

1 **The Effects of a Free Bus Program on Travel Behaviour of Older Adults: A**
2 **Case Study of a Canadian Suburban Municipality**

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1 ABSTRACT

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3 Public transit can be a potentially attractive alternative to driving for older adults, particularly
4 for those who cannot drive due to health decline. Encouraging the shift of older adult travel
5 behaviour from automobiles to transit could be accomplished through incentive programs. An
6 example is the free bus/transit programs, which are more commonplace in Europe and are
7 recently gaining popularity in Canada and the US. In this paper, short surveys (n = 131) and
8 semi-structured interviews (n = 16) were utilized to explore older adults' travel behaviour and
9 experiences related to a recently introduced free transit program in the suburban municipality
10 of Oakville, Ontario, Canada. Results from logistic regression models suggest that older adults
11 with lower incomes, those who drive more during the week, and who live closer to downtown
12 are more likely to have benefited from Oakville's free bus program. The common reasons for
13 using the program related to scheduling, the opportunity to produce and maintain social capital,
14 financial savings and declining health. Some older adults did not use the program because they
15 already had a subsidized monthly pass or when using bus was inconvenient. This research
16 expands on a limited North American literature on the impacts of free bus programs among
17 older adults. The North American population is aging rapidly, and most older adults would live
18 in suburban communities in coming decades. In this context, the findings from this research
19 may help planners and policy makers accommodate for older adults' travel needs and
20 preferences in suburban municipalities.

1 INTRODUCTION

2 A substantial increase of older adult population, those over 65 years of age, is expected in
3 North America over the next few decades (1, 2). Canadian older adults accounted for 14% of
4 the population in 2009 (3, 4) and this proportion is estimated to reach 25% by 2036 (5, 6, 7).
5 Currently, the majority of the working age adults (30-64 years old) in North America live in
6 low density suburban areas (8, 9) that are characterised by separated land uses and meandering
7 hierarchical street networks that favour automobile use (10, 4). Many older adults and the
8 working age population are opting to “age in place” in order to continue living in their homes
9 or communities because they perceive it to be safer and more comfortable (11, 5, 12, 13, 14).
10 As a result, suburban municipalities across Canada may be disproportionately affected by a
11 rapid growth in older adult population in the coming decades, and may face significant
12 challenges accommodating their specific travel needs (15).

13 Today’s older adults in suburban environments have a tendency to drive more,
14 compared to a decade ago (8). Older adults situated in the suburbs most often identify the car
15 as their main form of transportation because it is part of a habitual lifestyle (6, 7, 8, 10, 12, 15,
16 16, 17), it is a symbol of “non-elderly” status (16, 18) and it provides independence, and quick
17 access to social, leisure and health services (15, 19). However, an older adult’s physical ability
18 to drive may decrease as their health declines when they get older (20). This limited ability to
19 drive may contribute to a decreasing quality of life (10) and isolation and/or reduced social
20 interaction (15, 16, 18), linking to increased instances of anxiety or depression (11, 19).
21 Furthermore, older adults without car access and someone to travel with have a tendency to
22 exhibit more sedentary behaviour (21, 22). Previous research has linked sedentary behaviour
23 from reduced physical activity to chronic illnesses such as cardiovascular diseases (14, 22),
24 osteoarthritis (14), diabetes (4) and dementia (4) among older adults.

25 Some older adults may be less inclined to use public transportation because it has not
26 been traditionally convenient for non-work travel in a suburban environment (8, 16, 18, 23,
27 24). However, public transportation has been shown to be a potentially attractive and vital
28 alternative to driving for those who cannot drive due to health decline (20, 22, 24), who do not
29 have access to a car or license (22, 24), who cannot afford a car (20, 22, 24), who have
30 experienced the passing of a partner who was the primary driver (17, 25), or do not have access
31 to a transportation network comprised of family, friends or community members (17, 25).

32 Encouraging the shift of older adult travel behaviour from automobiles to public transit
33 could be accomplished through providing incentive programs (8) such as eliminating the transit
34 fare for older adults. Research conducted in Europe indicated that free bus programs could play
35 an important role in maintaining independence, supporting mental and physical well-being (11,
36 6, 26, 27) and physically and socially linking older adults to their communities (27) when
37 driving is not an option.

38 Despite the existence of several free bus programs across Canada, there has been
39 limited local research conducted on their impact. With the aging population situated in mostly
40 suburban communities, systematic research on this topic could make an important contribution
41 by enabling suburban municipalities to review their alternative transportation options for older
42 adults and work towards building more age friendly cities, which are commonly described as
43 healthy, liveable, and accessible cities that support active participation among the older
44 population (28). Developing transportation policies that encourage more sustainable modes of
45 transportation such as walking, cycling, or using a wheel chair (29), instead of the private

1 vehicle, will help reduce negative environmental impacts and increase physical and mental
2 health of older adults (30).

3 Using a quasi-experimental approach, the goal of this research is to explore the public
4 transportation travel behaviour of older adults on a free bus program using the case study for
5 Oakville, Ontario. More specifically, the research examines the effect of a free bus program
6 on travel behaviour of older adults in a suburban municipality. This paper examined two
7 research questions: 1. Which older adults benefit most from a free bus program? and 2. Why
8 do older adults use or not use a free bus program?

9 The paper makes a novel contribution by offering much needed North American
10 comparison to the existing international literature. Findings from this research will help to inform
11 Canadian, and more broadly North American, municipalities who are exploring ways to
12 improve their public transportation policies or programs for older adults.

14 **LITERATURE REVIEW: BENEFITS OF PUBLIC FREE BUS/TRANSIT PROGRAMS**

16 Free bus/transit programs has been a common practice in the UK. For example, concessionary
17 travel schemes exist in England (31) and Scotland (32), which are commonly known as the
18 National Bus Pass Schemes. The programs provide public transportation at no cost every day
19 or at specific times during the week. Previous research has indicated that the users of these
20 concessionary travel schemes tend to be older adults aged 60-70 years (26, 33), are female,
21 have lower social economic status, are without access to a car, live in more dense urban
22 environments (26) and within a 5 minute walk to a bus stop with a 15 minute bus frequency or
23 better (34).

24 The availability of a public transportation network can greatly influence the physical
25 activity and quality of life of older adults (22). For example, research conducted in England
26 indicated that older adults with a free bus pass had increased physical activity levels from
27 accumulated walking a minimum of three times a week to and from bus stops (26, 30) and had
28 a reduced chance of developing obesity (35). Having a free bus pass can also help older adults
29 to maintain their independent mobility (26), dignity and quality of life (23) – meaning the
30 ability to maintain one’s personal mobility when they drive (36).

31 National bus pass schemes have shown to increase transit ridership among older adults.
32 A longitudinal study, using the UK’s National Travel Survey, found that England’s National
33 Bus Pass significantly improved the frequency of bus trips, and that older adults were four
34 times more likely to use active transportation than those without a bus pass (26). Furthermore,
35 other studies reported that a free bus pass increased the number of trips taken by older adults
36 that would not have been taken otherwise (26, 30, 34). Public transit trips using the free bus
37 pass in Salisbury, England increased from 20 to 27% between 2005-2006 and 2006-2007 (33).

38 Older adults are more inclined to use the free bus program and change their travel
39 behaviour if they perceive it to be useful. For example, frequent bus service, and avoiding
40 traffic congestion and parking costs were some of the benefits that were previously pointed out
41 by the users of free bus passes (34). Research on travel behaviour on a free bus program is not
42 extensive; however, a survey in Edinburg, Scotland found that the free bus pass enabled older
43 adults to take more shopping and leisure trips and it also enabled 27% of older adults to take
44 new trips on the bus, 23% to shift from the car, and 44% to shift from walking (34).

45 Canadian free bus programs for older adults are not a new concept, but they have not
46 been as extensive as examples in the UK. Programs have occurred in Edmonton, Alberta in the

1 1980s (37). More recently, programs started in Ottawa, Ontario in 2010 (38) and Oakville,
2 Ontario in 2012 (39), Moncton, New Brunswick in 2012 (40), Halifax, Nova Scotia in 2012
3 (41), and Laval, Quebec in 2014 (42). Unlike programs in the UK where older adults have
4 access to free transit all days of a week, most Canadian programs offer free bus service one
5 day a week and sometimes between specific hours, with the exception of Laval, which
6 provides free service every day at any time. Other North American examples in the USA
7 include the Ride Free Transit program in Illinois (43) and the Pennsylvania Free Transit
8 Program (44), among others. However, systematic evaluation of these programs, at least in the
9 Canadian context, is rare.

11 **STUDY AREA**

13 The Town of Oakville's free bus program was selected due its representative nature of a
14 Canadian and more generally North American suburban municipality in terms of its urban
15 characteristics. The Town has a population of 182,520, with 12.8% of the population over 65
16 years or more (45), and is located approximately 35km or 21.7miles west of the City of
17 Toronto in the Regional Municipality of Halton (Figure 1). The urban form typically consists
18 of car-oriented communities characterised by low density residential neighbourhoods and
19 separated land uses. Oakville Transit offers 26 bus routes and five "Senior Specials", which
20 transports older adults from residences or community centres to main destinations (46). With
21 the exception of exact cash fares of \$3.50 per ride, older adults pay less for public
22 transportation than adults (20-64 years) and child/students (6-19 years) (39). Older adults pay
23 \$18.00 for a pack of ten tickets, \$50.00 for an older adult monthly bus pass or \$1.80 per ride
24 with a PRESTO card (an electronic public transportation fare system that integrates and
25 coordinates transit agencies in parts of Ontario) (39, 47).

26 In 2012, the Town of Oakville implemented a three month "Free Transit for Seniors"
27 (FTFS) pilot program for older adults over 65 years of age, allowing for free travel at no cost
28 on Mondays (48). The FTFS pilot program results reported that older adult ridership increased
29 by 578% or by 12,917 trips from the previous Mondays in 2011 (48). The survey also found
30 that the pilot program offered some "soft benefits" that pertained to the quality of life among
31 older adults. For example, some older adults indicated that they used the service to explore the
32 town, visit friends, and go shopping at a mall when their alternative would have been to stay
33 home (48). The success of the pilot program was formalized into a permanent program.

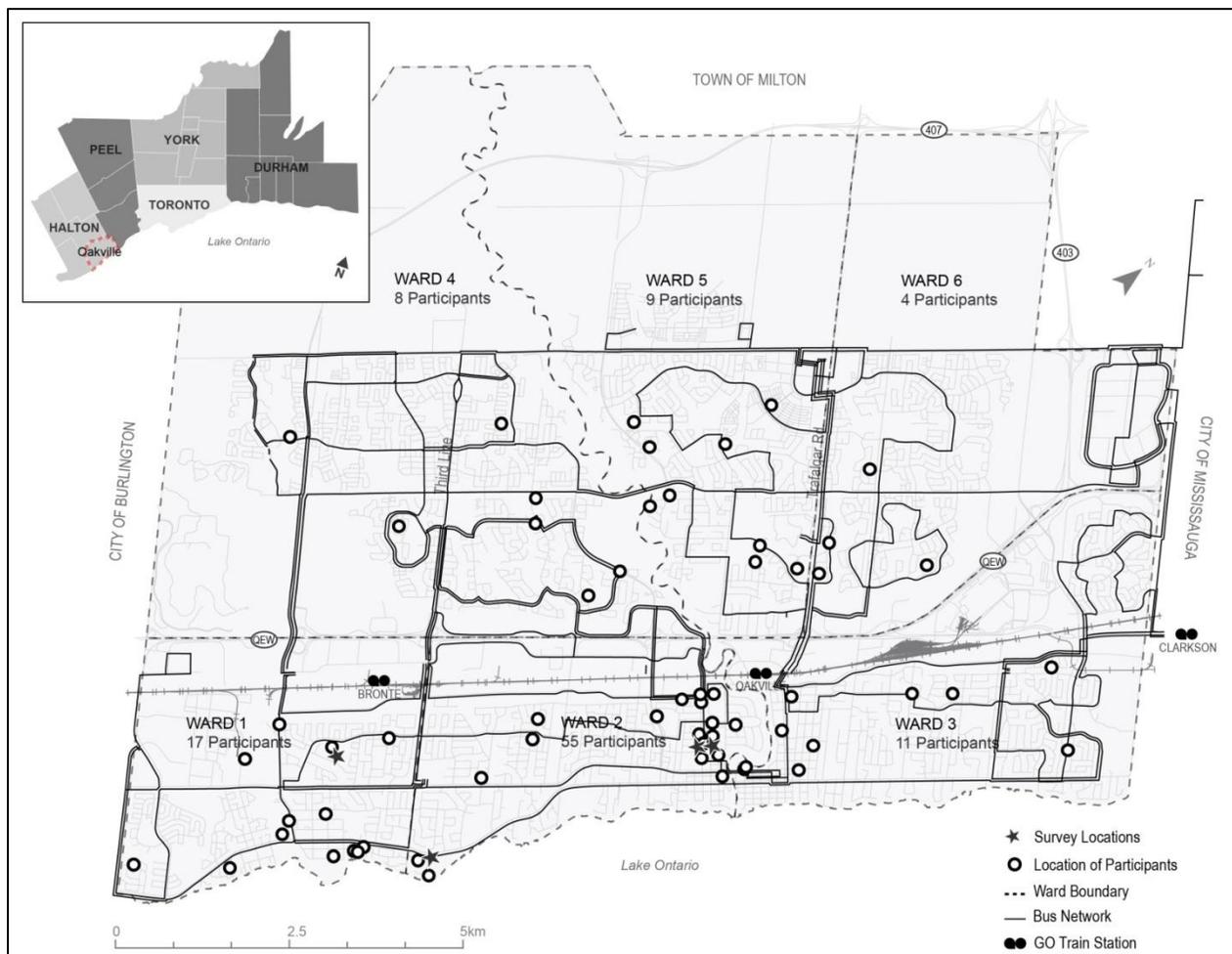
35 **METHOD**

36 **Data**

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38 This research used short surveys and semi-structured in-depth interviews to collect data on
39 older adults' travel behaviour related to the use of the free bus program, known as the FTFS
40 program, in Oakville, Canada. The ethics approval for this research was obtained from the
41 Ryerson University Research Ethics Board prior to data collection. Older adults were surveyed
42 at three older adult centres managed by the Town of Oakville during Open Houses between
43 August and September 2014, and at one older adult residence in September 2014. Participants
44 were asked questions on their frequency of travel using public transportation and private
45 automobile, and their reasons for using the FTFS program. A total of 89 surveys were
46 completed at these four locations.

1 Upon the completion of the open houses, we left three survey drop boxes at the two
 2 older adult centres and the older adult residence to collect more surveys. A drop box was not
 3 placed at one of the older adult centre because the Town of Oakville staff felt that most of their
 4 membership had been surveyed at the Open House. A total of 42 surveys were collected from
 5 the drop boxes by November 2014. Overall, a total of 131 surveys were collected.

6 The residential location of participants by postal code or by major street intersections
 7 was geocoded and entered into a Geographical Information System (GIS) (see Figure 1). A
 8 spatial analysis was used to determine the number of bus routes within a 400m or 1312ft radius
 9 (i.e., approximately 5 min walking distance) of an individual's home, which is a typical
 10 measure for transit accessibility (11, 22). The straight-line distance between an individual's
 11 residential location and Oakville's downtown core was also measured, which was used as a
 12 proxy measure for suburban conditions; our observations indicated that neighbourhoods closer
 13 to downtown were more dense and diverse.



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 16
 17 **FIGURE 1 Town of Oakville, Ontario: Residential Location of Study Participants**

1 **Statistical Analysis**

2
3 A quasi-experimental approach was undertaken to determine the effect of the FTFS program.
4 The statistical analysis was centered on a statement question: “You would be impacted if this
5 Free Transit for Seniors program was no longer available to you”. The respondents answered
6 on a 5-point Likert type scale ranging from “strongly disagree” to “strongly agree”. For the
7 purpose of this analysis, the answers were grouped into two categories “agree” (incorporating
8 responses “strongly agree” and “agree”) and “neutral or disagree” (incorporating responses of
9 “strongly disagree,” “disagree” and “neutral”). Binomial logistic regression models were
10 estimated to explore the likelihood of an individual’s agreeing to the statement, versus the
11 “neutral or disagree” option. The first set of models analyzed each socio-economic, access and
12 travel variables separately. The second set consisted of partially adjusted models, where the
13 correlation between each independent variable (i.e., potential explanatory factors) and travel
14 outcome was explored after adjusting for variations in age, gender and education. A fully
15 adjusted model was not estimated due to the small sample size and the multi-collinearity
16 between variables. The results are presented by means of Odds Ratio ($OR = e^{\beta}$) with 95% CI,
17 which represents the likelihood of an individual being potentially affected if the current FTFS
18 program was discontinued.

19 **Qualitative Analysis**

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21
22 During the survey, each participant was also asked if they would like to further participate in
23 an in-depth interview. Among those who responded positively, 25 potential participants were
24 approached to take part in an interview. A total of 16 participants consented to a semi-
25 structured in-depth interview, which were between 10 and 30 minutes in length. Participants
26 were asked about their experience with the FTFS program. The researcher interviewed the
27 majority of the participants at the Oakville Seniors Centre with some interviews occurring on
28 the phone through October and November 2014. All interviews were audio recorded and
29 transcribed verbatim. A thematic analysis of the interview data followed, and each participant
30 was given a pseudonym to preserve anonymity.

31 **RESULTS**

32 **Survey Questionnaires**

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34
35 Surveys were collected from older adults living in Oakville, Canada. A large portion of the
36 participants surveyed were female (77.7%) and the majority were aged between 75 and 84
37 years (52.8%) (Table 1). Participants lived in Oakville for an average of 29.6 years (SD 16.7
38 years), and 57.3% indicated that they lived alone (57.3%).

1 **TABLE 1 Summary Statistics**
2

Variable	Mean (SD)	%
Gender (n = 121)		
Male		22.3
Female		77.7
Age (n = 123)		
65 to 74		34.1
75 to 84		52.8
85+		13.0
Years lived in the Town of Oakville (n = 125)	29.6 (16.7)	
Education attainment (n = 125)		
No High School		1.6
High School		23.2
Post-Secondary		53.6
Certificate		10.4
Trades		2.4
Other		8.8
Individual income level ^a (n = 127)		
Low (less than CAD 40,000)		34.4
High (CAD 40,000 or more)		30.5
Prefer not to say		35.1
Living arrangement (n = 124)		
Live with partner		36.3
Live alone		57.3
Live with family		4.8
Other		1.6
Language spoken at home (n = 131)		
English		82.4
French		0.8
Other		16.8
Access to personal vehicle as a driver (n = 115)		67.8
Access to a personal vehicle as passenger (n = 78)		60.3
Personal vehicle use as a driver or passenger (n = 124)		
Never use personal vehicle		17.7
Less than once a week		8.0
1-4 days a week		30.6
4+ days a week		43.5
Oakville Transit use (n = 130)		
Never use public transit		35.4
Less than once a month		27.7
1-4 days a week		29.2
4+ days a week		7.7
Aware of FTFS program (n = 126)		
Yes		94.4
No		5.6
Would be impacted if FTFS program stopped (n = 115)		
Agree		38.2
Neutral or disagree		61.8

3
4 Note: ^a Individual income categories were based on the individual median income levels of 2010 for the Town of
5 Oakville. The median individual income in 2010 was CAD 39,385 based on National Household Survey data
6 (49). Based on the median individual income, low income was defined as below CAD 40,000 and high income
7 was defined as CAD 40,000 or more.

1 Table 1 also indicates that 94.4% of older adults were aware of the FTFS Program. The
2 survey also found that many older adults in Oakville relied on the automobile as their main
3 mode of transportation with 43.5% of older adults stating that they used the car more than four
4 times a week. Conversely, 34.5% of older adults stated that they never used public
5 transportation. A high percentage of older adults (67.8%) had access to a car as a driver and as
6 a passenger (60.3%). Focusing on the potential impact of the FTFS program on travel
7 behaviour, the survey results suggest that the majority of participants selecting neutral or not
8 impacted (61.8%), while 38.2% of older adults felt that they would be impacted if the program
9 was no longer available.

10 Table 2 summarises the results from both unadjusted and partially-adjusted logistic
11 regressions. Focusing on the partially-adjusted models, an older adult with lower income (i.e.,
12 < CAD 40,000) was 5.34 times more likely to be impacted if the program stopped, compared
13 to those with higher incomes (\geq CAD 40,000).

14 With regard to access and accessibility, distance to downtown Oakville was negatively
15 associated with the likelihood of being affected by a discontinuation of the FTFS program,
16 indicating that older adults living in more suburban locations would less likely to be affected
17 (Table 2). In addition, having no access to a car and having more transit lines within a 400m of
18 a participant's home variables showed positive correlations in our unadjusted models, but these
19 correlations were not statistically significant when controlled for age, gender and education
20 attainment of an individual.

21 Lastly, an individual's driving behaviour was associated with their likelihood of being
22 affected by the FTFS program. Table 2 indicates that those who drive more than once a week
23 (i.e., 1-4 times a week, and >4 times a week) were more likely to be impacted than those who
24 drove less than once a week. Our unadjusted model also showed a negative association
25 between transit use (1-4 times a week) and the impact of FTFS program, although no such
26 correlation was observed in the partially-adjusted model.

1 **TABLE 2 Potential Impact of FTFS Program if it Stopped**

2

	Unadjusted		Partially-Adjusted ^a	
	N	OR (95% CI)	N	OR (95% CI)
<i>Socio-economic Variables</i>				
Age	113			
65 to 74 (Ref)				
75 to 84		0.86(0.26-2.87)		
85+		1.16(0.37-3.65)		
Gender	112			
Male (Ref)				
Female		1.86(0.71-4.90)		
Education	111			
High School or Less (Ref)				
Graduate or Equivalent		0.81(0.33-1.96)		
Living Situation	111		108	
Live with partner or family (Ref)				
Live alone or other		1.22(0.55-2.70)		0.75(0.37-1.52)
Number of Years Living in Oakville	108	0.99(0.96-1.01)	104	0.99(0.96-1.01)
Individual Income	77		75	
High; CAD 40,000 and above (Ref)				
Low; Below CAD 40,000		5.32(1.83-15.46)		5.34(1.61-17.67)
<i>Access / Accessibility Variables</i>				
Access to Car as driver and/or passenger	114		110	
Yes (Ref)				
No		2.37(0.98-5.78)		2.00(0.75-5.31)
Number of Transit Lines within 400m	98	1.31(0.98-1.75)	94	1.27(0.94-1.71)
Distance to Downtown Oakville (km)	98	0.77(0.63-0.93)	94	0.80(0.65-0.97)
<i>Travel Behaviour Variables</i>				
Car Use	109		105	
< Once a week (Ref)				
1-4 times a week		4.87(1.72-13.77)		4.42(1.45-13.49)
> 4 times a week		4.22(1.60-11.36)		4.10(1.39-12.05)
Transit Use	114		110	
< Once a week (Ref)				
1-4 times a week		0.65(0.15-2.90)		0.69(0.15-3.10)
> 4 times a week		3.54(0.76-16.57)		3.02(0.63-14.46)

3
4 Note: ^a In the partially-adjusted models, the correlation between each variable tested and stated travel outcome
5 was adjusted for variations in age, gender and education levels.

6 ORs with bold fonts are significant at $\alpha = 0.05$

7 ORs with *bold italic* fonts are significant at $\alpha = 0.10$

8 9 **In-depth Interviews**

10
11 A total of 16 older adults participated in the in-depth semi-structured interviews. The
12 participants were predominately female (n = 12), and the majority (n=9) of them were >75
13 years old. Many participants reported low individual income levels and lived alone (n = 11).

14 Participants discussed their experience with the FTFS program and the reasons why
15 they would or would not use the program as summarized in Table 3. Responses on why
16 participants would use the FTFS program centered on four major themes: trip purpose and
17 scheduling, social capital, economic conditions (i.e., saving) and declining health. Participants

1 leveraged the FTFS program for appointments or errands. Participants found the Oakville
 2 Transit bus drivers helpful, polite and courteous, which provided a pleasant social experience.
 3 Participants also discussed how they liked the spontaneous social interaction by meeting new
 4 people on the bus. Two of the participants used the program for economic reasons; it allowed
 5 them to save money. Declining health and inability to drive was also mentioned by one
 6 participant as a key reason for using the FTFS program.
 7

TABLE 3 Qualitative Experiences with the FTFS Program

Interview Responses	Theme	Representative Statement	Frequency
<i>Reasons for using the program</i>			
Schedule outings/appointments on Mondays	Trip purpose and scheduling	"...the seniors I talk to are making their doctor's appointments and doing their minimum shopping and doing their things on a Monday because they know that they can get around." (Todd, Male, 65-74 y)	4
Friendly and courteous bus drivers	Social capital	"I find that the bus drivers are so well-trained to be polite." (Ellen, Female, 85+ y)	3
Enjoy taking bus / Meet people	Social capital	"I meet [people] on the bus because of [the program] and we go for coffee somewhere." (Ralene, Female, 75-84 y)	2
Save money	Economic	"It's free! I mean when you're old, you have such a limited income." (Ellen, Female, 85+ y)	2
Health declined and could not drive	Health	"When I can't drive anymore I would [use the program more]." (Diane, Female, 65-74 y)	1
<i>Reasons for not using the program</i>			
Have a SPLIT pass	Other options	"...since I have the SPLIT pass, I use it just as often. [The program] doesn't affect me." (Ralene, Female, 75-84 y)	3
Schedule is too busy	Inconvenience	"...I do too many things to be bothered about thinking one day a week." (Sandra, Female, 65-74 y)	1
Long wait times for bus	Inconvenience	"When I take a bus, like when I took that Monday bus weeks ago, I forgot what time it got to the certain destination. I had to wait a whole hour before the bus came." (Amy, Female, 75-84 y)	1

8
 9 Participants also shared reasons why they would not use the FTFS program (Table 3).
 10 Some participants had Subsidized Passes for Low Income Transit (SPLIT) passes, a program
 11 that provides low income low income students, adults and older adults with a regional subsidy
 12 for public transportation that covers at least 50% or more of the cost of a monthly transit pass
 13 (50), and therefore, they did not need to rely on the FTFS program. Some said that the SPLIT
 14 pass was a more convenient and economical option than using the FTFS program because
 15 those with a pass could use the bus at any time at a subsidized monthly rate. Participants with
 16 busy schedules had multiple trips to take on a weekly basis and as a result, travelling by bus
 17 was not convenient to their schedule.
 18
 19
 20

1 DISCUSSION AND CONCLUSIONS

2 A dramatic increase in older adult population in future decades may reshape the need for
3 transportation policies and programs in suburban municipalities. Free bus programs have the
4 potential to shift travel behaviour away from the private vehicle and encourage public
5 transportation use among older adults (33) and to improve the physical and mental health of
6 older adults (26, 35). Using the FTFS program in Oakville, Ontario, Canada, as a case study,
7 we explored two research questions focused on the potential impact of the FTFS program on
8 older adult's travel behaviour.

9 Our survey results showed that older adults with lower incomes were 5.34 times more
10 likely to be affected if the program stopped compared to those with higher incomes. The result
11 was not surprising; previous studies reported that low income individuals were more likely to
12 use free bus programs (26, 33). Since many older adults have fixed incomes, as mentioned by
13 interviewees, the cost of paying for public transportation could limit an older adult's mobility.
14 However, some older adults with lower income reported having a SPLIT pass, which meant
15 that they did not have to rely as much on the FTFS program.

16 A high percentage of older adults (67.8%) had access to a car as a driver, and 60.3%
17 had access to a car as a passenger. Most of the older adults drove to participate in day-to-day
18 activities (43.5% of older adults used the car more than 4 times a week) and only a small
19 proportion used public transit (7.7% of older adults used public transportation more than 4
20 times a week). A study found that older adults who recently started to use a free bus program
21 had higher rates of car ownership (33). The research suggested that older adults would use the
22 car for daily trips, but they would take the bus to go to city centres to avoid road congestion
23 and parking costs (33). Assuming that older adults' weekly activity-travel patterns are similar
24 in Oakville to what has been reported elsewhere, a positive association between a higher level
25 of car use and the likelihood of being impacted by the FTFS program is not surprising. A high
26 rate of car use may be representative of a higher level of weekly activity participation by some
27 older adults, and they would likely be the ones to be affected if the FTFS program stopped
28 operating, compared to someone who engages in outdoor activities less frequently.

29 A recent US study found that older adults were less likely to choose public
30 transportation as an alternative if they had never taken public transportation before; however,
31 older adults within walking or close public transit distance to activities were more likely to
32 walk or take public transportation (17). Therefore, older adults in the suburban locations
33 (where transit service is relatively limited both in terms of coverage and frequency) may be
34 less likely to consider the FTFS program if they never used public transportation before and/or
35 if they could access private vehicle rides. On the other hand, older adults in the more urban
36 locations may be able to walk more conveniently to a transit stop or take public transportation
37 to urban destinations taking advantage of a relatively better transit coverage and frequency.
38 Perhaps as a result, our model results indicated that the potential impact of the FTFS program
39 declined as the distance between an older adult's residential location and downtown Oakville
40 increased (OR = 0.80).

41 The FTFS program also played a potentially important role in the social well-being of
42 participants. Interview respondents outlined that they would consider using the FTFS program
43 when their health declined or when they had decreased access to a car. This finding supports
44 current literature, which hypothesize that public transportation can become more important as
45 the health of an older adult or their ability to drive decreased (11, 6, 22, 24, 26, 51). Some
46 older adults reported taking the FTFS program because it allowed them to meet bus drivers and

1 other people. This is also consistent with findings from previous research reporting that public
2 transportation can help to connect older adults with others and perhaps improve their social
3 capital (23, 51). A closer investigation of the “soft” benefits of a concessional transit service
4 remains subject to future research.

5 Lastly, although the survey did not ask older adults specifically about their daily
6 activities, some interview participants reported having fairly active lifestyles throughout the
7 week that required the use of a car to take care of their families, to attend exercise classes or
8 community clubs, or to run errands. Previous studies (16, 25) reported similar active lifestyles
9 by present-day older adults. Interviewees mentioned that taking the bus to complete their daily
10 activities would take too long because they would have to wait for the bus, which would hinder
11 their schedule, supporting findings from previous research that identified conventional public
12 transportation systems with fixed routes and schedules uncondusive to the lifestyles of today’s
13 older adults (7, 16, 17, 20, 25).

14 In summary, this research provides insight into how a free bus program may benefit
15 older adults living in a North American suburban municipality. An improved understanding of
16 the specific transportation needs of older adults can have important implications for planners
17 and policy makers. Public transportation may become more popular in suburban municipalities
18 if policies and programs can accommodate the needs of older adults. There is a paucity of
19 research completed on the free bus programs especially in Northern American suburban
20 municipalities, making it difficult for transportation planners to conclusively predict the
21 potential benefits of such programs during the planning phase. This study, although it
22 investigated one intervention program using a relatively small dataset, begins to address this
23 need for local research on the topic that may inform public transportation policy in small
24 Canadian, and more broadly, North American, communities.

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1 REFERENCES

1. Hildebrand, E. Dimensions in elderly travel behavior: A simplified activity-based model using lifestyle clusters. *Transportation*, Vol. 30, 2003, pp. 285-306.
2. Mercado, R., A. Páez, and K. B. Newbold. Transport policy and the provision of mobility options in an aging society: a case study of Ontario, Canada. *Journal of Transport Geography*, Vol. 18, no. 5, 2010, pp. 649-661.
3. Statistics Canada. Population projections for Canada, provinces and territories: 2009-2036. *Statistics Canada*, 2010. <http://www.statcan.gc.ca/pub/91-520-x/91-520-x2010001-eng.pdf>. Accessed July 29, 2015.
4. Mitra, R., H. Siva, and M. Kehler. Walk-friendly suburbs for older adults? Exploring the enablers and barriers to walking in a large suburban municipality in Canada. *Journal of Aging Studies*, Vol. 35, 2015, pp. 10-19.
5. Federation of Canadian Municipalities. Canada's Aging Population: The Municipal Role in Canada's Demographic Shift. *Federation of Canadian Municipalities*, 2013. http://www.fcm.ca/Documents/reports/FCM/canadas_aging_population_the_municipal_role_in_Canadas_demographic_shift_en.pdf. Accessed July 26, 2015.
6. Newbold, K., D. Scott, J. Spinney, P. Kanaroglou, and A. Páez. Travel behavior within Canada's elderly population: A cohort analysis. *Journal of Transport Geography*, Vol. 13, 2005, pp. 340-351.
7. Páez, A., D. Scott, D. Potoglou, P. Kanaroglou, and K. Newbold. Elderly mobility: Demographic and spatial analysis of trip making in the Hamilton CMA, Canada. *Urban Studies*, Vol. 44, 2007, pp. 123-146.
8. Rosenbloom, S. Sustainability and automobility among the elderly: An international assessment. *Transportation*, Vol. 28, no. 4, 2001, pp. 375-408.
9. Scott, D., K. Newbold, J. Spinney, R. Mercado, A. Páez, and P. Kanaroglou. Changing mobility of elderly urban Canadians 1992-1998., 2005.
10. Cao, X., P. L. Mokhtarian, and H. S. L. Neighborhood design and the accessibility of the elderly: An empirical analysis in northern California. *International Journal of Sustainable Transportation*, Vol. 4, no. 6, 2010, pp. 347-371.
11. Hodge, G. *The Geography of Aging: Preparing Communities for the Surge in Seniors*. McGill-Queen's University Press, Montreal, Canada, 2008.
12. Turcotte, M. Profile of senior's transportation habits. *Canadian Social Trends*, Vol. 11(008-X), 2012, pp. 3-16.
13. Ewing, R. H., and K. Bartholomew. *Pedestrian-& Transit-oriented Design*. Urban Land Institute, 2013.
14. Franke, T., C. Tong, M. C. Ashe, H. McKay, S. Joanie, and T. W.T.T. Team. The secrets of highly active older adults. *Journal of Aging Studies*, Vol. 27, no. 4, pp. 393-409.
15. Ladd, A. Stranded in Suburbia. *Canadian Centre for Policy Alternatives Manitoba Office*, 2012.
16. Alsnih, R., and D. Hensher. The Mobility and Accessibility Expectations of Seniors in an Aging Population. *Transportation Research Part A*, Vol. 37, 2007, pp. 903-916.

17. Kim, S. Transportation Alternatives of the Elderly After Driving Cessation. *Transportation Research Record: Journal of the Transportation Research Board*, Vol. 2265, 2011, pp. 170-176.
18. Davey, J. Older people and transport: coping without a car. *Ageing and Society*, Vol. 27, 2007, pp. 49-65.
19. Broome, K., E. Nalder, L. Worrall, and D. Boldy. Age-friendly buses? A comparison of reported barriers and facilitators to bus use for younger and older adults. *Australasian Journal on Ageing*, Vol. 29, 2010, pp. 33–38.
20. Scott, D., K. Newbold, J. Spinney, R. Mercado, A. Páez, and P. Kanaroglou. New Insights into Senior Travel Behaviour: The Canadian Experience. *Growth and Change*, Vol. 40, no. 1, 2009, pp. 140-168.
21. Crombie, I. K., L. Irvine, B. Williams, A. R. McGinnis, P. W. Slane, E. M. Alder, and M. E. McMurdo. Why Older People do not Participate in Leisure Time Physical Activity: A Survey of Activity Levels, Beliefs and Deterrents. *Age Ageing*, Vol. 33, 2004, pp. 287–92.
22. Kerr, J., D. Rosenberg, and L. Frank. The Role of the Built Environment in Healthy Aging: Community Design, Physical Activity, and Health among Older Adults. *Journal of Planning Literature*, Vol. 27, no. 1, 2012, pp. 43-60.
23. Jones, A., A. Goodman, H. Roberts, R. Steinbach, and J. Green. Entitlement to concessionary public transport and wellbeing: a qualitative study of young people and older citizens in London, UK. *Social Science & Medicine*, Vol. 91, 2013, pp. 202-209.
24. Smith, B., and J. Hiltner. Who are the Elderly Users of Public Transportation? A Case Study in Toledo, Ohio. *The Journal of Applied Gerontology*, Vol. 7, no. 4, 1988, pp. 504-513.
25. Hensher, D. Some Insights into the Key Influences on Trip-Chaining Activity and Public Transport Use of Seniors and the Elderly. *International Journal of Sustainable Transportation*, Vol. 1, 2007, pp. 53-68.
26. Coronini-Cronberg, S., C. Millett, A. Levarty, and E. Webb. The Impact of a Free Older Persons' Bus Pass on Active Travel and Regular Walking in England. *The American Journal of Public Health*, Vol. 102, no. 11, 2012, pp. 2141-2148.
27. Julien, D., L. Richard, L. Gauvin, M. Fournier, Y. Kestens, B. Shatenstein, M. Daniel, G. Mercille, and H. Payette. Transit use and walking as potential mediators of the association between accessibility to services and amenities and social participation among urban-dwelling older adults: insights from the VoisiNuAge study. *Journal of Transport & Health*, Vol. 2, 2014, pp. 35–43.
28. World Health Organization. Global Age Friendly Cities: A Guide. *World Health Organization*, 2007. http://www.who.int/ageing/publications/Global_age_friendly_cities_Guide_English.pdf. Accessed July 26, 2015.
29. Public Health Agency of Canada. What is Active Transportation. *Public Health Agency of Canada*, 2014. <http://www.phac-aspc.gc.ca/hp-ps/hl-mvs/pa-ap/at-ta-eng.php>. Accessed July 26, 2015.
30. Laverty, A. A., and C. Millett. Potential impacts of subsidized bus travel for older people. *Journal of Transport & Health*, Vol. 2, 2015, pp. 32-34.
31. Unicard. Concessionary Card. *Unicard*, 2015. <https://concessioncard.net/>. Accessed July

- 26, 2015.
32. Transport Scotland. Concessionary travel for people aged 60+ or with a disability. *Transport Scotland*, <http://www.transportscotland.gov.uk/public-transport/concessionary-travel-people-aged-60-or-disability>. Accessed July 26, 2015.
 33. Baker, S., and P. White. Impacts of Free Concessionary Travel: Case study of an English Rural Region. *Transport Policy*, Vol. 17, no. 1, 2010, pp. 20-26.
 34. Rye, T., and W. Mykura. Concessionary bus fares for older people in scotland – are they achieving their objectives? *Journal of Transport Geography*, Vol. 17, no. 6, 2009, pp. 451-456.
 35. Webb, E., G. Netuveli, and C. Millett. Free bus passes, use of public transport and obesity among older people in England. *Journal of Epidemiology & Community Health*, Vol. 66, no. 2, 2012, pp. 176-180.
 36. Spinney, J., D. Scott, and K. Newbold. Transport mobility benefits and quality of life: A time-use perspective of elderly Canadians. *Transport Policy*, Vol. 16, no. 1, 2009, pp. 1-11.
 37. George, V. E. Edmonton Journal. *Transit socks it to seniors*, Sep. 10, 2000. <http://ezproxy.lib.ryerson.ca/login?url=http://search.proquest.com/docview/252860244?accountid=13631>. Accessed Apr. 20, 2014.
 38. OC Transpo. Senior Riders. *OC Transpo*, 2014. http://www.octranspo1.com/riding-with-oc-transpo/senior_riders. Accessed Apr. 20, 2014.
 39. Oakville Transit. Fares. *Oakville Transit*, 2014. <http://www.oakvilletransit.com/fares.html>. Accessed Apr. 20, 2014.
 40. Codiac Transpo. Fares. *City of Moncton*, 2014. <http://www.codiactranspo.ca/fares.htm>. Accessed Apr. 18, 2014.
 41. Halifax Transit. Halifax Transit Service for Seniors. *Halifax Transit*, 2015. <https://www.halifax.ca/transit/seniors.php#FreeTuesdayforSeniors>. Accessed July 26, 2015.
 42. STL. Senior Zone. *STL*, 2015. <http://www.stl.laval.qc.ca/en/seniors-zone/>. Accessed July 26, 2015.
 43. Illinois Department of Aging. Eligibility and Frequently Asked Questions. *Illinois Department of Aging*, 2015. <http://www.illinois.gov/aging/BenefitsAccess/Pages/Eligibility%20and%20Frequently-Asked-Questions.aspx>. Accessed July 26, 2015.
 44. Pennsylvania Department of Aging. Pennsylvania Free Transit Program. *Commonwealth of Pennsylvania*, 2015. <http://www.portal.state.pa.us/portal/server.pt?open=514&objID=616418&mode=2>. Accessed July 29, 2015.
 45. Statistics Canada. 2011 Community Profiles. *Statistics Canada*, 2011. <http://www12.statcan.gc.ca/census-recensement/2011/dp-pd/prof/details/page.cfm?Lang=E&Geo1=CSD&Code1=3524001&Geo2=CD&Code2=3524&Data=Count&SearchText=oakville&SearchType=Begins&SearchPR=01&B1=All&Custom=&TABID=1>. Accessed July 26, 2015.
 46. Oakville Transit. Schedules and Maps. *Oakville Transit*, 2014. <http://www.oakvilletransit.com/schedules-and-maps.html>. Accessed July 26, 2015.
 47. PRESTO. Learn about PRESTO. *PRESTO*, 2014. <https://www.prestocard.ca/en-US/Pages/ContentPages/AboutPresto.aspx>. Accessed July 26, 2015.

48. Oakville Transit. Budget Committee Report: Pilot Results – Free Transit for Seniors. *Oakville Transit*, 2012. <https://securepwa.oakville.ca/sirepub/cache/107/yjxs0dkjg5cszoaiib5tq5s3/23109902082015122016357.PDF>. Accessed July 26, 2015.
49. CHASS. 2011 National Household Survey (NHS) Profile Files. *Canadian Census Analyser*, 2013. <http://dc1.chass.utoronto.ca/cgi-bin/census/2011nhs/displayCensus.cgi?year=2011&geo=prov>. Accessed July 26, 2015.
50. Halton Region. Subsidized Passes for Low Income Transit. *Halton Region*, n.d. <http://www.halton.ca/cms/One.aspx?portalId=8310&pageId=66697>. Accessed July 26, 2015.
51. Michael, Y. L., M. K. Green, and S. A. Farquhar. Health & place. *Neighborhood design and active aging*, Vol. 12, no. 4, 2006, pp. 734-740.
52. Public Health Agency of Canada. The Chief Public Health Officer's Report on The State of Public Health in Canada 2010, Chapter 3. *Public Health Agency of Canada*, Oct. 28, 2010. <http://www.phac-aspc.gc.ca/cphorsphc-respcacsp/2010/fr-rc/cphorsphc-respcacsp-06-eng.php>. Accessed July 26, 2015.
53. Chaudhury, H., A. Mahmood, Y. Michael, M. Campo, and K. Hay. The influence of neighbourhood residential density, physical and social environments on older adults' physical activity: An exploratory study in two metropolitan areas. *Journal of Aging Studies*, Vol. 26, 2012, pp. 35-43.