Examining the influence of personal-time-based accessibility on the frequency of public transit use among older adults across Canada

Meredith Alousi-Jones
School of Urban Planning
815 Sherbrooke St. West,
McGill University, Montreal, Canada, H3A 0C2
Email: meredith.alousi-jones@mail.mcgill.ca
orcid: 0000-0003-4515-1083

Ahmed El-Geneidy*
School of Urban Planning
815 Sherbrooke St. West,
McGill University, Montreal, Canada, H3A 0C2
Email: ahmed.elgeneidy@mcgill.ca
orcid: 0000-0002-0942-4016

*Corresponding author

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HIGHLIGHTS

- Older adults in Canada rely on private vehicles to conduct their daily travel
- Public transit can be a solution for older adults facing driving cessation
- Personal-time-based accessibility uses the time people are willing to travel for
- Older adults with higher levels of PTB accessibility use public transit more frequently
- Those who perceive having good access by public transit use it more frequently

ABSTRACT

As our population ages and many face the prospect of driving cessation, ensuring that public transit services meet older adults' needs could allow them to maintain their independent mobility and contribute to their long-term quality of life. Accessibility, the ease of reaching destinations by a certain mode, is a measure that can be used to indicate how well transport systems and land use allow people to reach their desired destinations. This paper explores how perceived and individual aspects of accessibility influence older adults' frequency of public transit use in a Canadian context. Based on a survey collected from six Canadian regions, we use respondents' stated reasonable travel time by public transit to generate a personal-time-based cumulative accessibility measure. We then use a multilevel linear regression model to understand the impacts of the personal-time-based accessibility measure, perceived accessibility, and other personal characteristics on older adults' frequency of using public transit. The results indicate that both perceived and personal-time-based accessibility have a strong and positive impact public transit use. Findings from this research can be relevant for transport planners and policy makers interested in improving the well-being and independence of older adults through using public transport.

Keywords: Public transit frequency, older adults, accessibility, personal-time-based accessibility.

1. INTRODUCTION

Older adults can experience a decrease in their level of mobility due to age-related challenges and life events, such as retirement or residential relocation (Shrestha et al., 2017; World Health Organization, 2021). They tend to make fewer and shorter trips and rely more heavily on private vehicles to get around, especially in the North American context (Newbold et al., 2005; Spinney et al., 2009; Wasfi & Levinson, 2007). However, as driving cessation becomes more prevalent with age, older populations can lose independence (Choi & DiNitto, 2016; Mezuk & Rebok, 2008; Musselwhite & Shergold, 2013). Older adults represent an increasingly significant proportion of our population (World Health Organization, 2021), and addressing their transport concerns is of particular importance in reducing their dependence on private vehicles and having positive effects on their quality of life on the long term. Providing older adults with adequate transport options, such as public transport, can help prevent social isolation and ensure they can maintain their independence as they age (American Psychological Association, 2021; Spinney et al., 2009; World Health Organization, 2018).

Accessibility, the ease of reaching destinations, is a measure that accounts for transport and land use. Accessibility could be utilized as a performance measure to evaluate how well the current land use and public transport system meet older adults' needs (El-Geneidy & Levinson, 2006; Geurs & Van Wee, 2004; Handy, 2020). According to Geurs and Van Wee (2004), the temporal and individual components of accessibility augment the measure by accounting for time constraints and personal characteristics. Considering temporal aspects of accessibility, different people might be willing to travel for shorter or longer times by public transit, which could impact their accessibility. Moreover, people might perceive having poor or no access to certain destinations by public transit due to, for example, lack of familiarity with the public transit network in their region, making them chose alternative modes of transport, regardless of their objective levels of accessibility by public transit (Curl, 2018; Lättman et al., 2016).

This study aims to get insights into the impacts of objective and perceived measures of accessibility on the frequency of public transit use among older populations in six metropolitan regions across Canada. The Aging in Place survey (Alousi-Jones et al., 2023), on which this study is based, collected travel behaviour and transport needs, as well as extensive sociodemographic and attitudinal details, of more than 4,000 older adults from six Census Metropolitan Areas (CMA): Toronto, Montréal, Vancouver, Halifax, Victoria and Saskatoon. The results from this study could help transport planners and policy makers better understand the effects of objective and perceived levels of accessibility on older adults' frequency of using public transport, which is known to have a positive impact on their health and well-being.

2. LITERATURE REVIEW

As many older adults face the prospect of driving cessation, it is important that alternative modes of transport such as public transit allow them to access their desired destinations and maintain their independent mobility.

Past literature has found that older adults take fewer and shorter trips and rely heavily on vehicles to get around (Böcker et al., 2017). As they advance in age, many older adults voluntarily limit their driving in more challenging conditions such as no longer driving at night or during peak commuting hours (Musselwhite & Shergold, 2013; Truong & Somenahalli, 2015). This can make them reliant on friends and family to get around or even prevent them entirely from meeting their travel needs (Choi & DiNitto, 2016; Jones et al., 2018; Luiu et al., 2016). On the other hand, older adults who take public transit more frequently tend to accord a lot of importance to the proximity of their home to transit services and believe to have favourable walking distances and conditions to their closest stops and stations (Moran et al., 2014; Truong & Somenahalli, 2015), showing the importance of easy access to their public transit system.

Older adults tend to be preoccupied with the safety of public transit services, both in terms of crime and risk of injury (e.g., falling) (Shrestha et al., 2017). Moreover, fear of infection became of particular concern over the course of the Covid-19 pandemic, and many older adults stopped using public transit and are now slow to return to it (Long et al., 2023).

Older adults' use of public transit can also impact their perception of the mode (Lättman et al., 2016). If they perceive their public transit service as inconvenient and maladapted to their travel needs and abilities, it is more likely they will not or will rarely use the mode (Panahi et al., 2022; Shrestha et al., 2017).

Accessibility measures can help evaluate the efficacy of the system in getting people to their destinations and identify potential areas for improvement or underserved communities and population groups, such as older adults (Ravensbergen et al., 2022; Salomon & Mokhtarian, 1998). Past research shows that increases in accessibility by public transit (to jobs/destinations accessible by public transit) can lead to a higher public transit mode share (Cui et al., 2020). Moreover, individuals' perception of their level of accessibility, or perceived accessibility, can have a significant and positive impact on their public transit use (Ryan & Pereira, 2021). However, older adults have been found to experience lower levels of both objective accessibility and perceived accessibility by public transit (Choi et al., 2021; Ravensbergen et al., 2022).

To ensure public transit systems are adapted to older adults' needs, a deeper examination of how accessibility and individual factors impact this group's public transit use is needed (Gascon et al., 2020; Truong & Somenahalli, 2015). This paper aims to delve deeper into the impact of this relationship on not only public transit use, but on the frequency of use among older adults in a Canadian context.

3. MATERIALS AND METHODS

3.1 Data Collection

The data used in this study comes from the 2023 Aging in Place Survey. This is a comprehensive online bilingual survey that captures public transport and daily travel experiences and needs of older adults (aged 65 and over) across six Canadian CMAs (Figure 1). As recommended by Dillman et al. (2014), multiple recruitment methods were applied to ensure the robustness of the collected sample such as distribution of fliers at senior and community centres, social media advertising, senior centre mailing lists, and recruitment through Léger, a firm specialized in public opinion and surveys. Various prizes were offered through a draw to encourage participation in the survey. The survey was administered in February and March 2023. After the data collection was complete, a nine-step cleaning process was applied to the sample, which filtered out any response that was answered too quickly, that had an invalid home or trip destination location, that had repeated IP or email addresses, as well as other criteria. The final sample, after data cleaning and validation was 3,551 respondents (Alousi-Jones et al., 2023).

Figure 1 CMAs selected for this research (Toronto, Montréal, Vancouver, Halifax, Victoria, Saskatoon). [colour]

3.2 Personal-time-based Accessibility

In this study we propose a new personal-time-based accessibility measure. This measure combines cumulative opportunities accessibility, given the measure's straightforward calculations and communicability, with acceptable travel time by public transit for every respondent from the survey. Respondents, regardless of how frequently they use public transit, were asked:

*In your opinion, what would a **reasonable travel time** to reach your desired destinations from your home by public transit in your region?*

10 minutes or less … 60 minutes or more (in 5-minute increments)

This reasonable travel time threshold was then used as the base to calculate a cumulative opportunities measure of accessibility for everyone in the survey with a varying travel time threshold (personal-time-based accessibility). Compared to using a generalized travel time threshold, this choice was made to better represent how older adults assess their level of accessibility by public transit and how it might impact their travel habits and perceptions.

The cumulative opportunities measure estimates the number of activities reachable by a specific mode from any given point in a fixed travel time threshold (El-Geneidy & Levinson, 2006). To calculate the personal-time-based accessibility measure for each respondent, we obtained the Commuting Flows Tables from the 2016 Canadian Census (the most recent census not impacted by the COVID pandemic) and General Transit Feed Specification (GTFS) data for each region in 2023. The Commuting Flow tables contain information about the number of workers travelling between their home census tract (CT) and their work CT. The number of commuters travelling to a CT for work was approximated as the number of jobs available at each CT, and was then used as a proxy for the number of destinations available in that CT. The GTFS data used includes the schedules, fares, geographic transit information, arrival predictions, and vehicle positions provided by each region's public transport agencies for a given date in 2023. This data was processed in the R statistical software using the r5r package (Pereira et al., 2021). Using the respondents' home location

(approximated at the centroid of their respective CT), the number of jobs (i.e., destinations) available in each CT and the GTFS data, the personal-time-based accessibility is calculated for each respondent according to their stated reasonable travel time. The r5r package calculates transit travel times and corresponding level of accessibility on a given date at a given time. In this study, Tuesday, February 14th, 2023, between 10 AM and 11 AM was selected to ensure an appropriate comparison between the respondents and to align the GTFS data (e.g., schedules, available routes) with the period in which the survey data was collected. It is important to note that a 10 AM departure time was chosen as older adults are found to travel outside of peak hours (Ravensbergen et al., 2022), and this time was the most reported in the travel diaries collected in the survey. To account for variation in the transit schedules, accessibility was calculated for every minute between 10 and 11 AM and the median accessibility was used.

The personal-time-based accessibility measures for all jobs were calculated for each respondent as follows:

$$PTB\ A_{jobs,i} = \sum_{j=1}^{J} E_j\, f(t_{ij})\ where\ f(t_{ij}) = \begin{cases} 1,\ t_{ij} \leq t_{reasonable} \\ 0,\ t_{ij} > t_{reasonable} \end{cases}$$

Where:

$PTB\ A_{jobs,i}$ = personal-time-based accessibility to jobs from origin census tract *i* (i.e., respondent home location)

E_j = number of jobs in destination census tract *j*

$f(t_{ij})$ = a dichotomous function to determine whether jobs in census tract *j* are reachable by census tract *i*

t_{ij} = travel time by public transport between 10 AM and 11AM between census tracts *i* and *j*

$t_{reasonable}$ = stated reasonable travel time being used as the travel time threshold specific to each respondent

Personal-time-based cumulative opportunities measures of accessibility were then divided by the total number of jobs in each region to allow the inclusion of data from various CMAs in one model. This variable will be interpreted as the percentage of jobs in a region that is reachable from an older adults home based on their acceptable travel time threshold by public transport. It is important to note that jobs are used in this paper as a proxy for services older adults seek to reach in their daily life, an acceptable assumption that has been made in previous research (Ravensbergen et al., 2022).

3.3 Perceived Accessibility

In the Aging in Place Survey (Alousi-Jones et al., 2023) respondents were asked if they believe they can reach a variety of destinations by public transit in their stated reasonable travel time. The four trip purposes (i.e., destinations) retained for this analysis are work, groceries stores, visiting friends and family, and medical appointments. This question was asked to all respondents, regardless of whether they use public transit to access these destinations, or go to these destinations at all, as we want to capture the impact of perceived accessibility to different destinations on the frequency of public transit use.

3.4 Multilevel linear regression model development

To develop a model to explore what factors influence older Canadians' frequency of use of public transit, variables related to objective and perceived accessibility, personal and household characteristics, and home selection purposes were retained from the survey responses. The summary statistics of these variables are found in Table 1 in the following section. Given certain region-specific characteristics such as quality of the public transit networks and size of the population, we opted for a multilevel linear regression, where

the respondent's region was the higher level accounted for in the analysis. Then, many iterations of the model were run with different combinations of variables in order to analyze the results and test the stability and accuracy of the final model. Some transformations to the variables were done to simplify the analysis. The dependent variable of the study is the frequency of public transit use in the last year.

4. RESULTS AND DISCUSSION

4.1 Descriptive Statistics

The mean values and proportion of the survey sample which corresponds to various input variables of interest are presented in Table 1. Though the full collected and validated sample amounts to 3,551 respondents, further cleaning was necessary for the purpose of this study, such as excluding those who did not choose to specify their household income or who did not participate in the choice of their residence, meaning the final sample used in this paper is comprised of 2,475 responses.

We can see that a large portion of the respondents (46.5%) never or seldom use public transport in their region. Around 17.3% of the sample indicated they public transit two to four times per week.

Having asked in the survey what the respondents considered a reasonable public transit travel time to reach a desired destination in their region, we find a mean travel time of 31.6 minutes, with a standard deviation of 12.1 minutes. This observed variation could be due to differences in region size, the expansiveness of the public transport network, as well as variation in destinations respondents consider when choosing their threshold. The mean level of accessibility in this stated reasonable travel time (specific to each individual), meaning the number the jobs accessible from their home location by public transit in the travel time they specified, is 72,430 jobs, with a standard variation of 140,930 jobs. Again, this considerable variation is due to the difference in area and population size across the six studied regions, and therefore the number of available jobs, as well as the public transit service provision. In terms of respondents' perception of their accessibility to various destinations by public transport in their reasonable travel time, the destinations with the highest perceived accessibility are grocery stores, followed by medical appointments. Work and volunteering and visiting friends and family were not perceived to be very accessible by public transit, but for work, this could reflect an overwhelming majority of survey respondents being retired. Due to the survey sampling methods, a large portion of the respondents live in the Greater Montréal region, followed by Greater Toronto and Greater Vancouver. The mean age of the sample is 72.2 years old, with a standard deviation of 5.2 years, and 53.5% of the sample are women. Due to their small size of the sample, genders other than man and woman were excluded from this analysis. Most of the sample (84.4%) are retired, while only 15.4% work full-time or part-time. Most households are comprised of two people (51.5%), and 46.9% of households surveyed have a yearly income of $59,999 CAD or less. Only 64.6% of the sample states benefiting from a reduced transit fare. Close to 75% of the respondents have access to a private vehicle and 72% of respondents selected their current home location in part for its proximity to public transit.

TABLE 1 Summary Statistics

Variable		*Percentage of the sample (N=2,475)*
Frequency of public transit use in the past year	Everyday	2.60%
	Five to six times a week	7.90%
	Two to four times a week	17.30%
	Once a week	9.40%
	Twice a month	9.80%
	Once a month	6.50%
	A couple of times a year	20.50%
	Never	26%
Mean reasonable public transit travel time in minutes (Standard deviation)		31.6 (12.1)
Mean PTB accessibility in stated reasonable travel time in thousands of jobs (Standard deviation)		73.42 (140.93)
Perceives having access by public transit to	Work/Volunteering	47.80%
	Grocery stores	65.90%
	Visiting friends and/or family	43.60%
	Medical appointments	59.90%
<u>Personal characteristics</u>		
Mean age in years (Standard deviation)		72.2 (5.2)
Gender	Man	46.50%
	Woman	53.50%
Region of residence	Toronto	27.20%
	Montréal	41.10%
	Vancouver	17.20%
	Halifax	4.20%
	Victoria	8.40%
	Saskatoon	1.90%
Number of household members	1	39.60%
	2	51.50%
	3 to 7	8.90%
Household income	Lower income (less than $60k)	46.90%
	Other income (more than $60k)	53.10%
Work Status	Retired	84.40%
	Homemaker	2.00%
	Full time worker	6.10%
	Part time worker	9.30%
	Volunteer	7.10%
	Student	0.60%
Has access to a private vehicle		74.60%
Receives a reduced transit fare		64.60%
Selected home location to be close to public transit		72.00%

4.2 Perceived accessibility

To contextualize the sample in terms of perceived accessibility, we plotted, for the four studied destinations, the respondents' personal-time-based accessibility (i.e., the cumulative accessibility by public transit in their reasonable travel time) against their frequency of public transit use over the past year, shown in Figure 2. The personal-time-based (PTB) accessibility measures were normalized by dividing each respondent's individual accessibility by the total number of available destinations (i.e., jobs) in their respective region. The x-axis therefore represents the percentage of total jobs in the respondent's region they have access to by public transit in their stated reasonable travel time. In each plot, survey respondents are represented by a point, coloured orange if they do not perceive having access to that particular destination in their stated reasonable travel time and green if they agreed to having access to it by public transit.

Across all four destinations, it is clear that those who never or seldom use public transit do not perceive as having good public transit accessibility to these destinations. This perception matches their measured level of accessibility, which tends to be lower. On the other hand, those who use public transit more frequently perceive as having good accessibility to these destinations, even if their level of accessibility is objectively lower.

This indicates the impact perceived accessibility has on travel behaviour. Respondents who use public transit frequently perceive having better accessibility by public transit to the four relevant destinations compared to those who never or rarely use it, while having similar levels of measured accessibility. It is therefore important to properly communicate how well public transit serves these various destinations, and make sure older adults are aware of what is accessible to them by public transit, as it could have a positive impact on their frequency of public transit use.

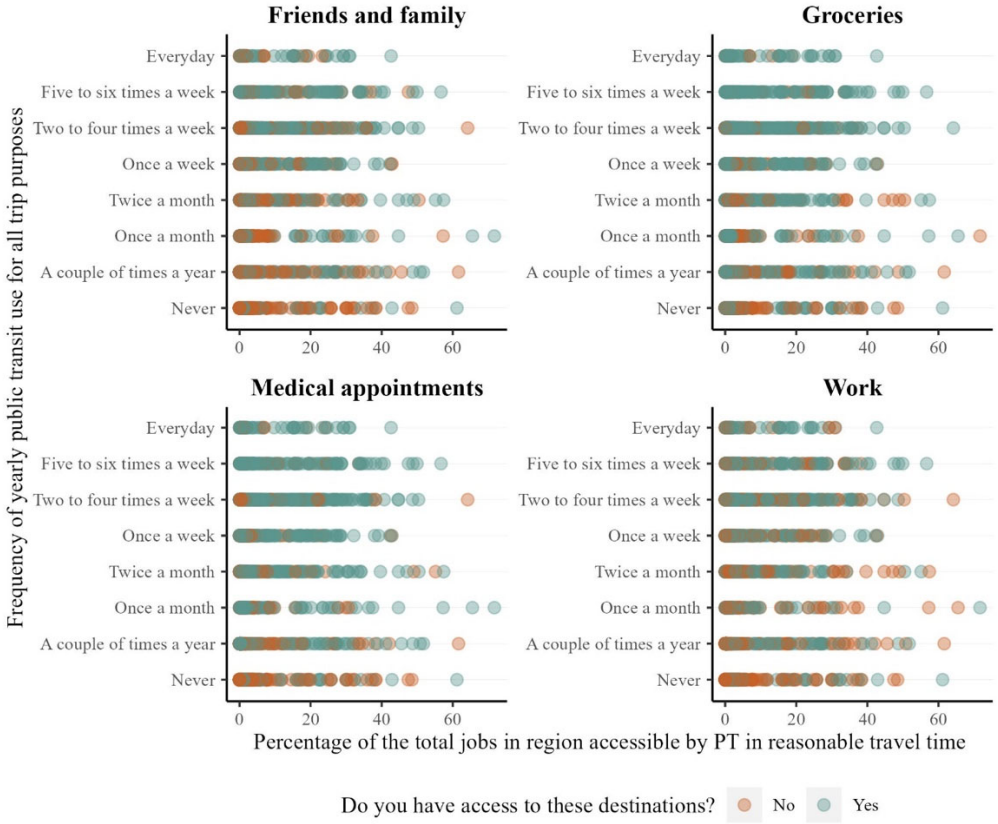

Figure 2 Perceived accessibility to work, groceries, friends and family, and medical appointments, in terms of PT use frequency and PTB accessibility. [colour]

4.3 Model results

Table 2 presents the results of the multilevel linear regression that was developed to study the relationship between frequency of public transit use and personal-time-based accessibility, all while controlling for various individual and context-specific variables. The marginal goodness-of-fit of the behavioural model is 0.417.

4.3.1 Personal-time-based accessibility

For PTB accessibility, i.e., the individual level of accessibility by public transit calculated with the stated reasonable travel time, both the value and its squared term are significant, the first being positive and the second negative. This demonstrates the importance of planning transit service to allow older users to reach a large number of destinations, within a reasonable time, as it directly and positively impacts their frequency of use. The negative sign for the squared term of accessibility indicates, moreover, that this level of service is not unachievable, and that there will come a certain optimal level (i.e., 26.3% of the region's total number of jobs) of cumulative accessibility after which improvements will not lead to higher frequency of public transit use among older adults. This parabolic representation of the relationship of level of PTB accessibility corroborates what has been found for the impact of objective cumulative accessibility on public transit mode share for different income groups in regions across Canada (Cui et al., 2020).

When looking at the respondents' stated perceptions of accessibility to various destinations, believing to have public transit access to work/volunteering destinations, grocery stores and visits with family and friends in a reasonable travel time positively impacts older adults' frequency of use of public transit, as discussed in the previous subsection. Interestingly, though over 80% of the sample is retired, perceived accessibility to work is significant in predicting frequency of public transit use, which could be due to many work locations being concentrated in city centres, where a large number of amenities and services are located (representing destinations older adults might wish to access) and be well-served by the public transport network. The importance of access to family and friends in higher public-transit use frequency demonstrates the importance of older adults' social network and its spatial component. Finally, the lack of statistical significance for medical appointments does not indicate that public transit providers should not improve their service to these destinations, but that perceived access to them does not significantly impact the frequency of public transit use, all other variables being held at their mean. Providers should continue increasing frequency and provision of service to these destinations and communicating these improvements clearly, especially to older adults, to increase the perceived accessibility, and therefore use of public transit.

Table 2 Multilevel regression for frequency of yearly public transit use

Variable	Coefficient		C.I. (95%)
(Intercept)	112.60	***	55.35 – 169.85
Personal-time-based accessibility (in percentage of total jobs in region)			
Measured accessibility	155.28	***	79.62 – 230.93
Measured accessibility^2	-295.51	**	-481.90 – -109.1
Region (reference is Toronto)			
Greater Montréal	4.18		-45.32 – 53.68
Greater Vancouver	3.89		-45.88 – 53.65
Greater Saskatoon	-5.87		-59.43 – 47.68
Greater Victoria	-1.58		-52.00 – 48.85
Greater Halifax	-5.15		-56.37 – 46.06
Perceived public-transit accessibility to…			
Work	16.58	***	9.81 – 23.35
Grocery stores	10.34	**	3.38 – 17.31
Friends and family	15.19	***	8.14 – 22.23
Medical appointments	5.76		-1.73 – 13.25
Employment status			
Volunteer	16.88	**	5.64 – 28.12
Full-time	35.76	***	23.50 – 48.02
Part-time	25.06	***	15.18 – 34.94
Student	37.99	*	1.27 – 74.71
Personal characteristics			
Woman	-2.15		-8.06 – 3.76
Lower income (Less than $60k)	6.54	*	0.01 – 13.06
Number of household members	-2.90		-6.99 – 1.19
Has access to a private vehicle	-72.69	***	-81.19 – -64.19
Holds a valid driver's license	-21.47	***	-31.16 – -11.78
Receives reduced transit fare	38.02	***	31.08 – 44.95
Age	-0.58	*	-1.14 – -0.01
Choice of home location			
Being close to public transit	13.10	***	5.72 – 20.48
Random Effects			
σ^2	5134.66		
$\tau_{00\ region}$	311.87		
ICC	0.06		
N_{region}	6		
Observations	2475		
Marginal R^2/Conditional R^2	0.417/0.450		

4.3.2 Personal and household characteristics

Among all the variables that were included in the regression model, the most (negatively) impactful on frequency of public transit use is having access to a private vehicle. Having a valid drivers' license, which is correlated to vehicle access, is also an important explanatory variable for frequency of public transit use. This demonstrates that discouraging private car use amongst older adults is an important strategy in increasing public transit use in this age group. In addition, making public transit a reliable and comfortable alternative mode of transportation could improve older adults' perception of public transit, making them more likely to use it.

The respondents' employment status also proved to be significant, with volunteering, working (part-time or full-time) and being a student as important predictors of more frequent public transit use. This makes sense as these imply more fixed, regular commute trips that tend to be at times and to destinations that public transport networks are traditionally designed for. To get older adults who are retired to use public transit more frequently, a group which represents over 80% of the sample, providers must turn towards ensuring adequate service at off-peak times and that routes allow older adults to reach their desired destinations.

Age was found to be significant and negatively impact frequency of public transit use. This implies that the older someone is, the less frequently they will use public transit. This has important policy implications as age also increases the changes of driving cessation. If we are to ensure they remain independent and retain a healthy level of mobility, we must provide public transit services that meet the needs of older adults who are further along in age.

Gender and region do not have a significant impact on older Canadians' frequency of public transit use. Though this may be unexpected, using the multilevel linear regression means the model specifications consider the particular characteristics of each region. The conditional goodness of fit of the model increases to 0.45.

Though the number of people in the household is not significant, yearly household income is, as respondents who are part of a lower income household ($59,999 CAD or less) are more likely to use public transit more frequently when compared to other income households. This supports the implementation of lower fares (or making transit free) for older adults, as it would reduce the financial burden daily transport represents, especially for lower income individuals. As can also be seen in the model, benefitting from a reduced transit fare results in higher public transit use, and this is the case for all income groups. Across all six studied cities, the respective transit providers offer reduced fares to their older patrons (65+). As only 64.6% of the sample indicated receiving a reduced fare, not all respondents are aware of this reduced fare, and better communicating their travel options and reduced fare eligibility to them could positively impact their frequency of transit use.

4.3.3 Self-selection

When looking at factors in the choice of residential location, having chosen one's home location while considering its proximity to public transport is significant. Its positive impact on frequency of public transit use makes sense as it could represent a desire to remain close to public transit services, presumably in order to use them. It could also indicate that before moving to their current home, respondents were using public transit and wished to continue after moving, as past use of public transit is a strong predictor of future sustained use.

CONCLUSION

In conclusion, this study offers insight into the factors that influence older Canadians' frequency of public transit use and how cumulative opportunities measures can be adapted to better reflect individual's understanding of accessibility. This was done by developing the personal-time-based measure of accessibility, which uses one's stated reasonable travel time by public transit to calculate their cumulative accessibility at a personal level. Based on survey results which polled a large sample of older adults across six Canadian metropolitan areas, the multilevel regression results indicate that both personal-time-based accessibility and perceived accessibility to various destinations have a significant impact on frequency of

public transit use. Moreover, having access to a private car and being able to drive negatively impacts this frequency, whereas reduced transit fares and engaging in regularly timed activities such as volunteering or having a job, increases the frequency of public transit use among older adults. These results indicate that more frequent and reliable public transit service, as well as better network connectivity (i.e., reaching more destinations more efficiently) could increase older adults' perception of their accessibility and subsequently increase their use of public transit. Moreover, ensuring the service improvements reflect older adults' needs and travel habits, such as travelling during the off-peak, is essential, allowing older travellers with different needs to use public transit and increase their satisfaction with the mode. However, attention must also be directed towards reducing car ownership among older adults. As is the case for all age groups, this is strongest explanatory factor in lower public transit use, and providing incentives and adequate travel alternatives, such as reduced or free transit fares, could make older adults choose to travel by public transit. Finally, public transit providers should focus on bettering how they communicate their services to older adults, as having a better understanding and perception of their public transit accessibility to various destinations and of their reduced fare eligibility could result in an increase in their frequency of public transit use.

A few limitations of this study should be noted. Firstly, though this survey data gives important insight into what older people consider when evaluating their access to various destinations using different travel modes, it remains a quantitative source of information. To better understand what accessibility means to them and how it influences their travel behaviour and quality of life, interviews or analysis of open-ended questions pertaining to the topic must complement the information that has already been collected. Another limitation is that the calculations of levels of accessibility remains reliant on the available data, which is highly granular. Aggregating both respondents to their home CT centroid and jobs to their respective CT centroid can under or overestimate travel times and accessibility by public transit. Thirdly, the jobs data used is from 2016, whereas the GTFS and survey data was collected in 2023. There might be changes in geography (expansion of the CMA, sectioning or aggregation of census tracts, etc.), or changes in job locations that could have occurred in the last 7 years that limit the accuracy of results of this study.

Future research can explore more factors pertaining to travel attitudes, which might be region-specific and provide pathways to more direct strategies for public transit agencies. Segmentation of the survey sample could also be interesting to explore, as we could compare public transit users to non-users, highlighting each of these groups' specific concerns regarding daily travel and the use of public transit.

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AUTHOR STATEMENT

All authors reviewed the results and approved the final version of the manuscript and declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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