers between snowfalls. But for the most part, our downtown winnipeg biz cleans the snow in our downtown to the pavement and a majority of the people within those communities walk because they don't have access to a vehicle" (Participant 4, 17th January, 2025)	"I think they wait for so much snow to fall before they clear the snow which can make it quite hazardous for people with disabilities" (Participant 7, 22nd January, 2025
		Privatize sidewalk clearing	2			
	Where are sidewalks easier or	Few sidewalks are relatively	2	"Sidewalks in the winter I would say are normally not accessible in terms of navigation. Some sidewalks are easier to navigate		

	hard to use	accessible including those around the Downtown BIZ		than others but I don't know in what areas they are, but I know that in some areas they're a lot easier to navigate. Like I said, it all depends on who travels the sidewalks and how well they get shoveled" (Participant 2, 16th January, 2025)		
		Most sidewalks are inaccessible	6			
	Role of assistive devices	Cane, wheelchairs and walkers	4	"That really depends on the device and the person. For myself, I have an electric wheelchair which can get through quite a bit of snow, but that's not the same for every powered wheelchair user. It's not the same for people that use my wheelchair. It's not the same, it really depends on a person's mobility, their comfort level with a bit of risk and how stakes are sidewalk is in their area. I would honestly put less focus on the devices". (Participant 3, 16th January, 2025)	"Using wheelchair is a little better, especially the electronic ones which help you get there quicker but sometimes you get stuck and you're doing like, you're bending your tires like a car. So you're like trying to get out of there. Canes get stuck and it's not helping them to have that support to walk their next steps" (Participant 8, February 10, 2025)	"Well, if you don't have good wheels, basically you're doomed. Because if you don't have the wheels that you need to actually get through the snow like I said, it becomes very difficult to get to even somewhere that's very close to you. You can use transit or like taxi services of course sometimes they can be somewhat unreliable" (Participant 5, 17th January, 2025)
		Struggle to use devices	5			
		Devices get stuck sometimes	3			
		Frustrating	2			
Impact on Social and Economic Participation	Impact on travel to specific destinations	Grocery shopping	3	"That's a challenge it's very unique to people. There are people that go to work. There are people that volunteer. We're a provincial organization, we have members across the city and the province.		
		Medical appointments	3			

		Work	4	So, people want to do the same things in winter like they do the rest of the year. They want be able to go out in their community and do their shopping. They want to be able to do their job. They want to be able to do their volunteer work. They want to be able to see their families and friends. They want to be able to do the same thing like able-bodied folks do out in the community in the wintertime. And there's no reason they shouldn't be able to do that". (Participant 3, January 16th, 2025)		
		Businesses	5			
		Visit friends	3			
	Alternative ways of getting to destinations	Handy vans	4	"Well, they go anywhere and everywhere. I mean, like anybody else in the community, they want to get out and be active so they can go anywhere from the gym to restaurants to malls. If they're students, they're navigating to class. Anywhere you would imagine any other member of the community going, that's where members of our community would go, and if they're unable to go there through walking or conventional transit. They would use the paratransit system". (Participant 6, 17th January, 2025	"Some use Transit Plus exclusively in the wintertime. But that too depends on clear sidewalk because Even if you're using public transportation, you need to be able to access that public transportation using a sidewalk. Transit plus still has to be able to pick you up so even that gets limited if they're living in areas or going to areas where the sidewalk may not be cleared. There's not a clear path to drop you off". (Participant 3, 16th January, 2025)	I am a handy transit user I use Handy Transit more in the winter than I do in the summer, but… I probably will start using it in the summer. I also use… an electric wheelchair, if you want to call it that. It's not your traditional wheelchair. (Participant 2,16th Janyuary, 2025
		Ride hailing	2			
		Taxi services	2			
		Impact of poor sidewalks on different types of modes	4			

	Change In daily routine/activities	change in daily routine or activities	4	Some people unfortunately do change their routine. I know of some people that don't go to vote in the winter at all because they're afraid of the sidewalks. (Participant 3, 16th January, 2025)	"We're called shut-ins for a reason and we're shut-in in the winter times, be that you want to make a doctor's appointment, or you want to go see your friend. It's too difficult to manage during this time". (Participant 7, 22nd January, 2025).	"I would say so. Personally, in terms of grocery shopping, now that we can do it online, I usually do my grocery shopping online and they come, and they drop off my groceries and then all I have to do is put them away". (Participant 2, 16th January, 2025)
Emotional and Mental Health Impacts	Emotional and mental health challenges	Anxiety	3	"Oh, I would imagine, yes, of course there are. Like I was saying earlier, there are people that don't go out of their homes all winter. You can imagine what the impact that has on people's mental health. And just speaking for myself I know when I'm trying to navigate and the sidewalks are not clear, it sure starts to feel like the city doesn't care about me. The city doesn't care about my safety, and what I need to do" (Participant 3, 16th January, 2025)	"Yeah, of course. It's most annoying and hard knowing that you can't go to the places you enjoy going to and that year, you feel so stuck. You feel stuck and you feel like you're chuck… like you're a chap essentially. I'm a pretty social person and sometimes I like to go out to watch movies and to meet new people and that piece of it having my loss of that during winters is definitely hard for me as well". (Participant 5, 17th January, 2025)	"Oh, absolutely. Like, I mean if blindness isn't your only concern than if you have mobility issues, there's fear and anxiety, risk of falling, depression, isolation, the inability to leave your house when you want to do the activities you want to do all of those things". (Participant 6, 17th January, 2025)
		Fear	5			
		Depression	3			
		Isolation	5			

Advocacy Work	Campaigns	Snow - plow campaign	4	"Yeah. So last year, I initiated what we're calling the Snow-plow campaign, which is a collaboration of different disability and seniors organizations trying to encourage the city and operators to do a better job clearing sidewalks. That campaign basically is urging people to send their photos and stories of improper snow clearing to us, then share that information with the city. The city told us they find that very helpful. We've also done a lot of media about it, like today for example, we found out that the pilot that the city was proposing in their budget to wait till roads were at 15 centimeters before clearing that looks like that's going to get cancelled now because of public pressure so I'm very grateful to you, John, for pushing our meeting up a little bit today because I've got media calling me this afternoon and getting my input on that". (Participant 3, 16th January, 2025		
		Media campaign	4		"For sure. Well, we've done some advocacy work with the City of Winnipeg, with their government and the city councillors. We'll show up if there's a proposal to increase funding, buy new equipment…that's positive. We're certainly going to be showing up and saying yes, absolutely from a community standpoint. What we're doing right now is working with a number of other organizations that you met yesterday, on the Snow-plow campaign to raise awareness using social media. Everyone has a phone, I mean, almost everybody and being able to kind of catch things in real time and post it on snow-plow campaign Facebook and Instagram pages for city	

					authorities to see" (Participant 1, 10th January, 2025)	
Potential Solutions	Features, policies and practices from elsewhere	No particular policies from participants . Believe timely clearing of snow will help	6	"Well, I can just give you things that are talked about. Sometimes I'm hesitant to kind of point, you know, all to a thing and say this is what's going to save it all other than money. There are no silver bullets, you know, I mean, I said it's a budget item. Like many other things the more you spend on it, the faster it's going to happen for you. Like it is really that simple but in terms of like outside of that question, how can we use the money more effectively. Well, these kinds of things I suppose would be more than Winnipeg. For example, there is no responsibility on private property owners to clear the sidewalk in front of their homes, residentially. So, in other cities, even other cities in Canada, I think Edmonton might be one of them. Regina might be one as well, private homeowners are required to clear their sidewalk right". (Participant 1, 10th January, 2025)	"I don't have specifics policies. But I think that there are winter communities that have a more balanced snow clearing policy where they clear all the major roads first and then all of the minor roads and then all of the major sidewalks and then all of the minor sidewalks. But if we want people to use or choose busing in our city, the sidewalks have to be cleared to get to the buses. You know like if we want to have a multimodal transportation system, if we want people to use active transportation, more green modes of transportation. If we want people to have access to services, if we want people, a majority of our population to participate economically as well as in the workforce, we have to have a more balanced look at how we clean our winter roads and sidewalks". (Participant 4, 17th January, 2025)	
	Most pressing concern	Regular clearing of snow is the	6	"Just cleaning the snow. So, travel can be safe and accessible in a timely manner so that everybody despite what abilities they have	"Clearing the street would be good. Clearing the sidewalk would be a good thing removing the snowbanks. You can't get around a	"Get the snow out of the sidewalks. Just Plow it and get rid of it". (Participant 8, 10th February, 2025)

		best way to go		can navigate the built environment the way they choose". (Participant 6, 17th January, 2025)	snowbank and you have to find an opening driveway in order to cross the street if you're walking. If using a scooter, obviously you need to find a place that's accessible". (Participant 7, 22nd January, 2025)	