INVESTIGATING CHANGES IN TRAVEL BEHAVIOUR OF THE OLDER POPULATION IN THE GREATER TORONTO AND HAMILTON AREA, 1986-2006

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ABSTRACT

This paper provides a descriptive analysis of demographic aging and the changes in travel behaviour of the older population in the Greater Toronto and Hamilton Area (GTHA) in the Province of Ontario, Canada, from 1986-2006. The changing travel dynamics of the past and current groups of elderly population is examined in terms of out-of-home trip-making and primary mode of travel. These travel demand trends are analyzed in relation to age groupings that differentiate the baby boomers and the elderly as well as by trip purpose or activity. The paper reflects on these trends in regards to transport research and policy implications in an aging society.

Keywords: travel behaviour, elderly, trends, aging, Canada

1. INTRODUCTION

One of the leading issues in transport research concerns the impact on the transportation system of the growing number and proportion of a new generation of older people who are perceived especially in the developed world to be relatively healthier (living longer) and wealthier (more varied lifestyle and mobile) than their counterparts in the past (e.g. He, et al, 2005). While there have been literature showing the apparent changing mobility of the elderly population (e.g. Alsnih and Hensher, 2003; Rosenbloom 2001); this has not been sufficiently quantitatively validated and updated. So far, studies have been done on a national scale. These include country case studies of the United States and Australia (Rosenbloom and Morris, 1998), Canada (Newbold, et al, 2005), a comparative study of elderly travel behaviour in Denmark, Norway and Sweden (2010) and with respect to public transit use among the elderly in New Zealand (Currie and Delbose, 2010) and automobility in the United States (Rosenbloom, 2001). However, there is dearth of studies of this nature done at the metropolitan level that are directly useful for regional transport policy and planning. There is also a growing interest in this area from a developing country perspective (e.g. Petterson and Schmöcker, 2010).

A basic constraint in undertaking trend research in travel behaviour is the lack of historical data to undertake more detailed analysis. Canada (i.e. Montreal and Toronto metropolitan areas), has large data sets to provide such information. While not particularly focused on the elderly, Morency and Chapleau (2008) provided an initial investigation of the changing mobility trend of various age groups including the older population in Montreal, Canada over

a 15-year period (1987-2003). This paper complements such analysis by investigating the mobility of the baby boomers/middle-aged (40-64) and the elderly population (65 years +) in the Greater Toronto and Hamilton Area (GTHA) over a twenty-year period (i.e. 1986-2006) based on the Transportation Tomorrow Survey (TTS) data.

The TTS is a one-day, large-sample (5% of all households) survey of travel behaviour conducted every five years since 1986 in the GTHA (Miller and Mercado, 2010). This paper aims to provide a picture of population aging in the GTHA and the changes in trip-making and the primary means of transport of the older population. These travel demand trends will be analyzed in relation to age groupings that differentiate the baby boomers/middle-aged (40-64), young old (65-74), old-old (75-84) and the oldest-old (85+), as well as by trip purpose or activity. The paper will reflect on these trends in regards to transport research and policy implications in an aging society.

2. DEMOGRAPHIC AGING IN THE GTHA

The GTHA comprises six census divisions, namely, Toronto, Durham, York, Peel, Halton and Hamilton. The GTHA is an important region especially in transportation planning since it has the largest concentration and strong links of population and economic activities in the Province of Ontario.

The GTHA is aging. **Figure 1** shows the dramatic increase in the absolute number of population starting at age 40 growing from 1.5M in 1986 to 3.5M in 2006. While the number of the younger population (11-39) is still considerable (2.1M in 2006), their rate of increase pales in comparison to the older age groups (**Figure 2**). Persons less than 40 years old barely increased (5.7%). Males 26-39 even posted a negative growth during the twenty-year period. In contrast, the percentage of people above 40 years old has grown by more than 40 percent. The biggest increase occurred among the old-old population (75+) which grew more than 70%. While there are still more women elderly than male, the growth in the number of elderly males 65+ outpaced elderly females. These trends are consistent with population projections in the province showing fast growth among the older age group (75+) and the expectation of a narrowing of the life expectancy gap between older men and older women (Ontario/MFO 2009).

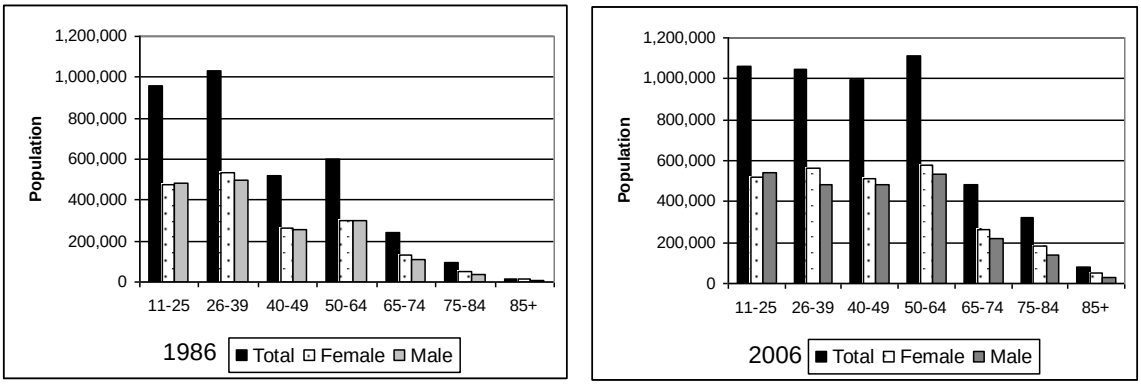

Figure 1 –Population, By Age Group and Gender,, GTHA, 1986 vs. 2006

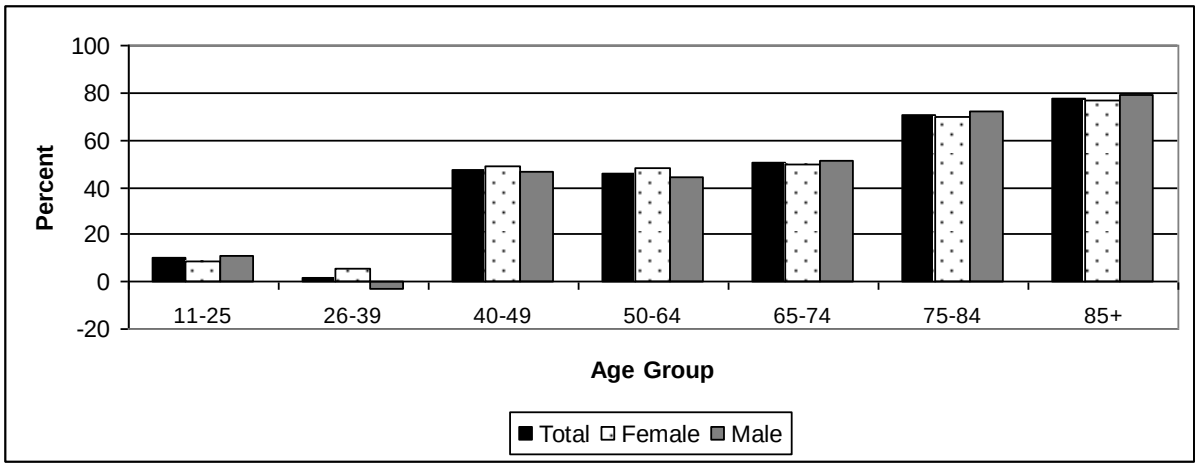

Figure 2 – Percent Change in Population, By Age Groups, GTHA, 1986-2006

Figure 3 compares the elderly population distribution in the GTHA between 1986 and 2006. Growth in the elderly population occurred more in the less dense and mostly suburban regions of Durham, York, Peel and Halton which took a good share of the total population 65+. The two big cities, Hamilton and Toronto lost 13% share of the population 65+ over time. These trends would continue as it has been projected that the senior population of Durham, Halton, Peel and York will triple (growth above 200 per cent) by 2036 (Ontario/MFO 2009). This means an increasingly larger share of the elderly population would be living in these areas where public transit is less available and efficient and require an automobile-oriented travel.

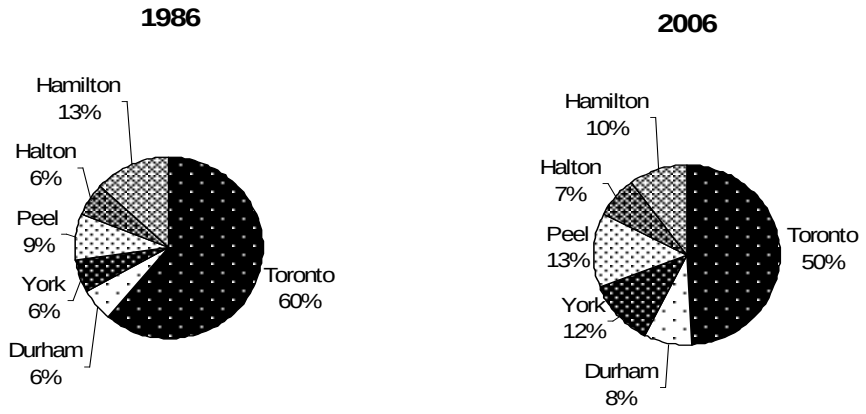

Figure 3 – Elderly Population Regional Distribution, GTHA, 1986 vs. 2006

3. TRENDS IN OLDER PEOPLE'S TRAVEL BEHAVIOUR IN THE GTHA

As mentioned, there is a general expectation that the newer generation of older people would be significantly different from their counterpart in the past in terms of being healthier and diverse in lifestyle. From a transport perspective, these assumptions imply that relative to the older population in the past, the succeeding elderly cohorts should be taking more trips, with greater variety of travel activities and more probably using car predominantly relative to other transport modes. The foregoing analysis aims to show to what extent these propositions are true or not based on the survey data conducted in the GTHA. The TTS data used in the

analysis are for the years 1986, 1996 and 2006. The degree of data consistency of the questions asked in the TTS and the large sample size help strengthen the findings of the trend analysis.

In Canada, baby boomers, who in 2001 represent one third of the total Canadian population, are officially defined as those born between 1946 to 1965 (Ontario/MFO, 2009; Statistics Canada, 2010). The oldest of the baby boomers in 1986 was aged 40. Thus, for the present study, we consider 40-44 as the lowest range in the age groupings. They represent those who would be aged 60-64 in 2006. Middle-aged people 45-49 in 1986 would compose the new elderly aged 65-69 in 2006. Older people 55-64 in 1986 who could be retired or planning for their retirement comprise the young-old in 1996 and are the old-old in 2006. In the same vein, the young old in 1986 represent the old-old in 1996 and are the oldest-old ten years after.

The analysis centres on the general trend in trip-making and trip modality overtime with special focus on the changes with respect to these travel behaviour indicators. The changes in travel rates across years are tested for significance (paired t-test) at alpha=0.5. The reported changes in this paper are all significant unless otherwise stated.

3.1 Trip making

The number of trips a person makes is negatively related to one's age. Studies have empirically supported such a decline in trip rate as age advances (e.g. Morency and Chapleau, 2008; Paez et al 2007; Schmocker et al 2005) and is further confirmed by the present analysis. Concomitant with the increase in the number of elderly 65+, their absolute number of trips have almost tripled (2.9 times) in 2006 from the figure in 1986 (**Figure 4**), almost matching that of the baby boomers 45-49.

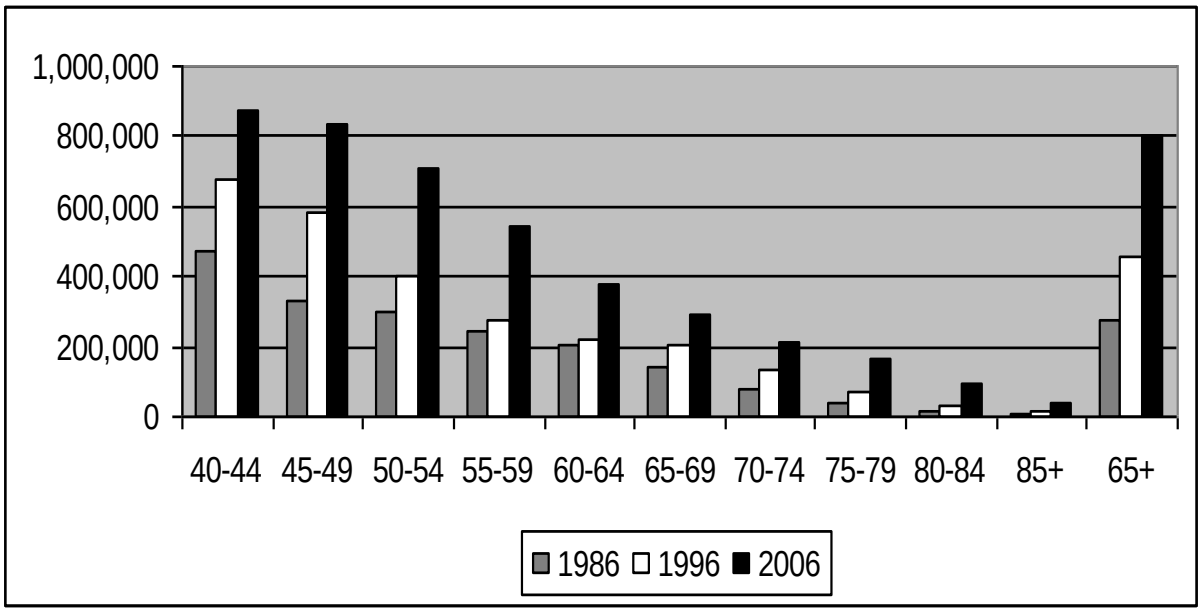

Figure 4 – Number of Trips, By Age Group, 1986, 1996, 2006

On a per capita basis, between 1986 and 2006 average trips have significantly increased in all older age groups with the largest increases in trip making occurring among the old-old group 75+ (**Table 1/ Figure 5/6**).

Table 1 - Trips per Person, 1986-2006

Age Group	Both Sexes			Women			Men		
	1986	1996	2006	1986	1996	2006	1986	1996	2006
40-44	1.592	1.675	1.730	1.528	1.676	1.775	1.655	1.673	1.682
45-49	1.451	1.620	1.709	1.335	1.562	1.722	1.570	1.679	1.695
50-54	1.331	1.423	1.567	1.181	1.323	1.505	1.481	1.524	1.635
55-59	1.243	1.299	1.450	1.079	1.163	1.353	1.398	1.441	1.554
60-64	1.140	1.158	1.321	0.973	1.036	1.188	1.323	1.285	1.467
65-69	0.985	1.021	1.093	0.834	0.929	0.997	1.163	1.131	1.208
70-74	0.800	0.912	0.974	0.671	0.839	0.887	0.964	1.001	1.077
75-79	0.634	0.799	0.869	0.530	0.677	0.768	0.773	0.955	0.994
80-84	0.438	0.569	0.716	0.372	0.488	0.614	0.545	0.696	0.858
85+	0.296	0.344	0.494	0.254	0.289	0.413	0.368	0.447	0.624
65+	0.787	0.861	0.905	0.655	0.763	0.803	0.958	0.987	1.033
p-value 1986-1996 -2006		0.0004	0.0000		0.0001	0.0000		0.0293	0.0010
p-value 1986-2006			0.0000			0.0000			0.0004

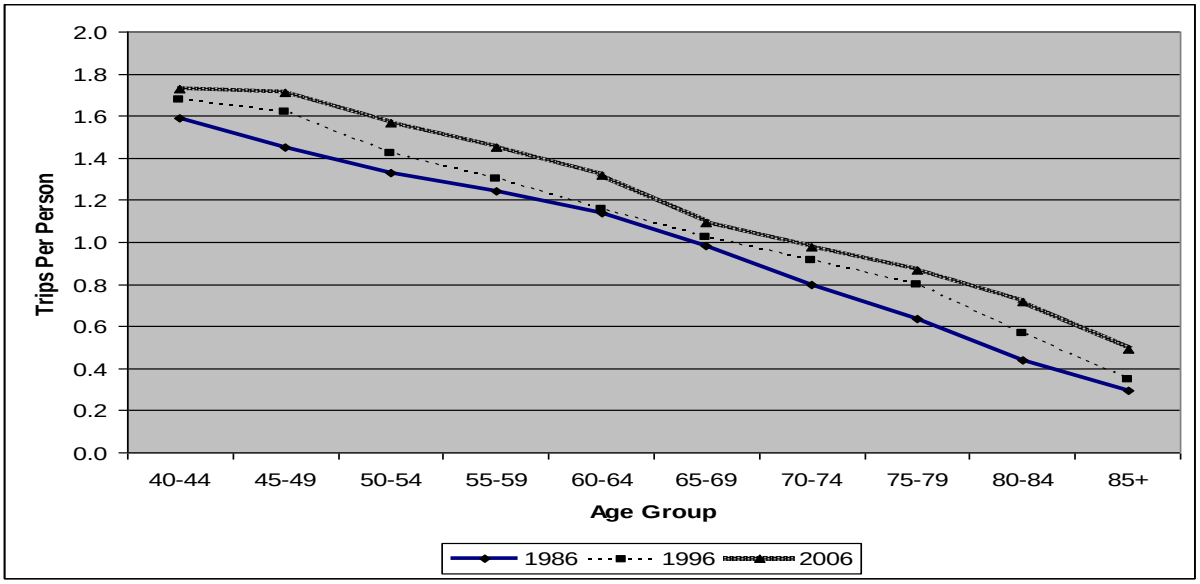

Figure 5 – Trips per person per day, By Age Group and TTS Year

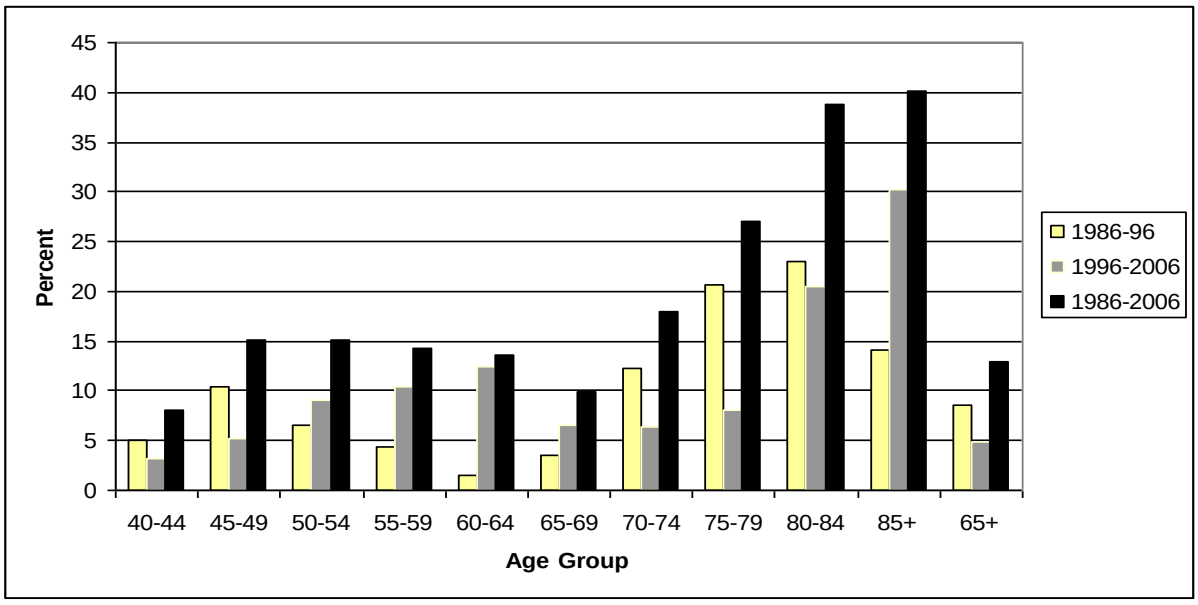

Figure 6 – Percent Change in Trips per Person per Day

The overall increase that has been observed in the GTHA can be largely attributed to increased trips by older women than by older men (**Table 1**/ **Figure 7**). While older men, particularly the old-old, increased their average trip rate over time, older women have increased trip rates remarkably in all age groups. Women baby boomers 40-49 have even exceeded the average trip rates of their male counterparts in 2006.

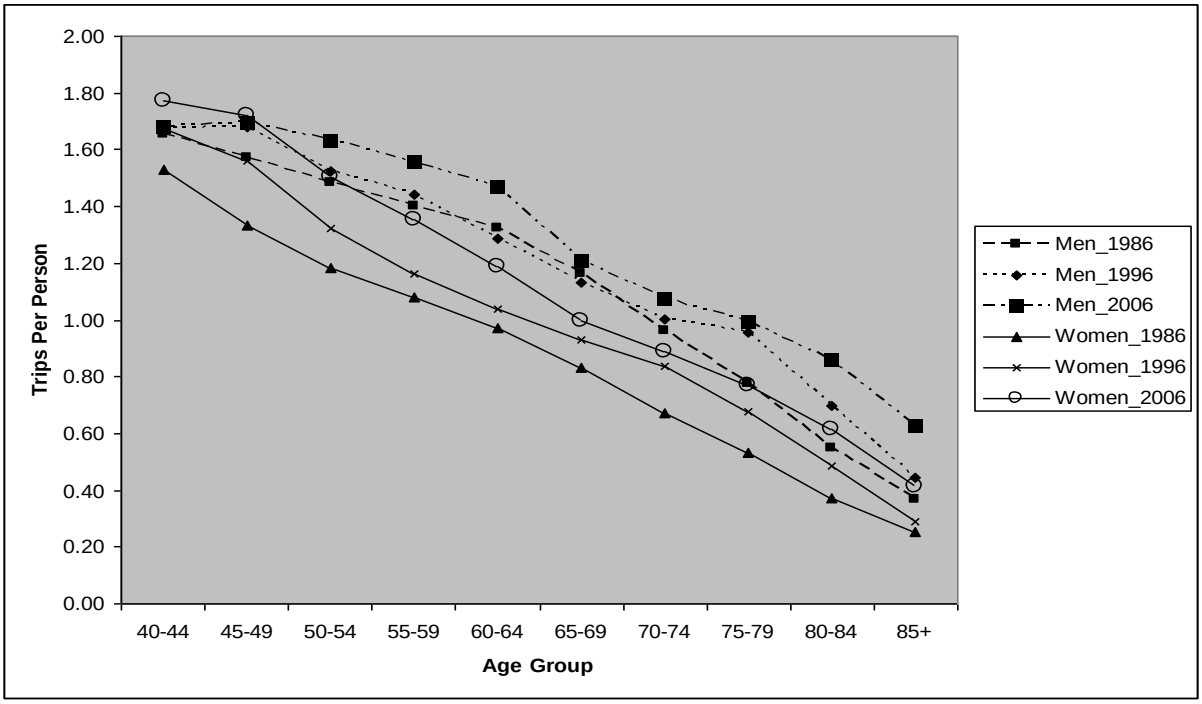

Figure 6 – Trips per Person per Day, By Gender

3.2 Car Ownership and License Possession

An important explanation of increased trip-making over the twenty year period is the swell in the number of people holding a driver's license. License rate rose by at least 13% among the elderly population. Compared to elderly men who already have a high license rate (79% in 2006), license holding by women 65+ has increased dramatically from 37% in 1986 to 49% in 2006 (**Table 2**/ **Figure 8**). For men, the significant increase in license rate that occurred in the period 1996-2006 could be attributed to the elderly, especially those 70+.

Table 2 - License Possession Rates, Total and By Gender, TTS Years

Age Group	Total			Women			Men		
	1986	1996	2006	1986	1996	2006	1986	1996	2006
40-44	87.9	88.5	89.1	79.5	82.4	83.8	96.2	95.0	94.8
45-49	85.1	87.8	89.4	74.4	80.5	84.1	95.9	95.4	95.1
50-54	80.6	86.1	87.6	66.8	77.4	81.4	94.4	94.9	94.3
55-59	78.2	81.1	86.0	62.4	69.6	78.5	93.2	93.0	94.0
60-64	71.7	74.4	81.8	55.1	60.2	72.4	89.8	89.3	92.0
65-69	64.9	68.0	74.0	48.1	54.1	62.3	84.8	84.6	87.8
70-74	57.0	61.6	68.0	39.4	47.1	54.6	79.3	79.3	83.9
75-79	48.1	53.5	62.3	29.3	37.1	48.3	73.0	74.6	79.5
80-84	29.9	35.8	49.1	15.7	23.6	35.5	52.9	54.8	68.1
85+	17.7	20.2	31.9	9.0	11.3	21.3	32.9	37.0	48.9
65+	54.1	57.2	62.4	36.8	42.5	49.1	76.4	76.1	79.1
p-value 1986-1996-2006		0.0001	0.0013		0.0000	0.0001		0.3198	0.0282
pvalue 1986-2006			0.0002			0.0000			0.0465

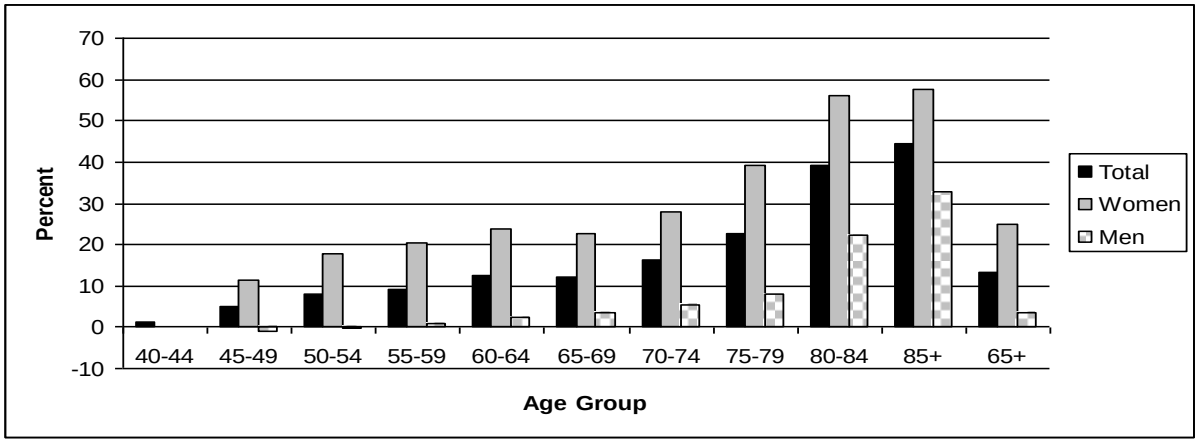

Figure 8 – Percent Change in License Possession, Total and By Gender, 1986-2006

Directly related to license possession is the rate of car ownership which has also seen a significant rise from 1996-2006 (**Table 3**). The increase observed seems to be independent of the change in household size, which showed no significant change during said period. In addition, the number of zero-car households has declined over time especially in the case of elderly in general and elderly women in particular (**Figure 8**).

Table 3 - Average Household Size and Auto Ownership, By Age Group, 1986-2006

Age Group	Ave. Household Size			Ave. No. Car in Household		
	1986	1996	2006	1986	1996	2006
40-44	3.67	3.63	3.68	1.72	1.60	1.62
45-49	3.51	3.43	3.50	1.88	1.75	1.75
50-54	3.22	3.10	3.13	1.92	1.83	1.84
55-59	2.79	2.78	2.78	1.70	1.70	1.81
60-64	2.52	2.62	2.55	1.44	1.54	1.65
65-69	2.28	2.40	2.42	1.17	1.27	1.41
70-74	2.18	2.26	2.33	1.00	1.11	1.26
75-79	2.17	2.17	2.21	0.90	0.96	1.11
80-84	2.21	2.14	2.06	0.79	0.85	0.97
85+	2.54	2.09	2.02	1.02	0.67	0.76
65+	2.34	2.18	2.16	0.98	0.90	1.02
p-value 1986-1996 -2006		0.4036	0.7479		0.6256	0.0012
p-value 1986-2006			0.5349			0.3134

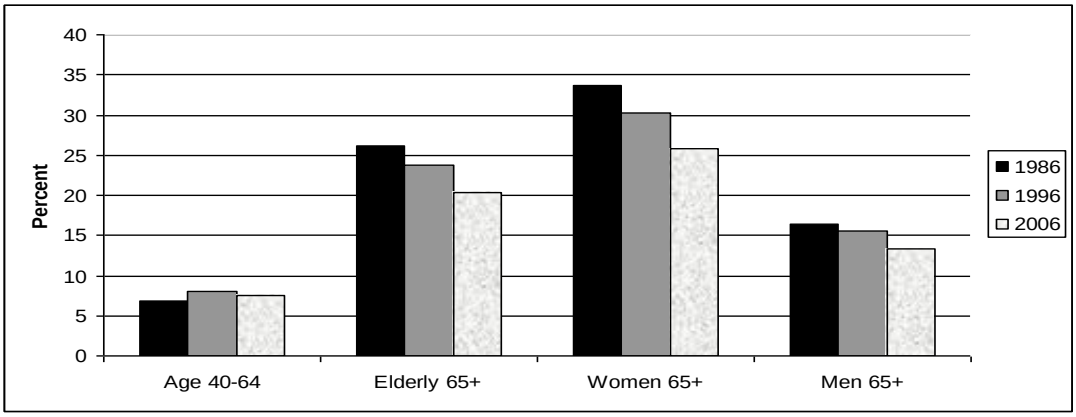

Figure 9 – Percent of Zero-Car Households, 1986-2006

3.3. Trip Activities

Trip activities among the older population vary between the elderly and the non-elderly as well as by gender. **Figures 10a** and **10b** depict this marked variation showing the distribution of major trip activities of older people that include work, market (shopping), facilitating passenger (FP) (including day care) and personal (including entertainment/recreation) trips. Work and personal trips constitute the largest bulk of total trips for persons aged 40-64. In contrast, for the elderly 65+, the drastic decline in work trips in view of retirement gives way to more personal and shopping trips.

Reflecting their higher labour force participation, men undertake more work trips than women. But there has been a shift in the share of other trip activities over the twenty years for both elderly and non-elderly. Among the non-elderly women, more notable than a three percent increase in the share of work trips, there has been a significant reduction in the share of shopping trips and a corresponding increase in the share of FP trips. Non-elderly men also increased slightly their share of work and shopping trips but more significantly they have boosted their share of FP trips. These increased trips have reduced the share of their personal trips.

In the case of elderly women, shopping and personal trips comprise the bulk of their daily travels in 1986. In fact, shopping comprised 62% of their total trips. Their trip activities have diversified in 2006. Work trips have been reduced further along with facilitating passenger and shopping trips. Meanwhile, the share of personal trips has shown a notable increase and now constitutes half of their total trips. Elderly men like their women counterpart have slightly reduced their work trips and increased facilitating passenger trips. The share of shopping and personal trips has almost remained unchanged.

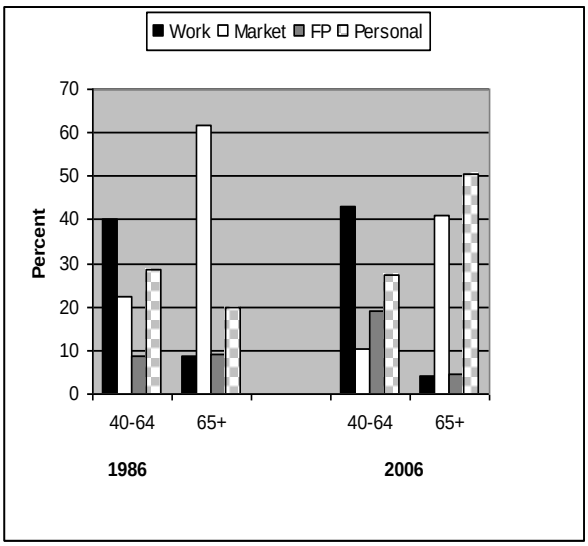

Figure 10a – Women's Trip Activities,1986 vs. 2006

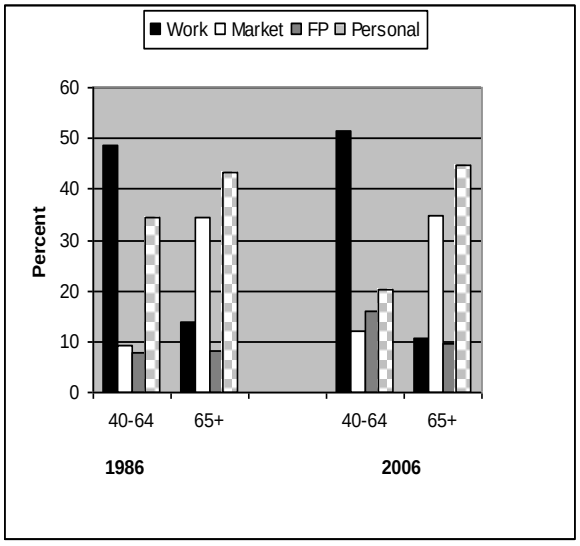

Figure 10b – Men's Trip Activities,1986 vs. 2006

Table 4 provides more detailed information with respect to the trip rates by major activity of the various age groups under study across the three survey years. Except for work trips, average trip rates in all activities have shown significant increases between 1986 and 2006. Men's work trip rates in 1986 in all age groups have shown a reduction starting in 1996 and while it rebounded in 2006, the rates are still lower than in 1986. For women, there has been a significant increase in work trips among non-elderly and a reduction of these trips among the old-old.

Table 4 – Trips per Person, By Age Group, Gender and Activity, 1986-2006

	Both Sexes			Women			Men		
Age Group	Work			Work			Work		
	1986	1996	2006	1986	1996	2006	1986	1996	2006
40-44	0.803	0.804	0.795	0.647	0.680	0.681	0.958	0.937	0.918
45-49	0.765	0.811	0.803	0.605	0.686	0.707	0.929	0.941	0.905
50-54	0.700	0.726	0.756	0.514	0.597	0.658	0.887	0.857	0.863
55-59	0.593	0.575	0.643	0.382	0.425	0.521	0.793	0.730	0.773
60-64	0.394	0.325	0.429	0.227	0.201	0.304	0.577	0.454	0.566
65-69	0.138	0.105	0.151	0.070	0.049	0.082	0.219	0.172	0.233
70-74	0.057	0.037	0.054	0.027	0.019	0.024	0.094	0.059	0.090
75-79	0.028	0.020	0.027	0.017	0.005	0.010	0.043	0.039	0.048
80-84	0.021	0.008	0.010	0.005	0.002	0.002	0.046	0.019	0.023
85+	0.025	0.008	0.005	0.010	0.002	0.004	0.050	0.021	0.008
65+	0.080	0.055	0.066	0.039	0.024	0.033	0.133	0.094	0.109
p-value 1986-1996 -2006		0.3225	0.0576		0.2397	0.0297		0.0111	0.1812
p-value 1986-2006			0.1124			0.0328			0.0155
	Shopping			Shopping			Shopping		
	1986	1996	2006	1986	1996	2006	1986	1996	2006
40-44	0.207	0.207	0.210	0.274	0.256	0.252	0.139	0.155	0.166
45-49	0.198	0.213	0.218	0.258	0.256	0.264	0.137	0.168	0.169
50-54	0.200	0.201	0.239	0.256	0.248	0.282	0.143	0.153	0.191
55-59	0.223	0.238	0.264	0.282	0.278	0.309	0.168	0.197	0.216
60-64	0.283	0.297	0.313	0.329	0.333	0.339	0.233	0.260	0.285
65-69	0.346	0.374	0.363	0.343	0.381	0.374	0.350	0.366	0.350
70-74	0.317	0.366	0.372	0.283	0.351	0.370	0.359	0.384	0.375
75-79	0.276	0.339	0.366	0.243	0.291	0.344	0.320	0.400	0.392
80-84	0.198	0.235	0.302	0.164	0.199	0.260	0.255	0.291	0.361
85+	0.097	0.141	0.208	0.088	0.116	0.175	0.112	0.186	0.260
65+	0.299	0.336	0.342	0.276	0.317	0.329	0.329	0.361	0.360
p-value 1986-1996 -2006		0.0032	0.0172		0.0649	0.0106		0.0014	0.0722
p-value 1986-2006			0.0022			0.0105			0.0035
	Facilitate Passenger			Facilitate Passenger			Facilitate Passenger		
	1986	1996	2006	1986	1996	2006	1986	1996	2006
40-44	0.193	0.272	0.384	0.205	0.324	0.462	0.180	0.216	0.300
45-49	0.140	0.228	0.351	0.119	0.226	0.372	0.162	0.230	0.328
50-54	0.093	0.143	0.227	0.067	0.101	0.196	0.119	0.186	0.262
55-59	0.083	0.105	0.147	0.054	0.066	0.103	0.110	0.146	0.193
60-64	0.066	0.087	0.121	0.036	0.043	0.083	0.098	0.132	0.163
65-69	0.066	0.063	0.097	0.032	0.041	0.056	0.106	0.090	0.146
70-74	0.044	0.041	0.074	0.019	0.029	0.036	0.077	0.056	0.118
75-79	0.032	0.039	0.051	0.015	0.028	0.032	0.054	0.054	0.075
80-84	0.007	0.023	0.032	0.003	0.015	0.021	0.015	0.034	0.048
85+	0.008	0.009	0.014	0.006	0.003	0.009	0.010	0.022	0.023
65+	0.046	0.045	0.064	0.021	0.029	0.036	0.077	0.065	0.100
p-value 1986-1996 -2006		0.0263	0.0054		0.0466	0.0209		0.0026	0.0009
p-value 1986-2006			0.0100			0.0275			0.0021
	Personal			Personal			Personal		
	1986	1996	2006	1986	1996	2006	1986	1996	2006
40-44	0.371	0.367	0.324	0.374	0.384	0.359	0.367	0.348	0.286
45-49	0.333	0.351	0.326	0.334	0.373	0.363	0.332	0.328	0.287
50-54	0.330	0.343	0.338	0.334	0.365	0.360	0.325	0.320	0.314
55-59	0.335	0.375	0.393	0.349	0.387	0.416	0.322	0.363	0.368
60-64	0.391	0.445	0.456	0.375	0.455	0.460	0.408	0.434	0.451
65-69	0.431	0.474	0.479	0.384	0.453	0.481	0.486	0.498	0.477
70-74	0.376	0.465	0.472	0.335	0.437	0.454	0.428	0.499	0.493
75-79	0.289	0.399	0.424	0.248	0.351	0.380	0.344	0.461	0.477
80-84	0.208	0.302	0.371	0.197	0.270	0.331	0.226	0.352	0.427
85+	0.166	0.185	0.267	0.150	0.167	0.225	0.192	0.217	0.334
65+	0.357	0.421	0.430	0.314	0.389	0.404	0.412	0.464	0.463
p-value 1986-1996 -2006		0.00369	0.25891		0.00053	0.06334		0.03724	0.58618
p-value 1986-2006			0.01429			0.00098			0.12020

Shopping trip rates have significantly increased over the twenty-year period. Such increase has occurred in all age groups except for women 40-44. Trips rates generally decline with age but this does not apply to shopping trips. Women generally have higher rates of shopping trips than men but the difference narrows upon reaching retirement (i.e. 65). In fact, men surpassed shopping rates of women starting at the age of 70. Given the car dependency of the elderly, as will be elaborated further in the next section, such gender differentiation in shopping trip rate in later stages of life could be related to the documented early voluntary driving cessation of women (Hakamies-Blomqvist and Wahlstrom, 1998; Siren et al 2004).

Like shopping trips, FP trip rates have significantly increased over the ten and twenty year period. FP trip rates are inversely proportional to age such that those in the youngest age grouping have the highest rate. While FP trip rates have increased in all age groups over the study period, the non-elderly (40-64) recorded higher increase in trip rates than the elderly age groups. Women 40-49 dominate their male counterpart with respect to FP trip rates but this is not sustained beyond 50. Conversely, men have higher FP trip rates than women in their golden years then gradually minimize these trips when they reach their 70s.

Personal trips have also increased over time in all age groups except for women 40-44 and men 40-54. Women registered higher personal trip rates than men but the reverse is true upon reaching their 70s. The changes in trip rates among women have been significant between study periods. In the case of men, the increases have only been significant from 1986-1996. In other words, personal trip rates among men have relatively been much the same over the twenty-year period.

3.3. Trip Modality

Older men and women are highly differentiated with respect to their primary mode of travel (**Figures 11a & b**). The former predominantly are car drivers but also use public transit (Figure 10b). Only a small percentage of trips by males are carried out as car passengers (private car or taxi) or walk to their trip destination. The male mode share has not changed considerably between 1986 and 2006 in the case of both non-elderly and elderly. In fact, trips by male elderly as drivers -- already at a high rate in 1986 -- increased during the period by more than 2%. In contrast, a reduction in the share of trips by public transit and an increase in the share of trips as car passengers have also been observed. Walking trips have increased but faintly.

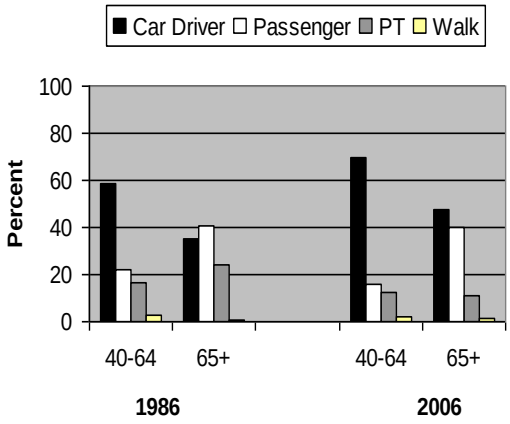

Figure 11a – Women's Primary Travel Mode

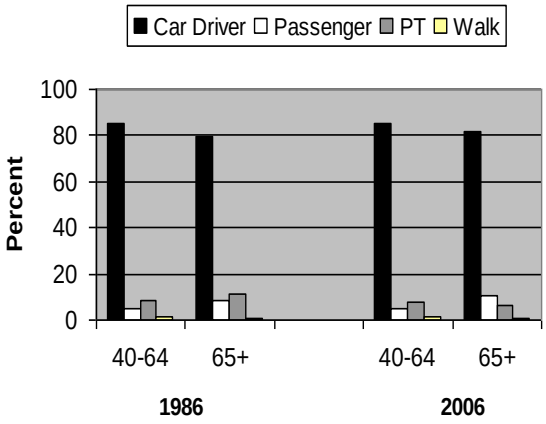

Figure 11b – Men's Primary Travel Mode

In contrast, women are more diverse in their travel modes (**Figure 11a**). More than half of their trips are made as drivers, but a considerable proportion is also made as car passengers. Public transit is also a more popular transport mode among women compared to men especially among the elderly. Over the twenty-year period, trips taken as drivers rose from 59% to 70% among the non-elderly and from about 35% to 48% among the elderly. While trips as car passengers have almost remained unchanged for the elderly, there has been a big reduction in the share of public transit. Walking trips have remained low and increase over the years has been minimal.

Table 5 provides greater detail concerning the (predominantly) increases in trip-making by primary mode of travel of the older population by age groupings and gender. The increase in driving trips has been significant over the study periods for both older men and women. The

Table 5 – Trip Rates by Travel Mode, Age Group, and Gender, 1986-2006

	Both Sexes			**Women**			**Men**		
Age Group	Driver			Driver			Driver		
	1986	1996	2006	1986	1996	2006	1986	1996	2006
40-44	2.083	2.208	2.290	1.751	2.029	2.183	2.414	2.400	2.405
45-49	1.871	2.146	2.295	1.450	1.853	2.123	2.302	2.450	2.475
50-54	1.671	1.856	2.054	1.164	1.471	1.759	2.182	2.246	2.378
55-59	1.528	1.660	1.859	0.965	1.211	1.491	2.059	2.125	2.252
60-64	1.297	1.408	1.656	0.727	0.937	1.215	1.925	1.901	2.142
65-69	1.091	1.133	1.293	0.576	0.719	0.890	1.695	1.627	1.769
70-74	0.819	0.969	1.106	0.413	0.618	0.730	1.336	1.398	1.548
75-79	0.590	0.825	0.961	0.265	0.451	0.608	1.020	1.308	1.394
80-84	0.321	0.511	0.723	0.118	0.285	0.433	0.649	0.864	1.131
85+	0.150	0.198	0.410	0.064	0.074	0.213	0.300	0.431	0.727
65+	0.810	0.908	1.010	0.401	0.547	0.652	1.337	1.372	1.459
p-value 1986-1996 -2006		0.0001	0.0000		0.0001	0.0000		0.0351	0.0010
p-value 1986-2006			0.0000			0.0000			0.0009
	Passenger			Passenger			Passenger		
	1986	1996	2006	1986	1996	2006	1986	1996	2006
40-44	0.281	0.280	0.255	0.430	0.401	0.361	0.132	0.151	0.141
45-49	0.294	0.282	0.247	0.438	0.421	0.371	0.145	0.139	0.117
50-54	0.303	0.297	0.272	0.476	0.456	0.396	0.130	0.137	0.136
55-59	0.315	0.319	0.305	0.519	0.489	0.456	0.122	0.144	0.144
60-64	0.382	0.377	0.338	0.602	0.599	0.509	0.140	0.144	0.150
65-69	0.345	0.434	0.386	0.540	0.655	0.581	0.114	0.169	0.154
70-74	0.336	0.410	0.396	0.487	0.582	0.591	0.143	0.199	0.166
75-79	0.299	0.373	0.381	0.400	0.505	0.542	0.164	0.203	0.185
80-84	0.288	0.337	0.382	0.348	0.406	0.491	0.191	0.229	0.229
85+	0.245	0.298	0.343	0.270	0.353	0.387	0.202	0.195	0.271
65+	0.324	0.398	0.383	0.466	0.558	0.542	0.141	0.190	0.184
p-value 1986-1996 -2006		0.0301	0.3541		0.0975	0.3420		0.0139	0.8706
p-value 1986-2006			0.2712			0.5963			0.0286
	Public Transit			Public Transit			Public Transit		
	1986	1996	2006	1986	1996	2006	1986	1996	2006
40-44	0.300	0.290	0.294	0.369	0.350	0.350	0.231	0.225	0.236
45-49	0.291	0.261	0.285	0.373	0.314	0.344	0.207	0.205	0.222
50-54	0.290	0.243	0.273	0.363	0.291	0.328	0.217	0.195	0.213
55-59	0.289	0.211	0.241	0.357	0.267	0.288	0.224	0.154	0.191
60-64	0.267	0.169	0.195	0.313	0.195	0.232	0.216	0.142	0.155
65-69	0.256	0.160	0.158	0.301	0.185	0.187	0.204	0.131	0.124
70-74	0.240	0.178	0.141	0.282	0.221	0.161	0.188	0.126	0.118
75-79	0.241	0.181	0.129	0.283	0.202	0.139	0.186	0.154	0.118
80-84	0.203	0.143	0.119	0.219	0.151	0.126	0.177	0.131	0.111
85+	0.139	0.114	0.107	0.127	0.091	0.114	0.161	0.158	0.096
65+	0.238	0.164	0.137	0.274	0.187	0.153	0.192	0.135	0.117
p-value 1986-1996 -2006		0.0002	0.9452		0.0000	0.9784		0.0026	0.6905
p-value 1986-2006			0.0016			0.0008			0.0042
	Walk			Walk			Walk		
	1986	1996	2006	1986	1996	2006	1986	1996	2006
40-44	0.052	0.053	0.052	0.068	0.067	0.060	0.037	0.038	0.044
45-49	0.049	0.050	0.052	0.059	0.062	0.064	0.039	0.037	0.039
50-54	0.047	0.043	0.046	0.062	0.059	0.058	0.032	0.028	0.033
55-59	0.042	0.043	0.047	0.045	0.045	0.055	0.039	0.042	0.039
60-64	0.036	0.028	0.036	0.043	0.031	0.039	0.028	0.025	0.032
65-69	0.014	0.018	0.022	0.015	0.021	0.023	0.012	0.015	0.020
70-74	0.006	0.015	0.013	0.007	0.017	0.016	0.006	0.013	0.010
75-79	0.005	0.011	0.010	0.005	0.015	0.009	0.005	0.006	0.011
80-84	0.003	0.011	0.007	0.002	0.015	0.009	0.004	0.006	0.006
85+	0.004	0.009	0.004	0.000	0.007	0.006	0.012	0.012	0.001
65+	0.009	0.015	0.013	0.009	0.017	0.014	0.009	0.012	0.012
p-value 1986-1996 -2006		0.1817	0.5708		0.1750	0.9878		0.5634	0.4790
p-value 1986-2006			0.0128			0.1076			0.2735

increases in trip rates among men have been modest relative to women. This has narrowed the gender gap in trip rates over time except in age groups 75+, where men continue to exceed women's trip rates. This can probably be attributed to the documented earlier driving cessation among women as pointed out earlier. Men, on the other hand, are more likely to continue driving as long as they can and, thus, can carry out more trips than women in later ages.

Passenger trip rates have significantly changed during the period 1986-1996. In the case of men, increases have been observed in all age groups except for age 45-49 and rates have significantly hanged over the twenty-year period. In the case of women, trip rates did not significantly change. It should be pointed out, though, that women have continued to register higher passenger trip rates than men over the twenty-year period.

Over time, public transit trip rates have significantly declined. This is the case for both older men and women. Women showed greater reduction in trip rates than men, although, they (women) continue to use public transit trips more than men. Elderly men and women posted larger decrease in transit trip rates compared to their non-elderly counterparts.

Walking is the least important travel mode for older people especially among the elderly 65+ where the gender divide no longer strongly holds. Changes in walking trip rates by gender over the twenty year analysis period were found to be statistically insignificant.

4. SUMMARY AND CONCLUSIONS

This paper provides a descriptive analysis of demographic aging and the changes in travel behaviour of older people in the GTHA from 1986 to 2006. The study explored the proposition that if the newer generation of older people are healthier and wealthier than their counterparts in the past, their trip making and use of the various transport modes to meet their lifestyle needs would be significantly different. TTS data for the years 1986, 1996 and 2006 were used in the empirical study.

The GTHA saw a dramatic demographic change in the last 20 years. From 1986 to 2006, the rise in the number and proportion of older people 40+ that comprise the baby boomers and the elderly has been substantial. Growth of more than 40% percent increase among the baby boomers and more than 50% in the case of the elderly 65 were observed during the study period. There has also been an increase in the number of elderly men in the GTHA which is due to their increasing life expectancy. A great majority of the older people live in the big cities of Toronto and Hamilton, but over the years, there has been a shift in residence towards the less dense and more suburban areas of Durham, Halton, Peel and York. Recent estimates by the Government of Ontario project a tripling of the number of older population in these GTHA census divisions by 2036. This means more and more people are living in areas where automobility is the norm and public transit is less available and less efficient.

The results of the analysis confirm an increase in out-of-home trips of older people over the past 20 years. While trip rates of both older men and women have significantly increased over time, the latter showed a more noticeable increase. This has been linked to the remarkable upsurge in women's rate of driver's license possession and car ownership. As a result of increased automobility, their trip-making has not only seen a notable growth but, as in the case of the baby boomers 40-49, shown convergence with their male counterpart. The increased trips combined with a more diversified trip activities. Their work trips have increased as well as FP trips while maintaining considerable shopping trips. There is a marked shift in travel activities upon reaching 65. Work trips are replaced by more shopping

and personal trips. Elderly men outdo women in these trips after age 70 as they continue to drive while the latter's tendency is to give up driving earlier on.

The twenty-year period saw an increase in automobility of older people. This has been instrumental in bringing about increased trip-making in the GTHA. The distribution of trips undertaken has changed with such increased car driving as well as the reduction in the use of public transit and the unpopularity of walking as a transport mode. Trips undertaken by the elderly as a car passenger have remained higher than those carried out by public transit. Elderly women conduct most of their trips as car passengers while elderly men continue and are becoming even more mobile as car drivers.

The aging in the GTHA has indeed impacted on the nature of traffic in the GTHA and, undoubtedly, will be felt more in the future. The implications are profound. The impacts of the increased automobility of the elderly as a result of cohort effects and the decentralization of their residential location on the transportation system have been emphasized in the literature with respect to congestion, environment, road safety and quality of life (e.g. Alsnih and Hensher, 2003; Coughlin 2001; Dulisse 1997; Mercado et al 2010; Rosenbloom, 2001). In addition, based on the results of the present study, the nature of traffic congestion could blur the differentiation between non-peak and peak periods as the GTHA demographically ages. In other words, the increased automobility of the new generation of elderly population coupled with the increase in non-work related trips -- discretionary trips (i.e. personal and shopping) usually done on non-peak periods -- could escalate to the point that there is no longer a significant difference between congestion rates between peak and non-peak periods. Moreover, the apparent decline in the use of public transit as a primary mode of travel among the elderly will continue to have implications on the sustainability of transit operations and their competitiveness. The challenge of attracting (again) both the baby boomers and elderly (especially women) to increase transit patronage would require improvements in hard (i.e. transit vehicle, operations and facilities) and soft (i.e. institutions, human resources,) infrastructure including pricing strategies that could rival car use. This is an important area for research and policy development that relates to expanding mobility options in an aging society that will ensure sustainable transportation as well as quality of life in later years.

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