

## Life in metropolitan areas

# Dependence on cars in urban neighbourhoods

by Martin Turcotte

To get around easily in today's big cities, especially in their sparsely populated suburbs, access to a private motor vehicle is not only very convenient but sometimes absolutely essential. Parents with young children know this only too well, since they often have to commute to work and back, drive the children to the daycare centre or evening activities, go to an appointment, shop for dinner and do other things besides – all in the same day.

While many Canadians simply could not do without their cars, the automobile is associated with numerous problems, as we are all aware. In Canada and other Western countries, road transportation is a big contributor to greenhouse gas (GHG) emissions.<sup>1</sup> A significant proportion of the increase in GHG emissions in recent years can be attributed to the growing popularity of pickup trucks and sport utility vehicles.<sup>2</sup>

Besides adding to GHG emissions, driving our cars every day is responsible for much of the pollution that generates smog.<sup>3</sup> In addition, the widespread use of automobiles by

workers commuting to work instead of using public transit is a major factor in the traffic congestion that affects most metropolitan areas in North America<sup>4</sup> and leads to high costs for building and repairing roads.

In these circumstances, it is hardly surprising that many people are calling for an end to the excessive use of cars and for greater reliance on more environment-friendly means of transportation, such as car-pooling, public transit, walking and bicycling.

As much as they want to do something, many people probably feel helpless when confronted with such suggestions. One of the underlying reasons for these feelings may lie in the fact that the types of neighbourhoods and municipalities in which people live simply do not lend themselves to modes of travel other than the automobile – in part because businesses, places of work and residences are located in different areas.

In this article, we focus on the relationship between the types of neighbourhoods in which people live

and the use of cars for daily travel. How much do residents of peripheral areas and low-density neighbourhoods depend on cars in their daily lives compared with residents of more "urban" neighbourhoods? To what extent can residents of central neighbourhoods go about their day-to-day business without using a car? In which metropolitan areas is exclusive use of the automobile most common?

At the same time, we are interested in identifying the characteristics of people who use cars. For example, are people who live alone less inclined to drive and more likely to walk than couples with children?

To answer these questions, we will use data from the 2005 General Social Survey (GSS) on time use to examine motor vehicle use by Canadians aged 18 and over who made at least one trip commuting and/or running errands on the survey reference day. Data from the 2001 Census were also used to differentiate the more central neighbourhoods of census metropolitan areas (CMAs) from the more peripheral ones, and low-density

This article is based on data collected by the 2005 General Social Survey (GSS). The GSS is an annual survey that monitors changes and emerging trends in Canadian society. For the fourth time in Canada, the GSS has collected national level time use data. In addition to the time use diary, the 2005 questionnaire covers perceptions of the time crunch, social networks, transportation, and cultural and sports activities.

The time use estimates in this report are based on data from the time use diary portion of the (GSS). The diary provides a detailed record of the time spent on all activities in which respondents participated on the designated day. In addition, information was collected on where the activities took place (e.g., in a car as the driver, on public transit) and who the respondent was with (e.g., spouse, children, family, friends).

This study includes all trips made by people aged 18 and over on the reference day. Since age restrictions on automobile use may vary from province to province, people aged 15 to 17 were excluded from the study population.

Only people who made at least one trip regardless of mode of transportation on reference day were selected for the study. A few respondents reported total travel time of more than 720 minutes (12 hours); because these extreme cases could have had an excessive impact on the estimates, they were also excluded from the analysis.

In 2005, 85% of Canadians aged 18 and over made at least one trip on their designated day. The proportion was roughly the same in low-density neighbourhoods as in high-density neighbourhoods and as high in central neighbourhoods as in peripheral neighbourhoods. Therefore, the differences in automobile dependence between types of neighbourhoods cannot be attributed to the fact that residents of certain types of neighbourhoods were more or less likely to have made at least one trip during their day.

According to 2005 GSS data, the factor that was most strongly associated with the probability of having made a trip on that day was age: 72% of people aged 65 to 74 and 61% of people aged 75 and over made at least one trip, compared with 91% of people aged 18 to 24.

### **Delimiting the city centre, the periphery and low- and high-density neighbourhoods**

In this study, the city centre is the census tract that contains the city hall of the central municipality; hence, the

distance from the city centre is the distance between the neighbourhood of residence and the central municipality's city hall. Central neighbourhoods are neighbourhoods that are less than 5 kilometres from census tract (CT) containing the city centre. Other neighbourhoods are referred to as peripheral neighbourhoods, and are differentiated by their distance from the city centre; for example, neighbourhoods that are between 5 and 9 kilometres from the city centre are regarded as part of the near periphery.

The density level of neighbourhoods is based on the type of dwellings they contain. We established three main categories of neighbourhoods:

**Low-density neighbourhoods**, which contain single, semi-detached and mobile homes and dwellings. Such dwellings are considered to be traditional suburban dwellings. Specifically, low-density neighbourhoods are neighbourhoods in which at least 66.6% of the dwellings are traditional suburban dwellings.

**High-density neighbourhoods**, which are essentially composed of apartment and condominium buildings (whether high-rise or low-rise) and row houses. Such dwellings are characteristic of traditional urban neighbourhoods. High-density neighbourhoods are neighbourhoods in which less than 33.3% of the dwellings are traditional suburban dwellings.

**Medium-density neighbourhoods** are characterized by mid-level concentrations of 33.3% to 66.6% traditional suburban dwellings.

For more details on how these criteria were defined, see "The city/suburb contrast: How can we measure it?" in *Canadian Social Trends*, 85.

### **Definitions**

**CMA:** Census Metropolitan Area. A CMA is an area consisting of one or more adjacent municipalities situated around a major urban core. A CMA must have a population of at least 100,000, and the urban core must have a population of at least 50,000.

**Eight largest CMAs:** This category includes Toronto, Montréal, Vancouver, Ottawa-Gatineau, Calgary, Edmonton, Quebec and Winnipeg.

**Medium CMAs:** This category includes Hamilton, London, Kitchener, St. Catharines - Niagara, Halifax, Victoria, Windsor and Oshawa.

**Smaller CMAs:** This category includes Saskatoon, Regina, St. John's, Greater Sudbury, Chicoutimi - Jonquière, Sherbrooke, Abbotsford, Kingston, Trois-Rivières, Saint John and Thunder Bay.

## **Predicted probability model**

To calculate the predicted probabilities, we kept constant a number of characteristics to simulate a "typical" reference person. In the context of this analysis, this reference person is a man aged 35 to 44 years old, born in Canada, who has a job and holds a college diploma, has a household income of \$60,000 to \$99,999 but has no children living in the household, and he lives in the CMA of Toronto. We then ask the following question: if a person having all these

characteristics moved from a high-density neighbourhood to a low- or medium-density neighbourhood, how would it change the probability that he would use a car to make all his daily trips?

## **Please note**

The differences between the central municipalities and other constituent municipalities of CMAs are presented for information purposes only. The 2005 General Social Survey used the CMA and municipality boundaries for 2001. Consequently, any boundary changes made between 2001 and 2005 (especially in Quebec) are not reflected in the municipal data.

from high-density neighbourhoods (for more information, see "What you should know about this study").

## **Going by car is even more common now**

Even though there is a growing tendency for the population to congregate in large urban centres and people have access to better public transportation services, dependence on the automobile increased between 1992 and 2005. According to data from the General Social Survey (GSS) on time use, the proportion of people aged 18 and over who went everywhere by car – as either a driver or a passenger – rose from 68% in 1992, to 70% in 1998 and then 74% in 2005.

Conversely, the proportion of Canadians who made at least one trip under their own power by bicycle or on foot appears to have declined between 1998 and 2005. In 2005, 19% of people 18 and over walked or pedalled from one place to another, down from 26% and 25% in 1992 and 1998 respectively. How can we explain why Canadians, most of whom live in large metropolitan regions, now need their cars more than ever to go about their daily business?

## **Distance from the city centre results in greater use of cars**

Part of the explanation lies in the fact that many residents of metropolitan regions live a significant distance from the city centre. There are very clear links between living in a peripheral neighbourhood and depending on the automobile as the primary mode of transportation for day-to-day travel. The farther people live from the city centre, the more time they spend behind the wheel (Table 1).

For Canadians aged 18 and over who made at least one trip on the survey reference day, those who lived 25 kilometres from the centre of a census metropolitan area (CMA) spent an average of one hour and 23 minutes per day in the car. In comparison, those who lived within 5 kilometres of the centre of their CMA spent an average of just 55 minutes travelling by car, whether as the driver or a passenger.

In view of these differences, it is not surprising to find that the greater the distance from the centre, the higher the proportion of people who used a car for at least one of their trips. Specifically, 61% of people living in a central neighbourhood got behind the wheel, compared with 73% of people living between 10 and

14 kilometres from the city centre and 81% of people living 25 kilometres or more from the centre.

In census agglomerations (CAs are smaller urban areas) and in rural areas and small towns, people behaved in much the same way as residents of neighbourhoods farthest from the CMA city centre. However, average travel times as a driver were lower for residents of small towns and rural areas that were farthest from the CA city centre.<sup>5</sup>

## **Neighbourhood density is important**

Even more revealing relationships emerge if we ignore distance and instead categorize people according to the density of the neighbourhood in which they live. For example, over 80% of residents comprising exclusively or almost exclusively suburban-type housing of very neighbourhoods made at least one trip by car (as the driver) during the day. By comparison, less than half of people living in very high-density neighbourhoods did so.

In addition, travelling exclusively by driving was far more common in low-density neighbourhoods. Only about one-third of residents in very high-density neighbourhoods were at

**Table 1 The more suburban the neighbourhood, the more time people spent in a car on the reference day**

	Population aged 18 and over making at least one trip by car			
	As a driver		As a driver or passenger	
	%	Average duration in minutes	%	Average duration in minutes
<b>Total (Canada)</b>	<b>74</b>	<b>56</b>	<b>87</b>	<b>68</b>
Census metropolitan areas (CMAs) †	71	55	85	68
Census agglomeration	78*	53	91*	64
Rural areas in a strong metropolitan influence zone (MIZ)	82*	66*	93*	80*
Rural areas in a moderate, weak or non-existent MIZ	77*	58	92*	74*
<b>Distance from city centre (CMA only)</b>				
Less than 5 km †	61	43	76	55
5 to 9 km	68*	50*	82*	62*
10 to 14 km	73*	56*	86*	69*
15 to 19 km	75*	60*	90*	74*
20 to 24 km	78*	60*	92*	71*
25 km or more	81*	70*	93*	83*
<b>Percentage of suburban-type housing<sup>1</sup> in neighbourhood (CMA only)</b>				
Less than 5 †	44	30	60	41
5 to 9	49*	34	68*	49
10 to 19	53*	39*	70*	52*
20 to 29	62*	43*	81*	57*
30 to 39	63*	52*	78*	65*
40 to 49	69*	52*	85*	64*
50 to 59	71*	50*	83*	60*
60 to 69	76*	59*	89*	71*
70 to 79	77*	57*	91*	71*
80 to 89	80*	60*	92*	73*
90 to 94	82*	68*	94*	81*
95 to 100	84*	74*	94*	87*

1. Single, semi-detached and mobile homes.

† Reference category.

\* Statistically significant difference from reference category at p<0.05.

Note: Metropolitan area boundaries used in the 2005 General Social Survey are those established in the 2001 Census. Also see "What you should know about this study" for more information.

Source: Statistics Canada, General Social Survey, 2005.

the wheel for all of their trips during the day, compared with almost two-thirds of those who lived in very low-density neighbourhoods (Chart 1).

**Difference between large and smaller CMAs**

Together, Canada’s eight largest metropolitan areas – the CMAs of Toronto, Montréal, Vancouver, Ottawa-Gatineau, Calgary, Edmonton, Québec City and Winnipeg– account

for nearly half of the country’s population (49% according to the 2006 Census). They differ from many other CMAs in the size of their population, their geographic size and their very rapid growth.

Not surprisingly, there are significant differences between these large CMAs and their smaller counterparts with regard to dependence on automobiles. For example, 81% of the residents of smaller CMAs with

a population under 250,000 in 2001 went everywhere by car – as either the driver or a passenger – on the reference day, compared with 69% of residents in the eight largest CMAs.

These differences between larger and smaller CMAs can be attributed to a number of factors. In CMAs such as Toronto, Montréal and Vancouver, especially in their more central neighbourhoods, public transit provides better service and is therefore used more often; parking is not as readily available for downtown workers, which discourages them from driving; and higher density makes it easier for people to walk or bicycle than to drive (higher density favours public transit, but it also tends to increase traffic congestion).<sup>6</sup>

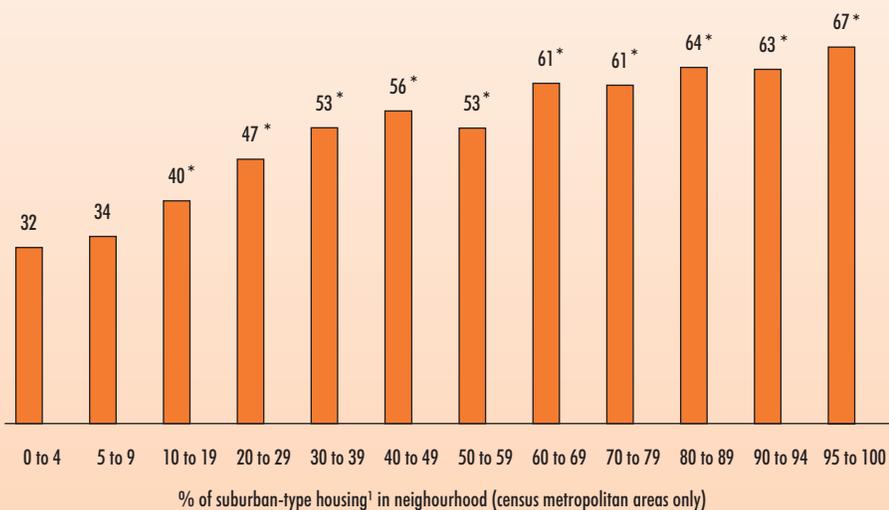
Conversely, in smaller CMAs, even neighbourhoods close to the centre have characteristics that make them similar in some ways to traditional postwar suburban neighbourhoods. In 2001, for example, 45% of the dwellings in the central neighbourhoods of smaller CMAs were single-detached houses, whereas the proportions of that dwelling type were much lower in the central neighbourhoods of Toronto (13%), Montréal (4%) and Vancouver (21%). Because of the high cost and scarcity of land in the centre of most big cities, very few single-detached houses are built there.

**Making all trips by car is less common in Montréal’s central neighbourhoods**

In 2005, of the people living in the eight largest CMAs, Calgary and Edmonton residents were the most likely to have made all their trips on the reference day exclusively by car as either the driver or a passenger (75% and 77%, respectively). In contrast, Montréal residents were least likely to have done so (65%). The difference may be due to the fact that more people live in low-density neighbourhoods in the two Alberta CMAs than in Montréal and other large urban areas. As we have seen, there is a correlation

**Chart 1 About two-thirds of people living in the most suburban neighbourhoods drove their cars to make all their trips on the reference day**

% of population aged 18 and over making all trips as drivers



1. Single, semi-detached and mobile homes.

\* Statistically significant difference from 0 to 4% at  $p < 0.05$ .

Source: Statistics Canada, General Social Survey, 2005.

between lower population density and greater reliance on cars.<sup>7</sup> The fact that Montréal is an older city that was well-established before the automobile became as ubiquitous as it is today may shed some light on this difference (Table 2).

Differences in automobile use also exist between the central neighbourhoods of the eight largest CMAs. Specifically, the proportion of central neighbourhood residents who travelled everywhere by car was 29% in Montréal, compared with 43% in Toronto, 56% in Vancouver and 66% in Calgary. In the smaller CMAs, 75% of the residents of central neighbourhoods travelled exclusively by car.

Despite these regional differences, the overall patterns are very similar in CMAs of all sizes: the greater the distance from the city centre, and the greater the prevalence of traditional suburban dwellings, the higher the proportion of people who made

**Table 2 Dependence on automobiles differs considerably between CMAs, but one of the most important reasons is housing density**

% of population aged 18 and over making all trips by car (as a driver or passenger) on the reference day, by census metropolitan area (CMA)

	Toronto	Montréal	Vancouver	Ottawa–Gatineau	Calgary	Edmonton	Quebec	Winnipeg	Medium CMAs	Smaller CMAs
<b>Total</b>	66	65	69	71	75	77	74	72	75	81
<b>Housing density</b>										
High †	52	50	51	51	46 <sup>E</sup>	58	53	60	58	66
Medium	63*	69*	74*	68*	76*	77*	78*	63	70*	77*
Low	73*	80*	77*	83*	77*	80*	82*	77*	80*	87*
<b>Distance from city centre</b>										
Less than 5 km †	43	29	56	48	66	64	51	65	67	75
5 to 9 km	51	54*	57	69*	72	78*	75*	73	78*	83*
10 to 15 km	61*	66*	64	76*	79	80*	76*	78*	81*	91*
15 km or more	74*	78*	83*	82*	79	82*	89*	91*	81*	92*
<b>Administrative boundaries</b>										
Suburban municipalities	76*	73*	75*	78*	89*	82*	78*	91*	..	..
Central municipality †	55	43	55	68	73	74	57	71	..	..

.. not available for a specific reference period

<sup>E</sup> use with caution

† Reference category.

\* Statistically significant difference from reference category at  $p < 0.05$ .

Notes: Metropolitan area boundaries used in the 2005 General Social Survey are those established in the 2001 Census. See “What you should know about this study” for a list of the CMAs comprising the medium and smaller CMA categories.

Source: Statistics Canada, General Social Survey, 2005.

their trips by car as the driver or a passenger.

### Characteristics of the neighbourhood, or of the people who live in it?

The correlations described above between place of residence and reliance on cars for day-to-day travel appear to be very robust. There is a possibility, however, that a portion of these differences is due to the fact that characteristics differ considerably between people who live in higher- versus lower-density neighbourhoods, or neighbourhoods that are closer to or farther from the city centre.<sup>8</sup>

Many characteristics, aside from place of residence, are associated with lesser or greater automobile use (Table A.1). In order to confirm the robustness of the association between the use of a car and a place of residence, we performed a statistical analysis taking account of a number of variables at the same time (in other words, the effect of age, sex, income and so on were held constant). Since we are primarily interested in the correlations between neighbourhood characteristics and automobile use for daily travel, only residents of CMAs were considered.

The results show a clear correlation between the density of the neighbourhood of residence and the probability that at least one trip during the day was made by car. For example, controlling for other factors associated with automobile use, the odds that a person drove on at least one of their trips during the day was 2.5 times higher for residents of low-density neighbourhoods than for residents of high-density neighbourhoods (Table 3, Model 1).

The conclusion was the same when we examined the other two cases: making *all* of the day's trips as a driver, and making *all* of the day's trips by car as either the driver or a passenger. That is, when we kept all other factors constant, the odds that a resident of a low-density neighbourhood made all of their trips

by car was 2.8 times higher than the odds for a resident of a high-density neighbourhood.

When the influence of factors such as income, age, and so on, is removed, the distance between neighbourhood of residence and the centre of the CMA is also associated with an increase in automobile dependence. For example, if we keep all those other factors constant, the odds that someone drove their car on all trips during the day was 3.0 times higher for people who lived 25 kilometres or more from the city centre than for people who lived less than 5 kilometres from the centre (Table 3, Model 2).

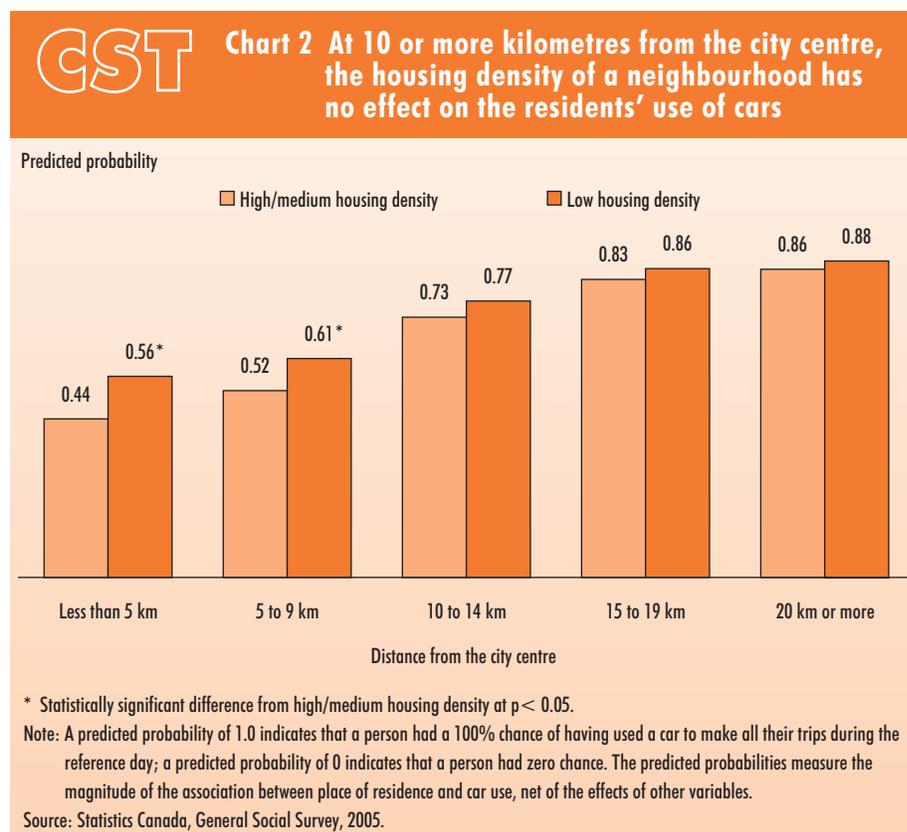
### Density, distance or both?

In many cases, high-density neighbourhoods are also central neighbourhoods, and peripheral neighbourhoods are usually low-density neighbourhoods.<sup>9</sup> So far, our analysis has not shown whether, at an equal distance from the city centre, a higher-density neighbourhood

will exhibit less dependence on cars, and vice versa for lower-density neighbourhoods. This is an important question, since land is scarce and expensive in central neighbourhoods and since most new construction takes place in peripheral neighbourhoods.

The answer is provided by a supplementary analysis (Chart 2). Keeping constant all factors associated with automobile use, we find that in central and near-peripheral neighbourhoods 5 to 9 kilometres from the city centre, living in a lower-density neighbourhood is associated with a higher predicted probability of using a car for all trips.

Above 10 kilometres from the city centre, however, the impact of neighbourhood density on automobile use dwindles until it almost vanishes.<sup>10</sup> If the effects of other factors are kept constant, the predicted probability that a person living in a *medium-* or *high-*density neighbourhood made all trips by car was not statistically different from



**Table 3 Neighbourhood housing density is strongly associated with car dependence, even when other factors like income, age and presence of children are accounted for**

	Model 1			Model 2		
	Number of trips as driver		All trips as driver or passenger	Number of trips as driver		All trips as driver or passenger
	At least one	All trips		At least one	All trips	
<b>Odds ratios</b>						
<b>Housing density</b>						
High †	1.0	1.0	1.0	...	...	...
Medium	1.7*	1.8*	1.9*	...	...	...
Low	2.5*	2.2*	2.8*	...	...	...
<b>Distance from city centre (CMA only)</b>						
Less than 5 km †	...	...	...	1.0	1.0	1.0
5 to 9 km	...	...	...	1.5*	1.3*	1.6*
10 to 14 km	...	...	...	2.1*	1.8*	2.1*
15 to 19 km	...	...	...	2.6*	2.1*	3.2*
20 to 24 km	...	...	...	3.5*	2.5*	3.4*
25 km or more	...	...	...	3.9*	3.0*	4.4*
<b>Sex</b>						
Female †	1.0	1.0	1.0	1.0	1.0	1.0
Male	2.0*	2.2*	1.3*	2.1*	2.2*	1.3*
<b>Age</b>						
18 to 24 years †	1.0	1.0	1.0	1.0	1.0	1.0
25 to 34 years	1.8*	1.9*	1.8*	1.8*	1.8*	1.8*
35 to 44 years	2.1*	2.3*	2.2*	2.2*	2.3*	2.2*
45 to 54 years	2.6*	2.5*	2.6*	2.6*	2.5*	2.6*
55 to 64 years	2.6*	2.4*	2.5*	2.6*	2.3*	2.5*
65 to 74 years	2.6*	2.7*	3.2*	2.5*	2.6*	3.1*
75 years or more	1.5*	1.6*	1.5*	1.4*	1.6*	1.4
<b>Immigration status</b>						
Born in Canada †	1.0	1.0	1.0	1.0	1.0	1.0
Immigrant (before 1990)	0.9	1.1	1.0	0.9	1.1	1.1
Recent immigrants (1990 to 2005)	0.5*	0.8*	0.9	0.5*	0.7*	0.8
<b>Presence of activity limitations</b>						
Yes/sometimes	0.8*	0.9	0.9	0.8*	0.8*	0.9
Yes/often	0.8*	0.8*	0.8*	0.8*	0.8*	0.8*
No †	1.0	1.0	1.0	1.0	1.0	1.0
<b>Highest level of educational attainment</b>						
No secondary diploma †	1.0	1.0	1.0	1.0	1.0	1.0
Secondary completion	1.5*	1.3*	1.3*	1.5*	1.3*	1.3*
College or trade diploma	1.6*	1.2*	1.2	1.6*	1.2	1.1
University degree	1.5*	1.1	0.9	1.6*	1.1	1.0
<b>Household income</b>						
Less than \$20,000 †	1.0	1.0	1.0	1.0	1.0	1.0
\$20,000 to \$39,999	1.5*	1.4*	1.7*	1.5*	1.4*	1.7*
\$40,000 to \$59,999	2.0*	1.6*	2.0*	2.1*	1.7*	2.1*
\$60,000 to \$99,999	2.7*	1.6*	2.2*	2.9*	1.7*	2.4*
\$100,000 and more	2.6*	1.6*	2.0*	2.7*	1.7*	2.2*
<b>Main activity for the last 7 days</b>						
Employed/looking for work †	1.0	1.0	1.0	1.0	1.0	1.0
Caring for children/keeping house	0.7*	0.6*	0.9	0.7*	0.6*	0.9
Retired	0.8	0.8	0.9	0.8	0.8	0.9
Student	0.6*	0.5*	0.5*	0.6*	0.5*	0.5*
Other activity	1.0	1.0*	1.0*	1.0	1.0*	1.0*

**Table 3 Neighbourhood housing density is strongly associated with car dependence, even when other factors like income, age and presence of children are accounted for – continued**

	Model 1			Model 2		
	Number of trips as driver		All trips as driver or passenger	Number of trips as driver		All trips as driver or passenger
	At least one	All trips		At least one	All trips	
<b>Odds ratios</b>						
<b>Presence of a child under 5</b>						
No †	1.0	1.0	1.0	1.0	1.0	1.0
Yes	1.0	1.0	1.0	1.0	1.0	0.9
<b>Presence of a child aged 5 to 12</b>						
No †	1.0	1.0	1.0	1.0	1.0	1.0
Yes	1.6*	1.1	1.0	1.6*	1.1	1.0
<b>CMA of residence (Census Metropolitan Area)<sup>1</sup></b>						
CMA of Toronto	0.5*	0.6*	0.5*	0.3*	0.4*	0.2*
CMA of Montréal	0.6*	0.7*	0.6*	0.3*	0.4*	0.2*
CMA of Vancouver	0.7*	0.7*	0.6*	0.4*	0.5*	0.3*
CMA of Ottawa-Gatineau	0.6*	0.7*	0.6*	0.4*	0.5*	0.4*
CMA of Calgary	0.8	0.8	0.6*	0.7*	0.7*	0.5*
CMA of Edmonton	0.7*	0.9	0.7	0.6*	0.7*	0.6
CMA of Quebec	0.9	0.7*	0.7	0.6*	0.6*	0.5
CMA of Winnipeg	0.6*	0.7*	0.5*	0.6*	0.7*	0.5*
Medium CMAs	0.7*	0.8*	0.7*	0.7*	0.8*	0.6*
Smaller CMAs †	1.0	1.0	1.0	1.0	1.0	1.0
<b>Day of the week</b>						
Weekday †	1.0	1.0	1.0	1.0	1.0	1.0
Weekend	1.0	1.0	1.7*	1.0	1.0	1.7*
<b>Worked on the reference day</b>						
No †	1.0	1.0	1.0	1.0	1.0	1.0
Yes	1.4*	1.4*	1.0	1.4*	1.4*	1.0

... not applicable

1. Metropolitan area boundaries used in the 2005 General Social Survey are those established in the 2001 Census. See “What you should know about this study” for a list of the CMAs comprising the medium and smaller CMA categories.

† Reference group.

\* Statistically significant difference from the reference group at  $p < 0.05$ .

Note: This table presents the odds that a respondent used a car on the reference day, relative to the odds that the reference group did the same thing, when the effect of all other factors shown in the table are controlled for. An odds ratio close to 1.0 for the comparison group means that there is little or no difference between the comparison and the reference groups.

Source: Statistics Canada, General Social Survey, 2005.

that of a person living in a *low*-density neighbourhood. In other words, beyond 10 kilometres from the city centre, the fact that a neighbourhood was mainly composed of single family or semi-detached houses rather than apartments was not correlated with greater or less automobile use.

This situation may be due to a number of factors, including the fact that neighbourhoods in peripheral areas, whether they are low-density or not, are usually zoned for only one

purpose (residential, commercial or industrial) rather than multiple uses simultaneously.<sup>11</sup> Because of that, and because the activities in which most people take part during a day are often farther apart, it is difficult to use any means of transportation other than a car.<sup>12</sup> This is especially true since many locations in suburban neighbourhoods, such as shopping centres, movie theatres, office buildings and other places of work, are difficult or impossible to get to on foot or by public transit.

In contrast, the central neighbourhoods of large cities are generally characterized by a greater mix of residential, commercial and industrial uses and by greater density, two conditions that favour adequate public transportation and travel on foot.<sup>13</sup>

### Suburban men take their cars

Statistical analysis shows that a number of personal characteristics, other than the type and location of

the neighbourhood in which one lives, are also strongly correlated with automobile use during a given day.

Age and sex are among the factors that have a substantial impact on the probability of driving. On the reference day in 2005, 81% of Canadian men aged 18 and over made at least one trip behind the wheel of a car. The corresponding figure for women was just 66% (Table A.1). This difference, which remains statistically significant when all additional factors are kept constant, is probably attributable to the fact that women are more likely to take public transit and that they are often passengers when they travel by car. In 2005, 31% of women made at least one trip by car as a passenger, compared with only 11% of men.

Baby boomers between ages 45 and 54 were particularly likely to have driven their cars during the day, a finding that remained statistically significant even when all other factors were controlled for. For example, when the density of the neighbourhood of residence and the other factors in the statistical model were kept constant, the odds that people aged 45 to 54 drove a car on all the trips they made in a given day was 2.5 times higher than the odds for 18- to 24-year-olds (Table 3).

Similarly, people with children aged 5 to 12 also had odds 1.6 times higher than people without children that age to have driven on at least one trip. These parents were also more likely to have made trips during the day, regardless of the mode of transportation. Also among the other characteristics associated with a greater probability of driving during the day were being employed and living in a small CMA.

### Summary

This article suggests that the physical and geographic characteristics of urban neighbourhoods are pivotal factors in Canadians' dependence on cars for their routine trips to work, to run errands and so on. It found that neighbourhoods composed primarily

of typically suburban dwellings and located far from the city centre were characterized by an appreciably higher level of automobile dependence. This confirms a number of facts that are already known about low-density peripheral neighbourhoods.<sup>14</sup>

These results also reveal some new factors, elements that are not considered as often. For instance, the study shows that beyond a certain distance from the city centre, the housing density of a neighbourhood is not likely to have much impact on automobile use.

These findings are important in view of what we know about new neighbourhoods. A large proportion of the housing stock built since 1991 is found far from the city centre in low-density neighbourhoods. As we have seen, these are the neighbourhoods with the highest level of automobile dependence.

  
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1. Environment Canada (2006). *National Inventory Report – Greenhouse Gas Sources and Sinks in Canada, 1990-2004*. Ottawa: Minister of the Environment.
2. Environment Canada (2006).
3. Statistics Canada (2006). *Canadian Environmental Sustainability Indicators*. Catalogue no. 16-251-XWE. Ottawa: Minister of Industry. Specifically, this publication refers to fine particulate matter, to volatile organic compounds and to nitrogen oxides. For details about the links between automobile usage and polluting emissions, see also H. Frumkin, Frank, L. and Jackson, R. (2004). *Urban Sprawl and Public Health*. Washington: Island Press.
4. Downs, A. (2002). *Still Stuck in Traffic – Coping with Peak-hour Road Congestion*. Washington: Brookings Institution Press.
5. Technically, these little towns and rural areas belonging to the metropolitan influence zones (MIZ) surrounding census metropolitan areas and census agglomerations are said to be in moderate, weak or no influence MIZ.
6. Downs (2002); Newman and Kenworthy (1999). *Sustainability and Cities*.

*Overcoming Automobile Dependence*. Washington: Island Press.

7. Turcotte, M. (2008). The difference between city and suburb: How can we measure it? *Canadian Social Trends*, 85. Catalogue no. 11-008-XIE, Ottawa: Minister of Industry.
8. Turcotte (2008).
9. See Turcotte, M. (2008). for more details about the relationship between distance to the city core and neighbourhood density.
10. Although the chart appears to show that neighbourhoods with low density are different than those with medium/high density at more than 10 kilometres from the city core, this difference is not statistically significant.
11. Duany, A., Plater-Zyberk, E. and Speck, J. (2000). *Suburban Nation – The Rise and Sprawl and the Decline of the American Dream*. New York: North Point Press.
12. Gillham, O. (2002). *The Limitless City – A Primer on the Urban Sprawl Debate*. Washington: Island Press.
13. Downs (2002); Newman and Kenworthy (1999).
14. It is impossible to account for all the characteristics of persons who live in different types of neighbourhoods and in particular for all the reasons leading a person to choose one neighbourhood rather than another. For example, it is possible that people who like to travel by car are more likely to establish themselves in peripheral suburbs of low density, while those people who like to walk choose a downtown location. In these cases, it is personal preferences that have a greater influence on the choice of transportation than the physical characteristics of the place of residence. Although this possibility has not been completely discarded by researchers, almost all recent studies seem to suggest that urban development has had a direct impact on the level of automobile dependence (see Cao, X, Mokhtarian, P.L. and Handy, S.L. (2007). *Examining the Impacts of Residential Self-selection on Travel Behavior: Methodologies and Empirical Findings*. Davis: Institute of Transportation Studies. In this article, the authors summarize and comment upon existing studies on this topic.) When people are choosing a neighbourhood in which to live, among other factors they consider are location of their workplace, access to schools and other services, geographic proximity to other family members, and so on. When these criteria are foremost in the choice of neighbourhood, the purchase and use of an automobile can become mandatory for most people.

**Table A.1 Characteristics associated with type of transportation used for daily trips by people living in a census metropolitan area (CMA)<sup>1</sup>, 2005**

	% of persons aged 18 and over making...			% of persons aged 18 and over making...		
	At least one trip as a driver	All trips as a driver	All trips by car	At least one trip as a driver	All trips as a driver	All trips by car
<b>Sex</b>						
Women †	66	49	72			
Men	81*	69*	76*			
<b>Age</b>						
18 to 24 †	57	41	57			
25 to 34	74*	58*	73*			
35 to 44	80*	65*	77*			
45 to 54	82*	66*	80*			
55 to 64	77*	62*	79*			
65 to 74	70*	57*	78*			
75 years or older	55	45	67			
<b>Immigration status</b>						
Born in Canada †	76	60	75			
Immigrants (before 1990)	74	61	75			
Recent immigrants (1990 to 2005)	55*	45*	60*			
<b>Presence of activity limitations</b>						
Yes/sometimes	69*	54*	71*			
Yes/often	69*	56*	75			
No †	75	60	74			
<b>Highest level of educational attainment</b>						
No secondary diploma †	64	54	73			
Secondary completion	72*	58*	74			
College or trade diploma	79*	62*	77*			
University degree	77*	59*	71			
<b>Presence of a child under age 5</b>						
No	73	59	74			
Yes †	76*	59	75			
<b>Presence of a child age 5 to 12</b>						
No	72*	58*	73*			
Yes †	81	63	77			
<b>Household income</b>						
Less than \$20,000 †	50	39	55			
\$20,000 to \$39,999	68*	55*	70*			
\$40,000 to \$59,999	75*	61*	76*			
\$60,000 to \$99,999	83*	64*	79*			
\$100,000 or more	83*	65*	77*			
<b>Main activity during the last 7 days</b>						
Employed/looking for work †	80	65	77			
Caring for children/keeping house	61*	43*	73*			
Retired	68*	55*	75			
Student	45*	31*	44*			
Other activity	65*	51*	72*			
<b>Day of the week</b>						
Weekday	75*	60*	72*			
Weekend †	71	55	79			
<b>Worked outside the home on the reference day</b>						
No	68*	52*	73*			
Yes †	81	67	75			

1. Metropolitan area boundaries used in the 2005 General Social Survey are those established in the 2001 Census.

† Reference group.

\* Statistically different from the reference category ( $p < 0.05$ ).

Source: Statistics Canada, General Social Survey, 2005.

**Table A.2 Percentage of persons aged 18 and over using public transit for at least one of their trips on the reference day, 2005**

	Toronto	Montréal	Vancouver	Ottawa– Gatineau	Calgary	Edmonton	Quebec	Winnipeg	Medium CMAs	Smaller CMAs
	%									
<b>All Census Metropolitan Areas (CMA)</b>	16	18	12	15	12	9	9	10	7	3
<b>Housing density</b>										
High	23	26	20	20	14	22	15	23	10	8
Medium	19	15	10	22	12	9	4	13	9	5
Low	12	10	7	6	12	6	3	9	4	2
<b>Distance from city centre</b>										
Less than 5 km	26	34	22	21	11	16	13	15	11	5
5 to 9 km	31	25	20	21	11	7	7	10	6	3
10 to 14 km	22	17	12	14	11	11	2	8	5	F
15 km or more	11	11	3	6	18	1	3	3	4	F
<b>Administrative boundaries</b>										
Suburban municipalities	9	14	7	10	5	3	5	F	..	..
Central municipality	25	30	23	17	13	11	9	12	..	..

.. not available for a specific reference period.

F too unreliable to be published

Notes: Metropolitan area boundaries used in the 2005 General Social Survey are those established in the 2001 Census. See “What you should know about this study” for a list of the CMAs comprising the medium and smaller CMA categories.

Source: Statistics Canada, General Social Survey, 2005.