When I'm 64

Assessing Generational Differences in Public Transit Use of Seniors in Montreal, Quebec, Canada

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The growth rate of adults older than 65 in Canada is increasing more rapidly than the population as a whole. This increase is reflective of the aging baby boomer population. That population is known to have a strong attachment to automobiles, which might be reflected in their travel behavior as they move toward different stages in their older life. The purpose of this paper is to contribute to the understanding of the travel behavior, mainly public transit usage, of Canada's older population relative to younger cohorts. A pseudocohort analysis was conducted in Montreal, Quebec, Canada, of residents who were 50 or older to follow changes in public transit use of similarly aged respondents from 1998 to 2013. The results revealed that older generations used public transit more than younger generations did at the same age. In addition, the most recent survey year showed a stagnation of transit use across all age groups. Differences in transit use between males and females were more pronounced in earlier cohorts, but the difference was decreasing in more recent years. These findings add to the growing body of work suggesting that the nature of transportation behavior in seniors is changing, and accordingly planners and engineers cannot expect the baby boomer generation to behave the same way as previous generations. Addressing the transportation needs of seniors around the world will be an important challenge for planners and engineers, as the population of seniors is growing more rapidly than the population as a whole in the majority of developed countries. This growth imposes new challenges on the transportation system because of differences in the travel behavior of today's older adults compared with that of previous cohorts of seniors.

Between 2006 and 2011, the Canadian population increased by 5.9%; however, the number of Canadians older than 65 increased by 14.1% (*1*). The fastest-growing age group was 60-to-64-year-olds, which exhibited an increase of 29.1%. This growth is reflective of the aging baby boomer population (*1*). This demographic shift is not unique to the Canadian context, as it is present in many countries around the world. Such a shift presents societies with far-reaching implications for health care, finance, and policy. Access to different destinations or services through different modes of transportation has been identified as a key factor in affecting the mobility of seniors and consequently their quality of life (*2*).

Generational differences and associated travel behavior have been observed in previous studies (*3, 4*). In relation to seniors, differences in travel behavior across generations are expected. Pre-World War II, cities were highly localized places, with an urban form that allowed daily requirements to be achieved either within walking distance or through public transit. In other words, cities subsisted on the premise of low automobile ownership (*5*). Postwar economics led to increased disposable income and decentralization of cities to suburban centers and single land uses, and accordingly, a greater reliance on automobiles (*6*). Individuals born during the post-World War II period, known as "baby boomers," were born with an intimate relationship with the automobile (*7, 8*). The prominence of the automobile while they were growing up suggests that, in later years, baby boomers will not behave like their parents' generation (*7*). In a study in the Minneapolis–Saint Paul, Minnesota, region, seniors expressed fear of losing their driver's licenses as they aged and of becoming unable to drive (*9*). However, the cohort of seniors in that study was not part of the baby boomer population. Previous research has associated baby boomers with higher automobile trip rates (*4*) and limited use of public transit (*10*). This higher reliance on automobiles later in life can be related to the lack of alternatives and the way that planners have been developing cities, which makes relinquishing driving difficult for older adults (*11*). Such reliance on automobiles imposes a bigger challenge for engineers and planners to gain better understanding of the differences in travel behavior, especially transit use, among cohorts of seniors. Of great importance will be providing the aging population with transportation services that adequately meet its needs and help in ensuring its independence.

Figure 1 displays a normalized transit mode share for those 20 and older for the years 1998, 2003, 2008, and 2013 for nonwork trips. These data were obtained from several origin–destination (O-D) surveys in Montreal, Quebec, Canada (*12–15*). From these data, the transit mode share for each 5-year age group was obtained. Then, it was normalized by the transit mode of all ages for the survey year from which it was extracted and plotted on the graph. The figure is an extension of previous research that shows the life-cycle analysis of transit mode share over time (*3*). Examining transit behavioral trends across the life cycle shows that transit use is high among individuals in their early 20s, declines as individuals progress into their 30s, and stabilizes until 65, or near retirement, similar to previous studies (*16*). Following retirement, people increase their transit use. Retirement presents a diverging point for cohorts, at which each cohort has a similar transit mode share before retirement age, and then, transit levels increase above the average (of the entire survey population) after average retirement age.

Two generational differences in transit use emerge in Figure 1. First, the transit mode share for respondents in their 20s and 30s is highest for the more-recent survey years, which confirms the trend of higher transit use among individuals in the millennial generation

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Transportation Research Record: Journal of the Transportation Research Board, No. 2651, 2017, pp. 31–41.
http://dx.doi.org/10.3141/2651-04

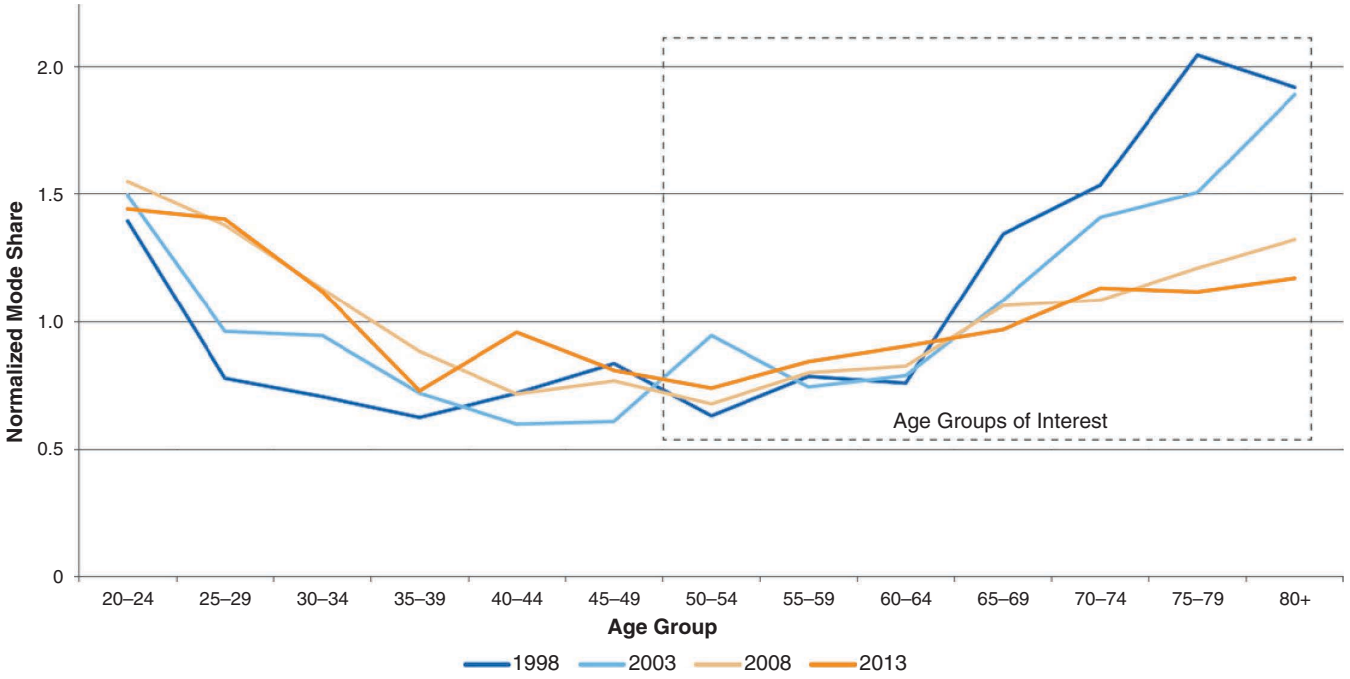

FIGURE 1 Transit mode share for all ages.

(born between 1980 and 2004) found by Grimsrud and El-Geneidy (*3*) as well as other recent studies (*16, 17*). Previous studies have shown that millennials exhibit different travel behavior than previous generations, including a reliance on transit and nonautomobile modes (*17*), and often prefer to live in high-density neighborhoods that facilitate a multimodal lifestyle (*16*). Figure 1 also clearly shows that seniors (65 and older) are experiencing higher-than-average transit usage compared with younger adults. This result is especially true for the older generations. For example, the age group that was 75 to 79 in 1998 took transit more than the same age group in 2013. A second generational difference is also exhibited among those 65 and older in that, in 1998, seniors used transit at much higher rates than seniors in 2003, 2008, and 2013. These generational differences, between baby boomers (born between 1946 and 1965) and the generation of the parents of baby boomers (born between 1919 and 1940) are evident in the figure and require further analysis for better understanding of the differences in transit usage between the cohorts.

The main goal of this paper was to highlight patterns in public transit use among older Canadian adults (50 and older). With this goal in mind, the paper assessed (*a*) the travel behavior of seniors across age groups as well as between males and females and (*b*) the transit mode share of six cohorts to consider travel behavior differences across generations. Generational differences in travel behavior were evaluated by using a pseudocohort analysis of Montreal residents who are 50 or older by using the 1998, 2003, 2008, and 2013 O-D surveys provided by the Agence métropolitaine de transport (AMT) (*12–15*). This evaluation was performed in an effort to examine how transit mode share changes over time, between age groups, and across generational cohorts.

The next section of this paper provides a review of the literature related to travel behavior at life-cycle changes and the travel behavior of seniors. The paper then presents an analysis of the transportation mode share for those 50 and older in all survey years; that analysis is followed by a pseudocohort analysis of the transit mode share of six cohorts to determine how transit is used by different generations over time. Subcohorts were created to investigate the impacts of gender on transit use. The paper ends with a discussion of the results.

LITERATURE REVIEW

A growing body of literature has aimed to analyze public transit use during the life cycle of individuals, especially the millennial generation (those born between 1980 and 2004) (*3, 16–18*). These individuals are adopting a more multimodal lifestyle, which includes greater reliance on public transit as well as other nonauto modes (*17*) as well as preference for living in dense and transit-rich neighborhoods (*16*). However, these individuals were found to decrease and stabilize their transit use in their 30s, a situation implying that transit agencies should aim to develop policies to retain the ridership of these individuals (*3*). On the other end of the age spectrum, Newbold et al. conducted a cohort analysis of travel behavior of Canadian seniors, focusing on automobile trips, and found that older Canadians were making more auto-based trips than previous cohorts (*4*).

The literature has well established that seniors are increasingly dependent on automobile use because of the sprawling and auto-dependent nature of the neighborhoods that were built post-World War II. This preference for automobile use among seniors is especially strong if they (*a*) have access to a car and (*b*) do not have other travel alternatives (*19*). Despite physical or cognitive changes with age and their impact on driving, seniors are increasingly dependent on automobiles to meet their travel needs (*4, 20*). Newbold et al. observed that, as the Canadian population ages, driving will continue to be the primary mode of transportation and that public transit will become relatively less important if this trend continues (*4*). This situation is problematic, as studies have found higher accident rates per distance traveled among older adults (*21*). The higher observed accident and death rates may be a result of cognitive changes with age that affect the reaction time and awareness of older adults when driving (*22*) as well as increased frailty and decreased ability to recover in the event

of an accident (*23*). Alarming accident statistics have led to discussions about policy changes in the regulation of driver's licenses among seniors (*24, 25*). However, to ease older adults into this transition from the independence provided by driving, high-quality alternative travel modes, including public transit, are needed.

Public transit can provide an alternative travel mode to driving by responding to seniors' preference for mobility independence if it meets their mobility needs and preferences (*26*). However, previous research studying travel behavior of older Canadians has suggested that public transit is not widely used as a replacement to driving (*4*). In a study of the 2008 O-D survey in Montreal, Moniruzzaman et al. found that the probability of walking and using transit decreased with age and retirement (*27*). Similarly, Newbold et al. found a decline in the mean number of trips following retirement, as well as changes observed in trip-related purposes (*4*). Newbold et al. also found that, over time, Canadian seniors increased the number of their trips taken by public transit (*4*). However, this growth was not as large as the observed increase in automobile trips. Other factors that influence transportation behavior of seniors include geographical variability, neighborhood design, household size, income (*27*), possession of a driver's license, and automobile ownership (*28*).

Following retirement, people take fewer work-related trips (*4, 20*), and the variety of trip purposes individuals make postretirement tend to narrow to destinations for essential purposes such as shopping and services (*29*). Another significant change that seniors undergo is driving cessation as a result of declining health as well as declines in finances or physical abilities. A longitudinal cohort study found that driving cessation was associated with a decrease in out-of-home activity (*30*). Seniors' preferences for aging in place (*31*) and dependency on personal automobile travel raises concerns of social exclusion and reduced mobility resulting from driving cessation (*9*). As Newbold et al. noted, as individuals age, potential exists for an increase in demand for public transit service (*4*). However, current trends in the travel behavior of older Canadians suggest that public transit is not widely used as a replacement to driving. Paez et al. examined mobility challenges faced by Canadian seniors following retirement and found that the propensity to make a trip decreased with age (*28*). Following an analysis of Americans older than 50 with data collected by AARP, Kim observed that most respondents would get rides with friends or family when they ceased driving (*32*). Moreover, Kim observed that respondents who lived within walking distance to public transit were more likely to choose transit. However, older adults with limited or no experience with public transit before the cessation of driving were resistant to using public transit. This finding suggests that older adults should be encouraged to experience other transportation modes before driving cessation.

Gender differences in seniors' travel behavior have been noted. Rosenbloom and Winsten-Bartlett observed that older women composed a disproportionate number of nondrivers and had been found to be more likely than older males to self-regulate their driving behavior (*33*). Collia et al. compared driving behavior of older and younger American adults and found that women older than 65 took fewer trips per day, drove shorter distances, and were more likely to report medical conditions that may limit their travel than men (*10*). Furthermore, those authors predicted an increase in older drivers on the road in the near future, a situation that they attributed to both an aging population and the anticipated trend that older women would drive in greater proportions than previous cohorts. In relation to gender differences in transit use, Rosenbloom and Winsten-Bartlett observed that women who did not drive took a smaller percentage of their trips by public transit than male nondrivers, a finding that the authors suggested may indicate that women are more willing to ask for rides and less willing to use public transit than men (*33*). However, the authors expressed concern that older women's reluctance to use public transit may mean that they were forgoing trips needed to maintain their quality of life. Because Canadian women tend to have a longer life expectancy than Canadian men, a gender-imbalanced older population is expected, which may have implications for overall travel behavior (*34*).

ANALYSIS

Study Context

This study focused on the transit mode share of seniors in the Greater Montreal Area, subsequently called the Communauté métropolitaine de Montréal (CMM). Montreal is the second-largest city in Canada, with a CMM population of 3,824,221 in 2011. CMM is served by several transit agencies. These include the Société de transport de Montréal, which provides the island of Montreal with bus and metro service; the Agence métropolitaine de transport, which provides commuter train service and overlooks several small suburban bus services for CMM; as well as the Société de transport de Laval and the Réseau de transport de Longueuil. Every 5 years the AMT conducts an O-D survey by telephone of residents of CMM. These surveys are performed in the fall and capture 5% of CMM's population. Within the survey, respondents are asked about their personal and household travel characteristics, including length of trip, mode used, and trip purpose. This survey was used in this study to understand changes in transit mode choice and travel behavior among different cohorts of seniors over time.

Data Preparation

The data used in this research are from the Montreal 1998, 2003, 2008, and 2013 O-D surveys. By using a geographic information system, trips with origins or destinations outside CMM were removed. In addition, all trips that did not begin at a respondent's home were eliminated. The most common trip purpose for the remaining respondents older than 60 was shopping. This response is consistent with previous findings that work-related trips decreased among older adults because of retirement of a big proportion of this population, while trips associated with shopping and services were expected to increase (*4*). Therefore, only trips made for the purposes of shopping, leisure, visiting friends, and health were analyzed in this study. Trips made for other purposes such as work and multimodal trips were eliminated to ensure consistency and uniformity of the remaining trips. The remaining trips were then coded into six modes. These were transit, automobile, automobile as a passenger, walking–biking, paratransit, and other (motorcycle, taxi, and undetermined). Transit included trips using a bus, metro, or a commuter train. Trips made by respondents 50 or older were selected and yielded sample sizes of 18,311, 14,572, 18,996, and 27,256 for 1998, 2003, 2008, and 2013, respectively.

Travel Behavior Analysis by Age and Survey Year

To gain better understanding of how seniors use public transit, one must understand their travel behavior across various modes to determine their dependence on these modes, across both age and survey years. By using the age variable of the survey, the respondents were divided into seven age groups, each including 5 years. The oldest age group included respondents 80 or older. Table 1 shows the number of

TABLE 1 Age Groups and Mode Shares in All O-D Survey Years

Age Group	Year	Transit		Automobile		Auto Passenger		Walk/Bike		Paratransit		Other		Total		Age Group % of Year Total
		Share (%)	Count	Share (%)	Count	Share (%)	Count	Share (%)	Count	Share (%)	Count	Share (%)	Count	Share (%)	Count	
50–54	1998	4.1	148	66.0	2,376	15.7	566	13.4	481	0.1	4	0.6	23	100	3,598	19.6
	2003	4.0	102	67.4	1,705	15.4	390	12.4	314	0.2	6	0.6	14	100	2,531	17.4
	2008	4.3	116	64.6	1,750	13.8	374	16.3	442	0.3	7	0.7	18	100	2,707	14.3
	2013	4.0	146	66.7	2,407	12.7	457	15.2	548	0.5	19	0.9	32	100	3,609	13.2
55–59	1998	5.1	162	63.8	2,020	17.4	551	12.9	407	0.3	8	0.6	18	100	3,166	17.3
	2003	3.2	87	67.5	1,849	16.4	449	12.2	334	0.2	5	0.6	17	100	2,741	18.8
	2008	5.0	155	60.8	1,868	15.9	487	17.0	521	0.5	16	0.7	23	100	3,070	16.2
	2013	4.6	188	64.0	2,611	14.6	596	15.7	639	0.3	12	0.8	33	100	4,079	15.0
60–64	1998	4.9	163	61.5	2,028	19.6	646	13.2	436	0.2	5	0.6	19	100	3,297	18.0
	2003	3.4	93	64.6	1,788	18.6	514	12.6	350	0.3	8	0.5	14	100	2,767	19.0
	2008	5.2	192	61.2	2,254	16.8	618	15.6	575	0.3	12	0.9	32	100	3,683	19.4
	2013	4.9	256	63.3	3,278	15.6	810	15.0	778	0.5	28	0.6	32	100	5,182	19.0
65–69	1998	8.7	294	53.8	1,808	22.0	740	14.5	487	0.3	10	0.7	24	100	3,363	18.4
	2003	4.6	112	60.3	1,461	20.4	494	13.6	330	0.4	9	0.7	18	100	2,424	16.6
	2008	6.7	229	56.7	1,932	17.6	599	17.4	595	0.6	20	1.0	35	100	3,410	18.0
	2013	5.3	283	61.0	3,256	18.4	985	14.2	759	0.5	27	0.6	31	100	5,341	19.6
70–74	1998	10.0	259	52.5	1,360	20.5	531	15.7	406	0.4	10	1.0	26	100	2,592	14.2
	2003	6.0	124	55.4	1,143	22.6	466	14.6	302	0.5	10	1.0	20	100	2,065	14.2
	2008	6.8	183	55.9	1,493	20.1	538	15.6	416	0.6	15	1.0	27	100	2,672	14.1
	2013	6.2	249	61.8	2,487	17.6	708	13.0	522	0.7	29	0.8	31	100	4,026	14.8
75–79	1998	13.3	185	45.0	625	19.3	268	20.4	283	0.3	4	1.8	25	100	1,390	7.6
	2003	6.4	77	52.4	629	22.2	266	14.6	175	1.4	17	3.0	36	100	1,200	8.2
	2008	7.6	145	51.0	967	22.2	421	16.6	315	0.8	16	1.7	33	100	1,897	10.0
	2013	6.1	154	57.7	1,455	21.5	541	12.8	323	0.8	19	1.1	28	100	2,520	9.2
80+	1998	12.5	113	31.2	282	25.1	227	26.1	236	1.4	13	3.8	34	100	905	4.9
	2003	8.1	68	39.2	331	27.7	234	19.7	166	1.7	14	3.7	31	100	844	5.8
	2008	8.3	130	39.9	621	24.5	382	21.9	341	2.0	31	3.3	52	100	1,557	8.2
	2013	6.4	160	51.2	1,279	21.6	540	15.6	389	2.5	62	2.8	69	100	2,499	9.2
Total	1998	7.2	1,324	57.3	10,499	19.3	3,529	14.9	2,736	0.3	54	0.9	169	100	18,311	100
	2003	4.5	663	61.1	8,906	19.3	2,813	13.5	1,971	0.5	69	1.0	150	100	14,572	100
	2008	6.1	1,150	57.3	10,885	18.0	3,419	16.9	3,205	0.6	117	1.2	220	100	18,996	100
	2013	5.3	1,436	61.5	16,773	17.0	4,637	14.5	3,958	0.7	196	0.9	256	100	27,256	100
Total		5.8	4,573	59.5	47,063	18.2	14,398	15.0	11,870	0.6	436	1.0	795	100	79,135	100

respondents in each age group and their mode share for the six coded transportation modes in 1998, 2003, 2008, and 2013. This information is also shown graphically in Figure 2.

For all survey years and all age groups, automobile as a driver had the highest mode share. Automobile as a driver was at its highest mode share in 2013 at 61.5%. It peaked in 2003 for the group 55 to 59 group, with 67.5%. Automobile as a driver had the lowest mode share for the age group 80 and older in 1998, with 31.2%. The second-highest mode share was automobile as a passenger. For all survey years, automobile passenger trips peaked for the age group 80 and older. Generally, walking and cycling increased as respondents aged. As expected, paratransit mode share was the highest for the two oldest age groups. The category other, which included mostly taxi trips and undetermined modes, accounted for 1% of total trips taken; however, the category other increased and was highest for the age groups 80 and older in 1998 and 2003, with mode shares of 3.8% and 3.7%, respectively.

Transit was the fourth most-popular mode choice, after automobile as a driver, automobile as a passenger, and walking–cycling. Figure 2 shows that, in 1998, transit use increased as respondents aged and decreased slightly for the age group 80 and older. In that year, it was highest for the age groups 75 to 79 and 80 and older, at 13.3% and 12.5%, respectively. In 2003 and 2008, transit mode share also increased with age. However, it did not increase to the levels seen in 1998. It peaked at 8.1% in 2003 and 8.3% in 2008 for the group 80 and older. An increase in transit mode share with age was also seen in 2013. However, this increase was the least dramatic of all survey years. It increased from 4.0% for the group 50 to 54 to 6.4% for the group 80 and older, which represents an increase of only 2.4%. Figure 2 shows that transit use increased as respondents aged. This increase was most dramatic in 1998 and appeared to be less so in the following survey years.

In all survey years, transit use was higher for the older groups. However, this effect was most apparent in 1998 and the least dramatic in 2013. As noted earlier, transit can provide an alternative to automobile use and maintain the mobility and independence of seniors (*26*). Yet the literature and Figure 2 suggest that public transit is not being used as an alternative to driving (*28*). The findings that seniors prefer to age in place emphasizes the importance of providing safe alternatives to driving in the context of sprawling auto-oriented urban development (*31*). The apparent stagnation of transit use for older adults in the most recent survey year provided an impetus to examine generational differences in transit use further through a cohort analysis.

Cohort Analysis

Although the above results revealed a pattern of increased transit use for nonwork trips after the age of retirement, relative differences in transit use were observed among survey years. These trends were examined further from a cohort perspective to observe transit use of older populations relative to younger ages. Although longitudinal data following individuals and their travel behavior across time were not available, changes in aggregate cohort behavior were evaluated by comparing O-D survey data among cohorts. Using the age groups described earlier the respondents divided into six cohorts, which are presented in Table 2. The purpose of the cohort analysis was to follow the transportation behavior change of similarly aged respondents from 1998 to 2013. The method of pseudocohort analysis used in this study and previous research (*3, 4*) provided an effective means to evaluate group behavior over time (*4*).

For example, Cohort 1 included respondents who were 50 to 54 in 2003, 55 to 59 in 2008, and 60 to 64 in 2013. Statistics Canada defines the "baby boomer generation" as those born between 1946

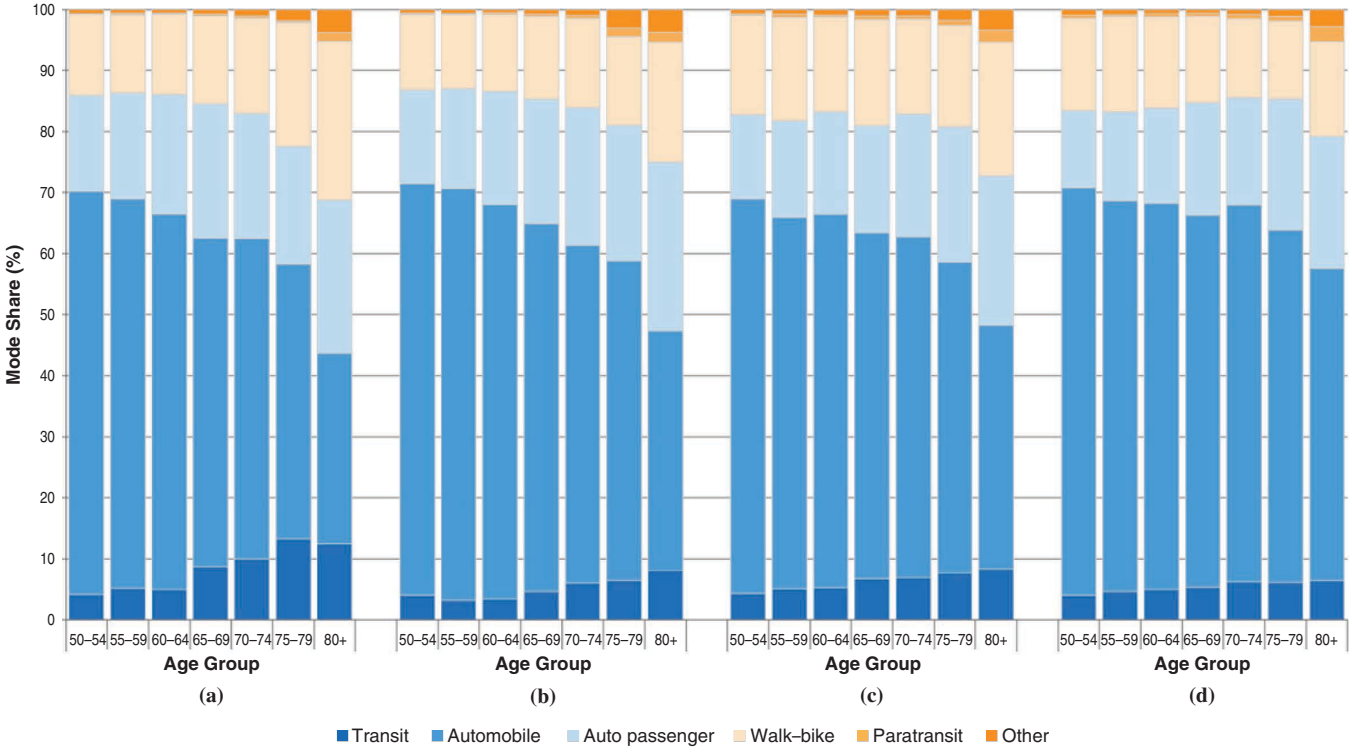

FIGURE 2 Age groups and mode shares in all O-D survey years: (*a*) 1998, (*b*) 2003, (*c*) 2008, and (*d*) 2013.

TABLE 2 Description of Cohorts

Cohort	Age in 1998	Age in 2003	Age in 2008	Age in 2013	Reference
Cohort 1 Born 1949–1953		50–54	55–59	60–64	Bruce Springsteen
Cohort 2 Born 1944–1948	50–54	55–59	60–64	65–69	Hillary Clinton
Cohort 3 Born 1939–1943	55–59	60–64	65–69	70–74	Harrison Ford
Cohort 4 Born 1934–1938	60–64	65–69	70–74	75–79	Mary Tyler Moore
Cohort 5 Born 1929–1933	65–69	70–74	75–79	80+	Clint Eastwood
Cohort 6 Born 1924–1928	70–74	75–79	80+		Gordie Howe

and 1965 (*35*). Therefore, the Canadian baby boomer generation was captured by Cohort 1 and partially by Cohort 2. Cohorts 5 and 6, whose respondents were born between 1929 and 1933 (Cohort 5) and 1924 and 1928 (Cohort 6), represented the oldest cohorts and oldest generations of seniors captured by this analysis. These respondents are the generation of seniors who are the parents of the baby boomers. Creating these cohorts allowed comparisons to be made of transit use between generations. Differences of transit mode share between generations were tested for statistical significance by using a Pearson chi-square significance test and are shown in Table 3. The results of this test show that the variation in transit use between survey years was statistically significant in all age groups, with the exception of the group 50 to 54. All other groups had *p*-values below the .05 threshold for statistical significance. The resulting *p*-values of the cohorts were also statistically significant, with one exception being Cohort 1. For all other cohorts, the variation in transit trips in a cohort was statistically significant between survey years.

By using data from Table 1, the transit mode share for each cohort in 1998, 2003, 2008, and 2013 was identified. Then, the mode share of each cohort was normalized by the transit mode share of the entire population for that survey year. The data were normalized to account for years in which transit mode share was exceptionally high or low. For example, in 2008, transit mode share was higher than in other survey years across all age groups, perhaps because of a spike in gasoline prices. Once normalized, the transit mode share could be analyzed relative to the average for that survey year. Figure 3 graphically represents the normalized transit mode share of trips taken by the six cohorts. The *x*-axis contains the age group, and the *y*-axis represents the transit mode share relative to the average. The normalized mode share of the four survey years is represented by dotted lines, and each cohort is represented with a solid line. Because the mode share has been normalized, when the lines are above one, transit mode share was above the overall average for that survey year. Alternatively, when the lines are below one, the transit mode share of that cohort was below the average. Displaying the cohort's mode share in this way allowed comparisons between generations. In other words, this display compares the transit behavior of those who were the same age in different years.

TABLE 3 Statistical Significance of Differences in Transit Mode Share Between Age Groups and Cohorts

Age Group	Probability (p)[a]	Cohorts	Probability (p)[a]
50–54	.962	Cohort 1	.141
55–59	.001	Cohort 2	.000
60–64	.003	Cohort 3	.000
65–69	.000	Cohort 4	.001
70–74	.000	Cohort 5	.000
75–79	.000	Cohort 6	.001
80+	.000		

[a]Chi-square test for difference between populations.

In 2011, the average age of retirement in Canada was 63 (*35*). Generally, the dotted lines in Figure 3 show that transit use was below average before retirement. It increased at retirement and then plateaued in the senior years. Figure 3 shows that Cohorts 1 to 4 had below-average transit mode shares in their preretirement years. These cohorts appeared to exhibit a change in transit behavior at retirement. The transition from preretirement to postretirement was captured by Cohorts 2, 3, and 4. For all these cohorts, transit mode share increased toward the average or to above average in postretirement years. After people retired, their transit mode share remained stable between 65 and 79. The transit mode share of older generations appeared to level out at higher levels than that of younger generations. This trend can be seen by comparison of Cohorts 4, 5, and 6. Cohort 4 had a transit mode share only slightly higher than the average for people between 65 and 79. Cohort 5, which represents an older group than Cohort 4, had a higher transit mode share for the same ages. Cohort 6, the oldest cohort, had the highest transit mode share. In other words, seniors 70 to 74 in 1998 took transit more than they did in 2003. Seniors 70 to 74 took transit even less in 2008. On the basis of the foregoing analysis, one can confidently say that older cohorts used transit more in their senior years than younger cohorts did, given the statistical significance of Cohorts 4, 5, and 6. In other words, Gordie Howe used transit more than Clint Eastwood did when they were the same age. Mary Tyler Moore used transit even less. If this trend continues, the baby boomer generation can be expected to use transit less in their postretirement years than older generations did, and this situation represents a challenge to maintaining the safe mobility of seniors.

Gender Differences in Transit Use

Following the review of literature about gender differences in travel behavior between generations of seniors, the authors iso-

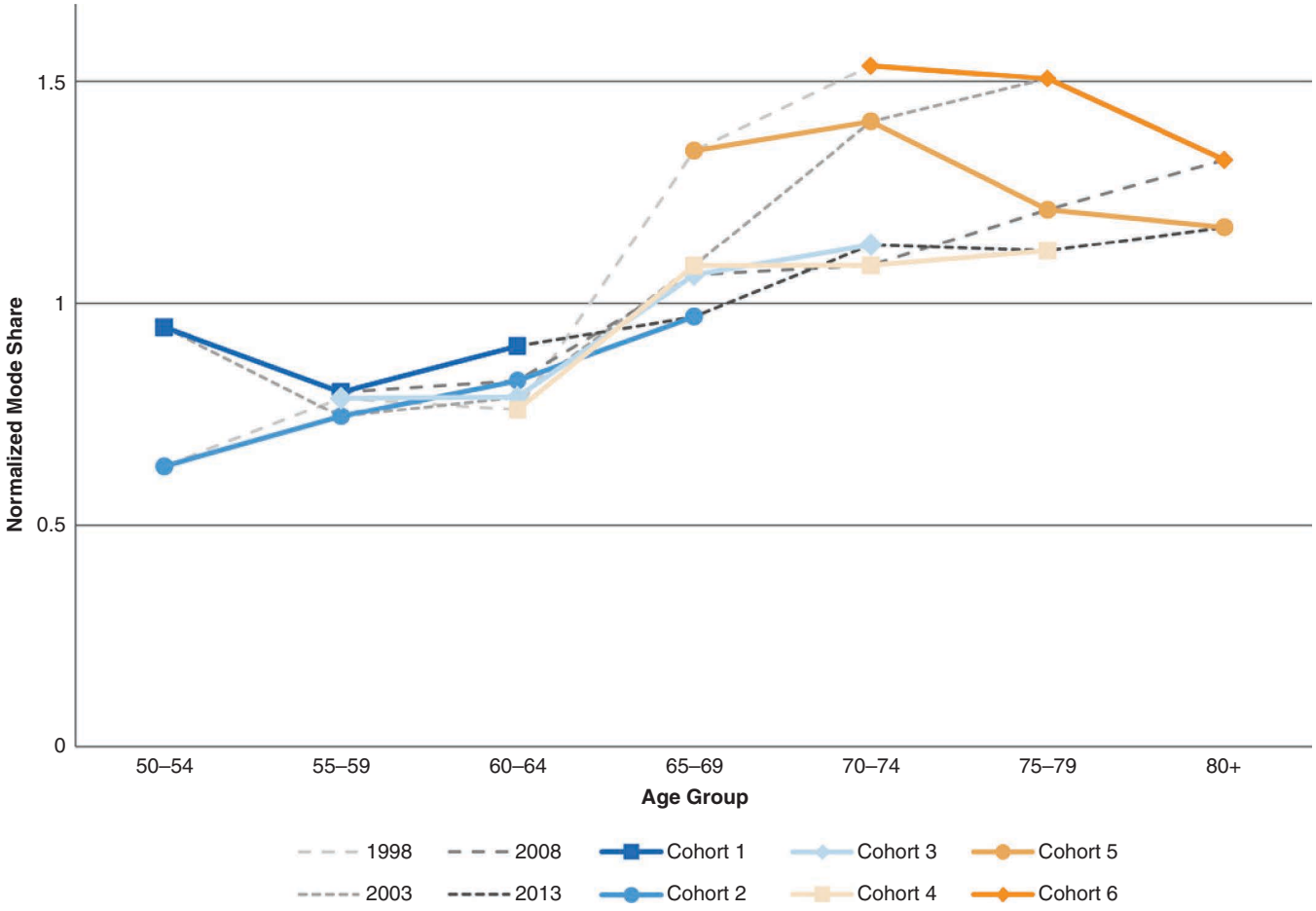

FIGURE 3 Transit mode share of six cohorts.

lated the transit use of males and females to consider differences in transit use across survey years as well as between older and younger cohorts of males and females. Figure 4 compares transit mode share of males and females for each age group in all survey years. For all age groups and all years, females had a higher transit mode share than males. The largest differences between males and females occurred in 1998. However, the transit behavior of males and females were most similar in 2013. Figure 4 shows a similar pattern emerging to that in Figure 2: transit use increased with age but increased less dramatically in more recent years. In particular, all male age groups had a transit mode share of less than 5% in 2013.

Figure 5 shows the results of applying the cohort analysis to these data. Transit mode share of males was normalized by the transit

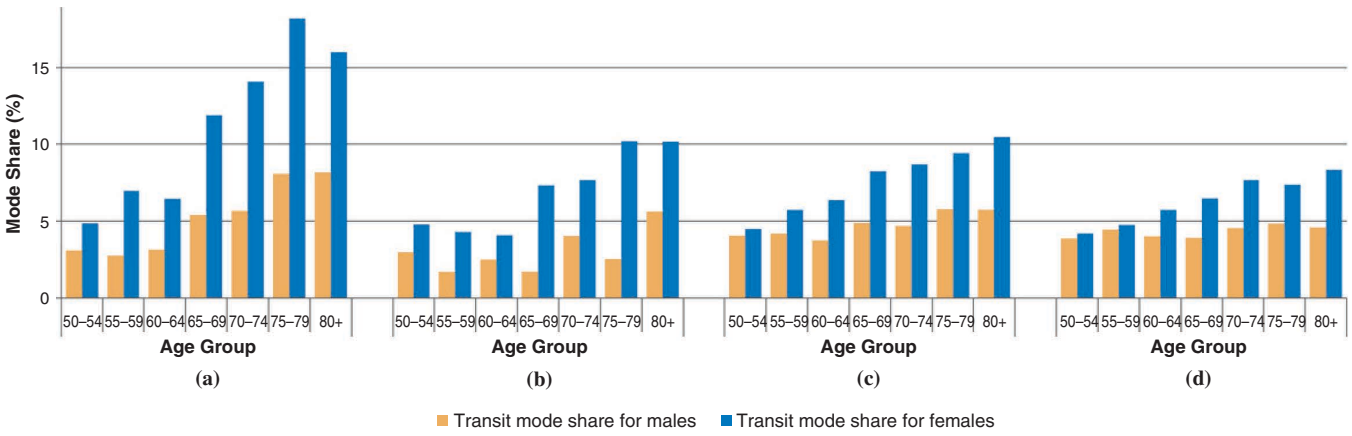

FIGURE 4 Transit mode share of males and females in all O-D survey years: (*a*) 1998, (*b*) 2003, (*c*) 2008, and (*d*) 2013.

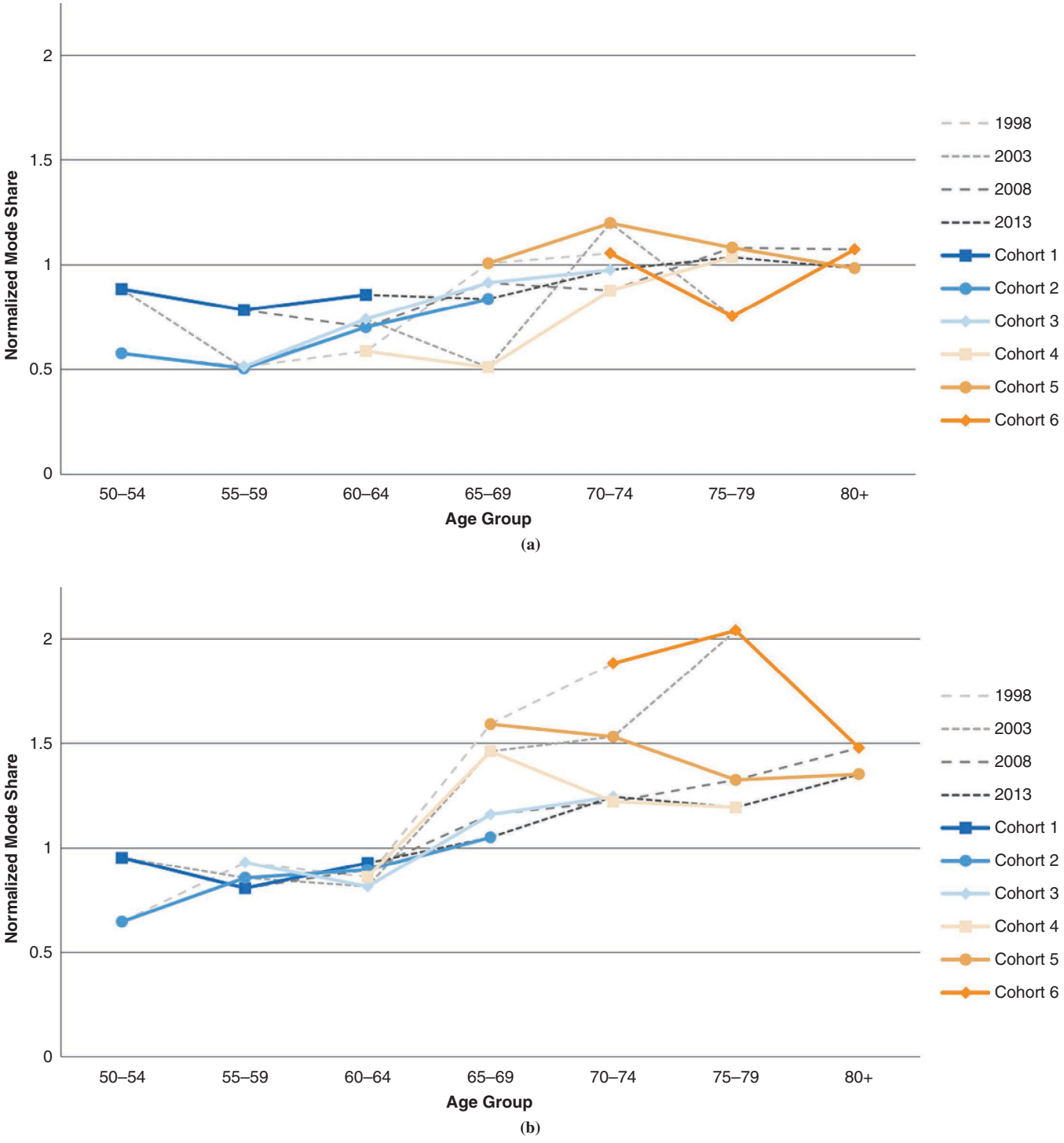

FIGURE 5 Transit mode share of six cohorts for (*a*) males and (*b*) females.

mode share of men of all ages for each survey year. All male cohorts were slightly below the average in preretirement years. In postretirement, transit mode shares of men did not deviate far from the average. The variation between cohorts and between survey years appeared to be only slight in the postretirement years in males relative to females.

A clearer pattern was observed in the transit mode share of females, which was normalized by transit mode share of females of all ages. As with the male cohorts, transit use of the female cohorts was below average before retirement. Cohorts 2, 3, and 4 rose above the average at retirement age. Cohort 4 showed a sharp rise at that point; Cohort 3 showed a less-sharp increase, and Cohort 2 showed a more subtle increase at this point. A comparison of the transit mode share of females in Cohorts 2, 3, and 4 shows that transit use was increasing after retirement but increasing to a lesser degree in younger cohorts. Overall, the transit use of older senior females was higher above the average than that of older senior males. In Cohort 6, a transit mode share for females that was double the female average was observed, and it occurred when they were 75 to 79 in 2003. Older female cohorts had a high transit mode share and diverged further from the average than their male counterparts. The younger female cohorts, who were in their preretirement years, behaved more similarly to males.

An analysis similar to the previously mentioned study was conducted in attempts to identify the differences between cohorts based on their home location relative to the central business district (*3*). The analysis revealed similar patterns to those previously observed: transit use was much lower in suburban areas and was higher in closer proximity to the central business district (*3*). The authors determined that these trends may not be specific to seniors or generational groups and would not be reported in this study.

DISCUSSION AND CONCLUSION

This study began with an analysis of seniors' travel behavior derived from O-D surveys in 1998, 2003, 2008, and 2013. Driving was the dominant mode of travel across each survey year, and in the most recent survey year, a greater proportion of seniors were driving at later years in life, a result that confirms previous research (*20, 36*). In relation to transit use, the opposite effect was observed in that older seniors appeared to use transit less than older groups of seniors at that age. Public transit can provide an alternative to the automobile by safely maintaining the independent mobility of seniors while providing older individuals with a greater sense of dignity and aiding older adults in the challenges faced with the cessation of driving (*37*). However, the results suggest that public transit was not as preferred and as widely used in more recent survey years.

Using a pseudocohort analysis, the authors compared the transit use of older cohorts of seniors to younger cohorts. The oldest cohorts used transit at a higher rate in their older senior years than the younger cohorts did. However, the higher transit use exhibited in older cohorts was not seen in younger cohorts (Cohorts 3 and 4). The least dramatic increase in transit use postretirement was seen in 2013. This finding is concerning because it suggests that baby boomer cohorts, which are now reaching retirement, are resistant to adopting alternative forms of travel. These results are potentially attributed to the established transportation preferences of baby boomers compared with their parents' generation, which were more dependent on public transit and continued to use transit postretirement, however, to a greater degree (*8*). Others have argued that existing transit use exhibited by older generations are not necessarily going to be shown by the baby boomer generation (*38*). This study corroborated previous research that the baby boomer generation has an attachment to private automobiles and that their transportation behavior as seniors will be different from that of previous generations. Therefore, when planning for an aging population, transportation agencies should be aware that individuals of the baby boomer generation are expected to exhibit a less dramatic change in travel behavior following retirement than that demonstrated by older generations of Canadian seniors. One way to address this issue is through active encouragement of seniors to experience public transit before the cessation of driving so as to foster a level of familiarity and comfort with the service. In this way, limited experience with public transit earlier in life will not be a barrier after driving cessation.

Differences in the transit behavior of males and females were revealed in this analysis. For all age groups and all survey years, females had a higher transit mode share than males. The most significant gender differences in transit mode share were observed in 1998, when the transit mode share of women was more than double that of men. However, this gender gap in transit share decreased over survey years, and little difference in share was seen in 2013. From this analysis, gender differences in transit behavior may be expected to diminish. The travel behavior of aging women may change for reasons such as having fewer children on whom to rely for assistance (*33*) as well as older women driving in greater proportions than in previous cohorts (*10*). However, to maintain the high transit use among older women, transit agencies should consult with women to develop strategies that may facilitate their transit use, such as increased safety initiatives (*9*).

The elderly are not a homogenous group. Differences exist between the younger groups of seniors (i.e., those 65 to 75) and seniors older than 75 in their travel patterns and mobility needs. The transit mode share among the two oldest cohorts (Cohorts 5 and 6) decreased toward the average for the group 80 and older. This decrease suggests that transit no longer met the needs of seniors who are older than 80. The transit mode share of each age group by survey year showed a higher mode share for the category other (i.e., taxi, motorcycle, and undetermined) for respondents 80 and older. This finding indicates that the oldest seniors were increasingly using alternative forms of transportation to maintain their mobility. Mobility reductions became more evident as people reached 80 (*39*). Perhaps as the physical mobility and cognitive functioning of older seniors declined, they were forced to use an alternative mode because, at this time, transit, as well as automobiles, may not be the most appropriate or safe option, as demonstrated by the accident rate in older adults in previous studies as well as the physical demands of using public transit (*21*). Coughlin found that baby boomers had expectations that technology would help them manage their mobility as they aged (*7*). This expectation may be met by the rising use of alternative forms of transportation, such as ridesharing services like Uber and Lyft. These alternatives could potentially address the changing demands of baby boomers by offering demand-based door-to-door transportation. However, barriers to entry for services like these include the cost and the requirement of a credit card and smartphone. Nonetheless, understanding both the current barriers that might prevent

or limit the transit use of older adults and their use of alternatives could provide valuable insights into the transportation needs of older seniors and how best to adapt public transit systems to an aging population.

The generational differences in travel behavior observed between baby boomers and the parents of baby boomers revealed the importance of encouraging the adoption of multimodal lifestyles and better planning and development that facilitates less dependence on the automobile. Attachment to and reliance on the automobile may indicate a lack of familiarity with public transit, which may act as reluctance to learn at an advanced age (*29*).

This study indicated that, as baby boomers experience changes in their physical mobility and cognitive functioning, their transportation behavior reveals reluctance to use public transit in the years following retirement. Public transit can provide an alternative travel mode to driving by responding to seniors' preference for mobility independence. Accordingly, transit agencies should aim to develop transit systems that account for the mobility needs and preferences of seniors, a situation that requires an increased understanding of the nuances of aging and generational differences in the transportation behavior and mode choice of seniors.

ACKNOWLEDGMENTS

The authors thank Daniel Bergeron, Benoît Lavigne, and Gabriel Sicotte of the Agence métropolitaine de transport for providing access to Montreal origin–destination survey data analyzed in the paper (2003, 2008, and 2013). Thanks go to Pierre Tremblay of the Quebec Ministry of Transport for providing the 1998 Montreal origin–destination survey. This research was funded by the Natural Sciences and Engineering Research Council of Canada, as well as the Social Sciences and Humanities Research Council of Canada.

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The Standing Committee on Public Transportation Planning and Development peer-reviewed this paper.