

**TRANS Committee**

**National Capital Region  
Travel Trend Study  
Part 1**

**National Capital Region**

**January 2011**

# **TRANS Committee**

## **National Capital Region Travel Trend Study Part 1**

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**HDR | iTRANS**

1545 Carling Avenue, Suite 410

Ottawa, ON K1Z 8P9

Tel: (613) 234-7575

Fax: (613) 238-6096

[www.hdrinc.com](http://www.hdrinc.com)

[www.itransconsulting.com](http://www.itransconsulting.com)

Project # 5578

## **HDR | iTRANS Project Team**

<b>Principal</b>	David Kriger, P.Eng., MCIP
<b>Project Manager</b>	Suzette Shiu, P.Eng.
<b>Technical Team</b>	Rhys Wolff, P.Eng. Veronica Restrepo, E.I.T. Kevin Shen, B.Sc. Don Cleghorn, P.Eng. Krista Tanaka, P.Eng.
<b>Advisor</b>	Alan E. Pisarski

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Ahmad Subhani, Project Manager (City of Ottawa)

Mona Abouhenidy (City of Ottawa)

Robert Calladine (City of Ottawa)

Hanako Cardinal (Ministère des Transports du Québec)

Sundar Damodaran (Ontario Ministry of Transportation)

Carmel Dufour (Société de transport de l'Outaouais)

Carol Hébert (Ville de Gatineau)

Arto Keklikian (National Capital Commission)

Pramod Kumar (Ontario Ministry of Transportation)

Brigitte St-Pierre (Ministère des Transports du Québec)

Pierre Tremblay (Ministère des Transports du Québec)

Ramana Zanfongnon (Ville de Gatineau)

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## 1. Introduction

### 1.1 Report objectives

The investigation of regional and inter-provincial travel trends in the National Capital Region (NCR) features three steps:

- ◆ firstly, by identifying and describing key relationships between variables recorded in the 2005 TRANS National Capital Region household origin-destination (OD) survey, and thereby providing an understanding of significant transportation characteristics and patterns across the NCR;
- ◆ secondly, by using data from previous surveys in 1995 and 1986 in order to derive trends, and compare these trends with those in other cities; and
- ◆ thirdly, by using the existing data and identified trends to extrapolate projections for ongoing transportation patterns in future years.

This report, serving as Part 1 of the three-step process, cross-relates a series of fundamental demographic and geographic characteristics on the one hand and trip-making characteristics on the other, using the sixty indicators that were selected for analysis following a workshop with the project team to determine which would be the most useful. The conclusions presented here will be built on in Parts 2 and 3 with the addition of a time component to derive trends from previous surveys and to make projections, respectively.

### 1.2 Report structure

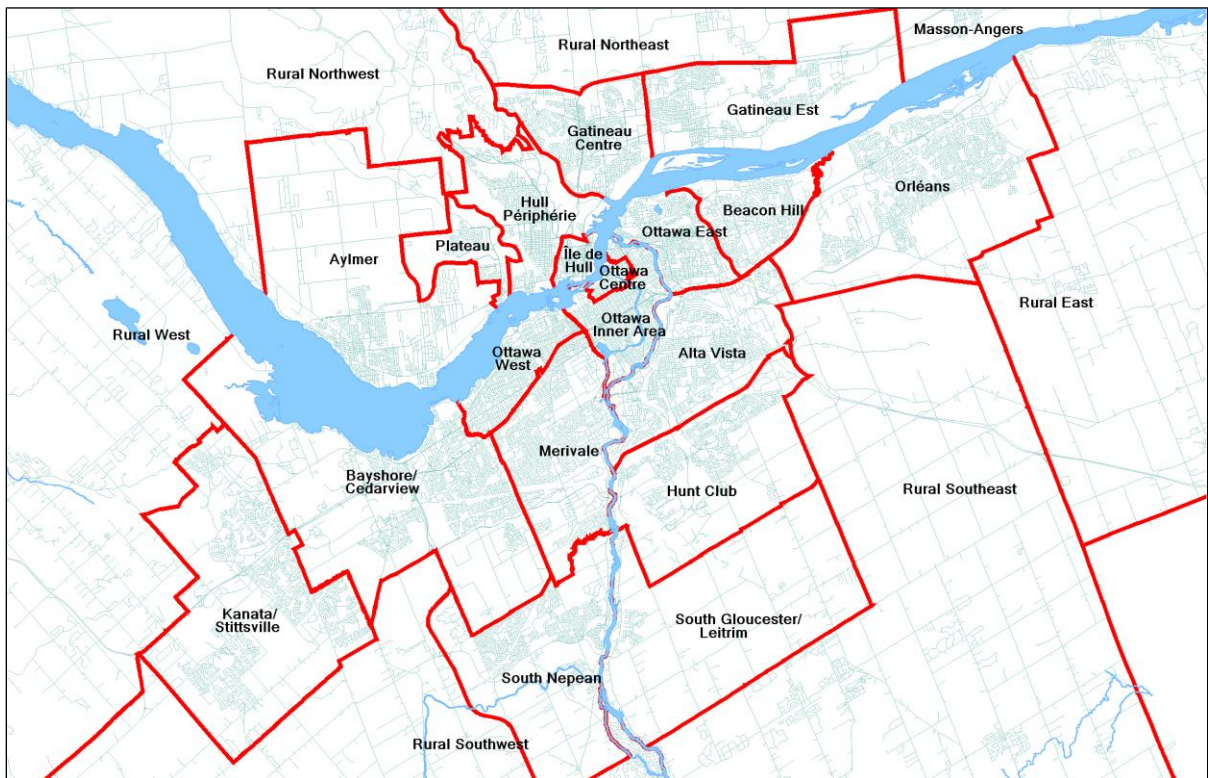
This report is divided into four sections, progressively increasing in the detail and narrowness of focus presented, and described as follows:

- ◆ Demographic structure, illustrating population, employment and household characteristics across the National Capital Region (described in Chapter 2);
- ◆ Transportation activity, illustrating how the demographic characteristics described previously influence the geographic attributes of trips, as well as the reasons for which they are made (Chapter 3);
- ◆ Modal shares, illustrating how the demographic, geographic and trip-based characteristics identified above help define what method of travel will be chosen (Chapter 4); and
- ◆ Public transit, investigating the transit sub-component of the overall modal share in greater detail to determine what characteristics most appear to influence people in choosing to make a transit trip (Chapter 5).
- ◆ Chapter 6 concludes the report.

### 1.3 Study area

Exhibit 1-1 depicts the study area. For the purposes of this report, four levels of aggregation are used (one or more may be used for any given indicator):

- ◆ Overall (the National Capital Region as a whole).
- ◆ Provincial level (separation of the Ontario and Québec portions of the National Capital Region (NCR).
- ◆ Urban structural level (separation of city core, urban, suburban, and rural elements of the Ontario and Québec portions of the NCR). In the exhibits that follow, “Ontario” and “Québec” are used to denote the respective sectors of the NCR.
- ◆ District level (breakdown of data to the level of the 26 districts of the NCR, which are shown in Exhibit 1-1).



**Exhibit 1-1: Geographical area (rural districts not shown in full)**

The urban structural level separates the districts as follows:

- ◆ Central Ottawa (Ottawa Centre, Ottawa Inner Area);
- ◆ Central Gatineau (Île de Hull);
- ◆ Urban Ottawa (Alta Vista, Bayshore/Cedarview, Beacon Hill, Hunt Club, Merivale, Ottawa East, Ottawa West);
- ◆ Urban Gatineau (Hull Périphérie);
- ◆ Suburban Ottawa [outside greenbelt] (Kanata/Stittsville, Orléans, South Gloucester/Leitrim, South Nepean);

- ◆ Suburban Gatineau (Aylmer, Gatineau Centre, Gatineau Est, Plateau)
- ◆ Rural Ontario (rural east, southeast and southwest); and
- ◆ Rural Québec (Masson-Angers, rural northeast and northwest).

For depicting trip flows, Urban Ottawa is further divided into east and west, as will be described in more detail in Section 3.1.

## 2. Demographic Structure

This section looks at how population (all residents and all labour force participants) and employment are distributed among the National Capital Region's districts, as well as household attributes. This gives an initial high-level identification of likely trip flow patterns (between areas of high population and nearby areas of high employment), which is investigated further in later sections.

### 2.1 *Population and employment distribution*

The population of the NCR in 2005 was 1,150,579, including 865,695 residents of the 17 Ontario districts and 284,884 of the 9 Québec districts – a ratio of 75% - 25% between the two sides of the Ottawa River. The geographical distribution of residents at the district level is shown in Exhibit 2-1, with a comparable distribution of jobs (at the same scale) shown in Exhibit 2-2.

In 2005 the NCR had 616,746 jobs (or one for every 1.86 residents), of which 467,099 were located in Ontario (one for every 1.85 residents) and 149,647 in Québec (a similar ratio of one for every 1.90 residents). The distribution of jobs between the two sides of the Ottawa River – 76% - 24% - is essentially the same as that of the population. Total employed labour force in the NCR was 543,296; approximately 73,500 (12%) workers in the NCR live outside of the NCR.

Exhibit 2-1 indicates that population on both sides of the Ottawa River is well-distributed among the urban districts, with Orléans, the Ottawa Inner Area and Kanata / Stittsville having the highest number of residents. Exhibit 2-2 shows a much more concentrated job distribution compared with the population distribution in Exhibit 2-1, with the focus on the central districts instead of the urban districts. Among the suburban areas, however, Alta Vista has the highest concentration of jobs, with most of the remaining suburban jobs located in west Ottawa.



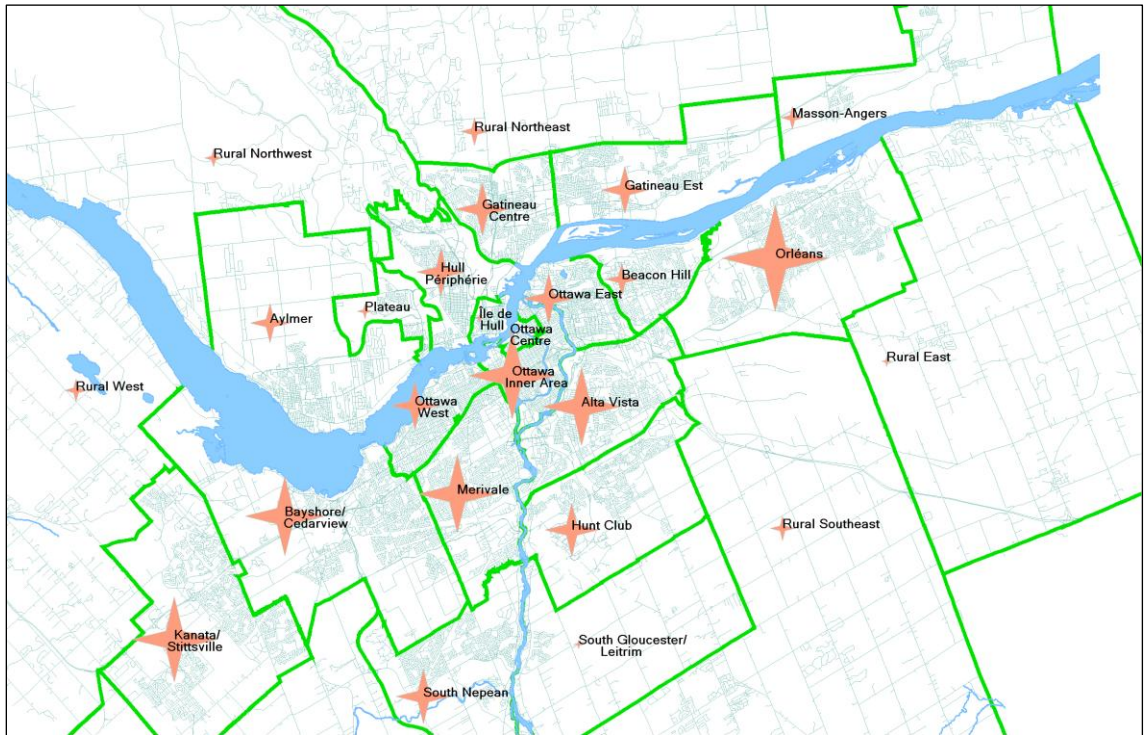


Exhibit 2-1: National Capital Region population, 2005

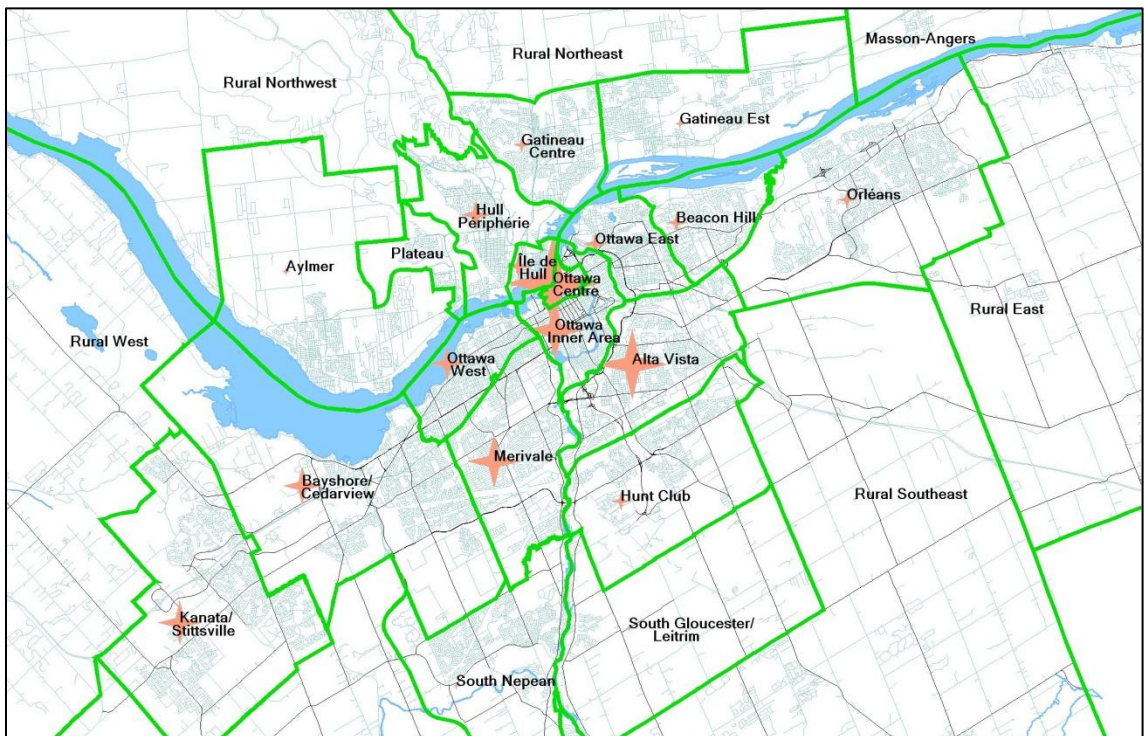
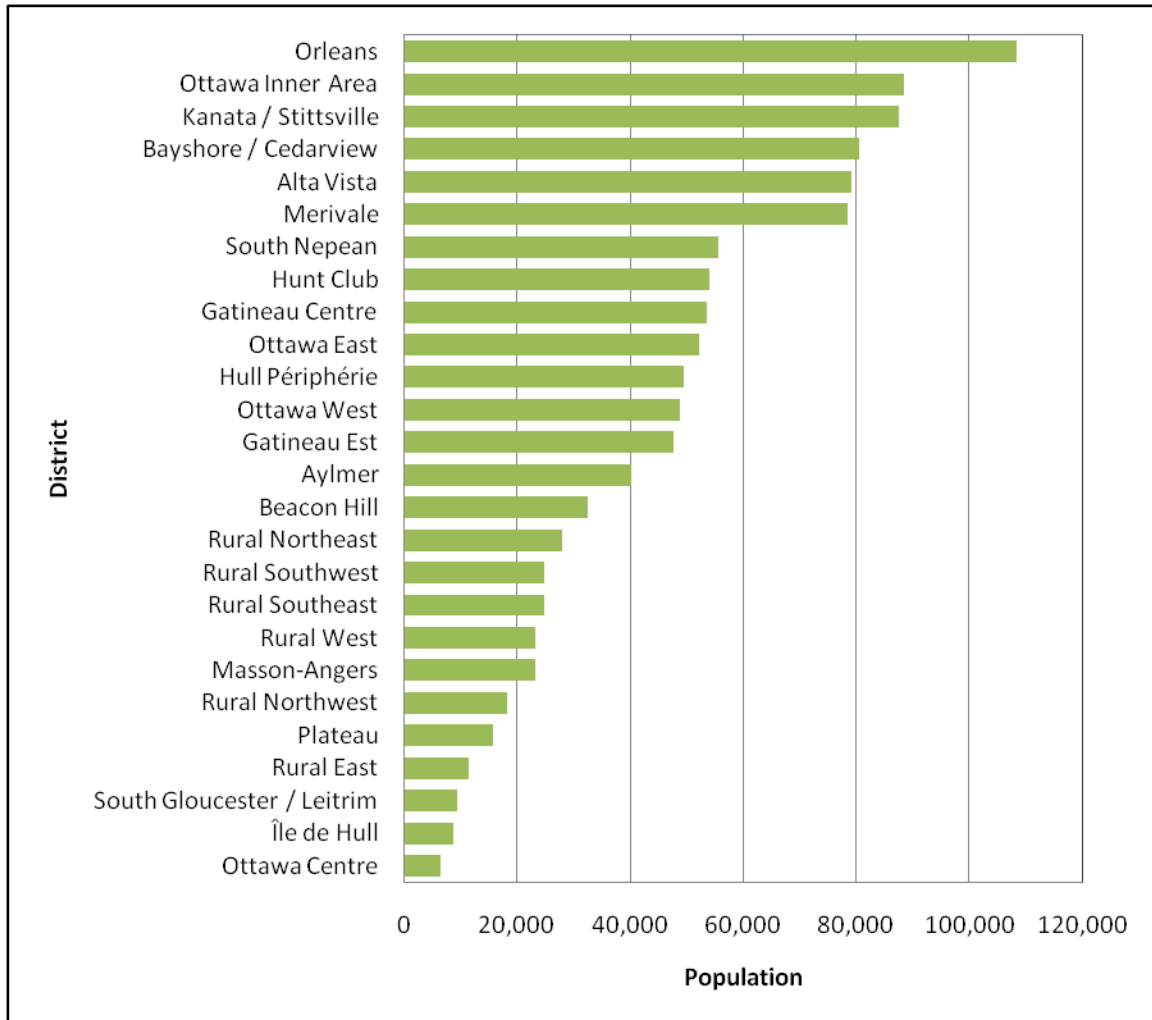


Exhibit 2-2: National Capital Region jobs, 2005

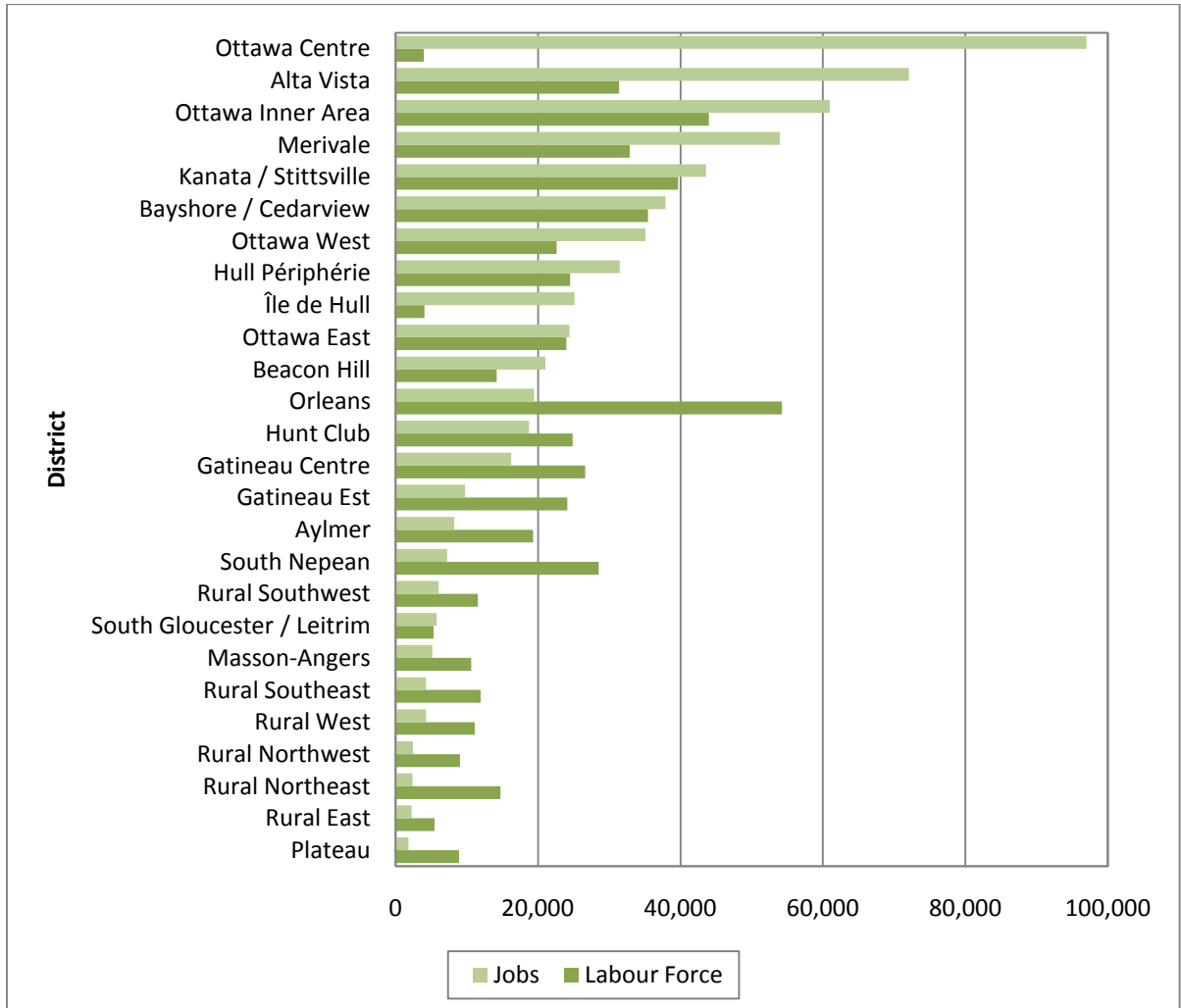
Exhibit 2-3 and Exhibit 2-4 provide a different look at the population and employment ranked by largest first (according to the characteristic described).



**Exhibit 2-3: NCR population by district, 2005**

We see from Exhibit 2-3, above, that the leading districts in terms of population, including several outer suburbs, contrast with the main sources of employment, with the downtown centres of both Ottawa and Gatineau having the lowest numbers of residents. On the other hand, the high population and employed labour force located in the Ottawa Inner Area means that a sizable number of workers lives close to Ottawa Centre, which is the highest concentration of jobs in the NCR. Meanwhile, whereas the East and West Urban Communities (Orléans and Kanata / Stittsville, respectively) now rank as the first and third highest in population, there are disparities between them in terms of the level of corresponding job growth; and this is true of other suburban districts as well. This is subsequently examined in more detail. As a final point, it is important to note that – although Gatineau contains only one-quarter of the NCR’s population, this disparity does

not reach down to individual districts: individual suburban districts in Gatineau are as similarly populated as counterpart districts in Ottawa.



**Exhibit 2-4: NCR employed labour force and jobs by district, 2005**

Exhibit 2-4 contrasts district labour force (the number of workers resident in that district) with jobs. As we would expect, downtown Ottawa has the greatest concentration of jobs, while most districts have a labour force that exceeds the amount of employment available locally. While the number of jobs decreases moving down the chart, in accordance with the sort order, the labour force, related to population rather than to employment, does not follow any corresponding pattern, apart from showing a similar decrease in the rural areas due to the overall low density there. However, several observations may be made:

- ◆ Overall, with 97,000 jobs, Ottawa Centre contains the largest single component of jobs in the NCR, at 15.7% of the overall (CMA) employment. This is consistent with the 10-20% range common in large Canadian municipalities—Toronto, Montréal and Vancouver were all between 12 and 15% in this category in 2006, with Calgary at

- 22%<sup>1</sup> (TAC, 2009, p. 25). (Combining Ottawa Centre with Île de Hull, the two central districts represent 19.8% of the overall employment.)
- ◆ The two downtown centres each have significantly more jobs than they do resident workers. The non-downtown high-employment districts identified in Exhibit 2-2 generally have more jobs than they do workers, with the absolute disparity being greatest in Alta Vista. This indicates that we may expect a net inflow of AM peak trips to these areas.
  - ◆ In contrast, several suburban districts and all rural districts have more workers than they do jobs. The absolute disparity is greatest in Orléans.
  - ◆ Jobs and workers are closely balanced in some districts: notably, Kanata / Stittsville (this in contrast to the other Urban Communities), Bayshore / Cedarview and Ottawa East, and to a lesser proportion in Hull Périphérie, Beacon Hill and Hunt Club (all except the last having more jobs than resident workers).
  - ◆ There are 616,746 jobs and 543,296 resident workers in the NCR, implying that at least 73,000 people travel to jobs in the NCR from outside the region (or more, if any people travel the other way). This represents (as a minimum) approximately 12% of commutes.

Having observed the population and labour force geographic distribution, the ensuing series of exhibits breaks them down by age group and occupation status. Each age category adds up to 100%.

In Exhibit 2-5, Exhibit 2-6 and Exhibit 2-7, similar demographic patterns are shown for both Ontario and Québec, with in both cases around 80% of the population between 25 and 54 in full-time employment, although in the categories on either side the trend is reversed, with people from 55 to 64 more likely to be fully employed than those between 20 and 24 in Ontario but the other way round in Québec. The near 100% of students in the lower age range and near 100% neither students nor employed in the highest age category are as expected for all three geographies.

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<sup>1</sup> Transportation Association of Canada, Urban Transportation Indicators Fourth Survey Final Report, TAC, December 2009



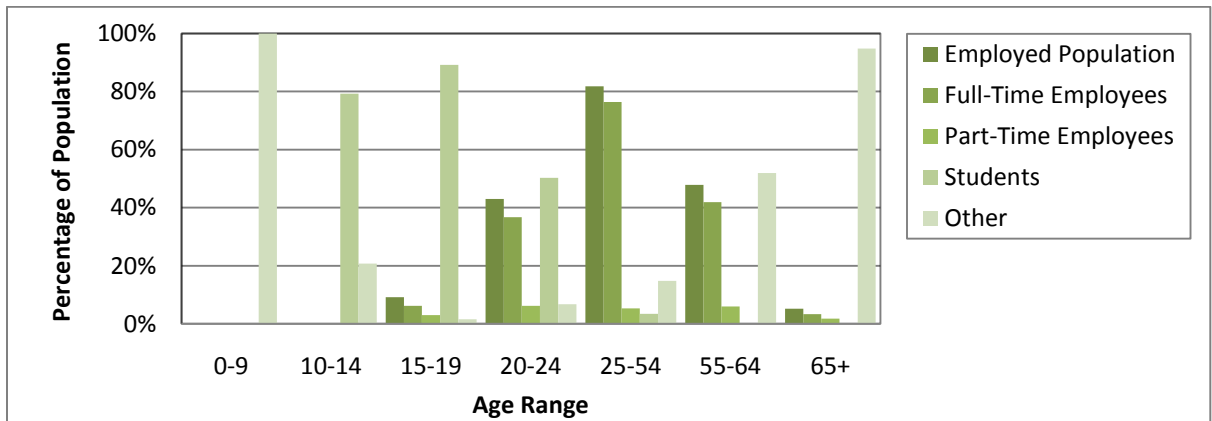


Exhibit 2-5: NCR population by age group and occupation status, 2005

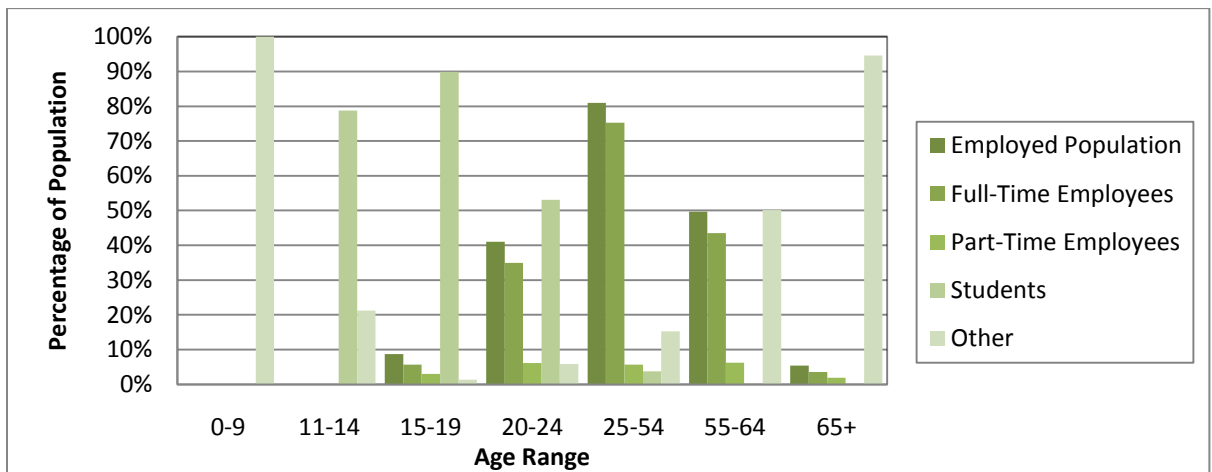


Exhibit 2-6: Ontario population by age group and occupation status, 2005

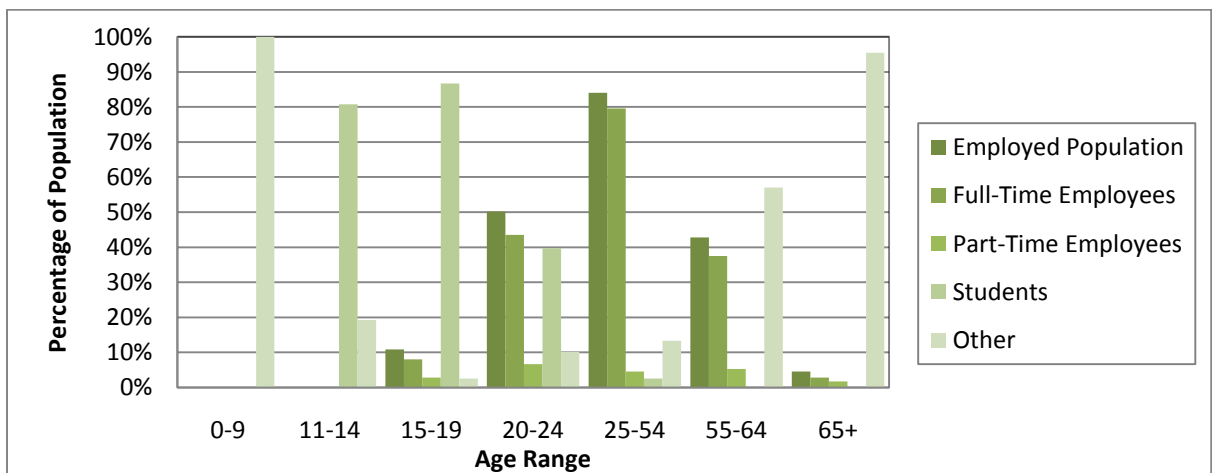
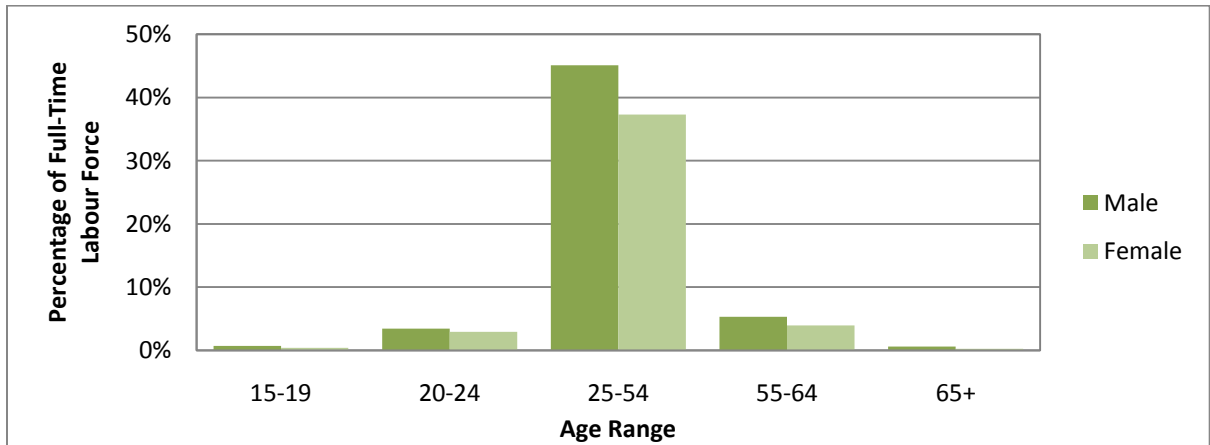
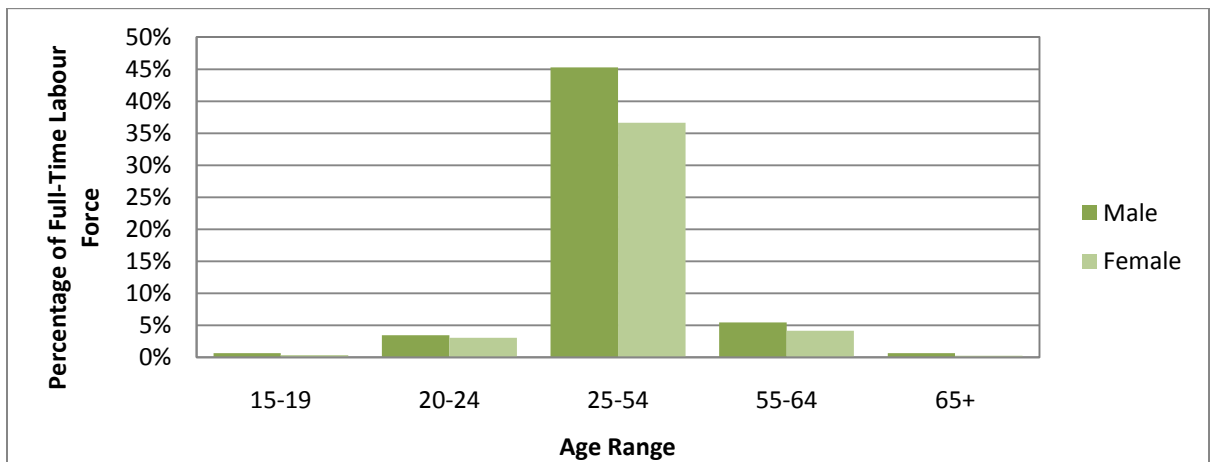


Exhibit 2-7: Québec population by age group and occupation status, 2005

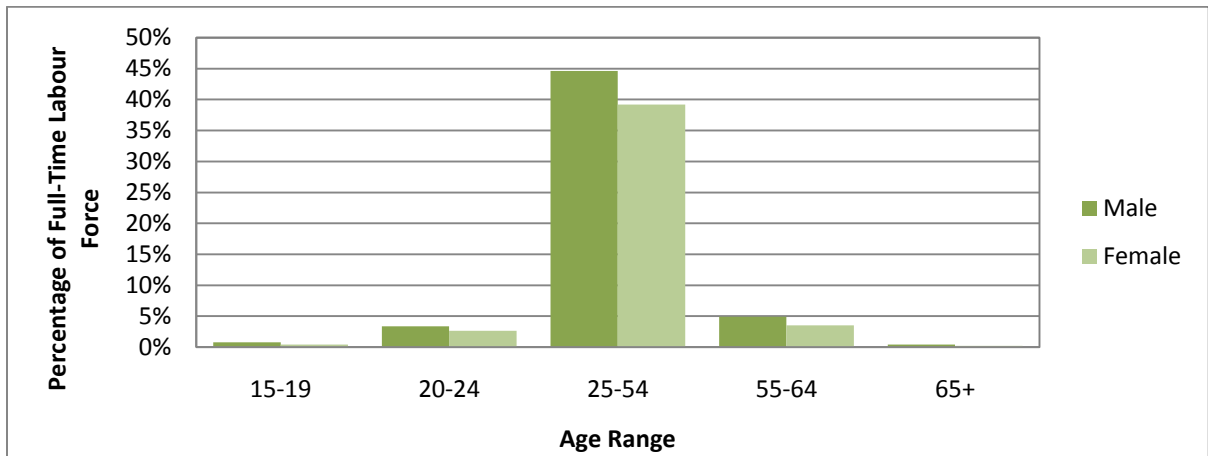
Exhibit 2-8, Exhibit 2-9 and Exhibit 2-10, take the full-time employment statistics and compare them by gender. The balances are similar across geographic areas and age groups, other than in categories where the sample size is very small such as 15-19. The male-female split in the overall workforce is around 55%-45% (56%-44% in the Ontario part of the NCR and 54%-46% in the Québec part).



**Exhibit 2-8: NCR full-time labour force activity by age group and gender, 2005**



**Exhibit 2-9: Ontario full-time labour force activity by age group and gender, 2005**



**Exhibit 2-10: Québec full-time labour force activity by age group and gender, 2005**

Exhibit 2-11 compares the average number of workers per household at the district level. Although there is somewhat of a trend towards lower average numbers of workers as employment density increases (and, to some extent, population density), the overall ratios are much closer together, ranging only within 0.8 and 1.5, than the other measures of inter-district comparison such as population or employment. The higher rates in the rural and newer suburban districts are consistent with expectations. Note also that the populations of the two downtown centres and of the rural districts are small; meaning that the significance of these ‘extremities’ may be distorted.

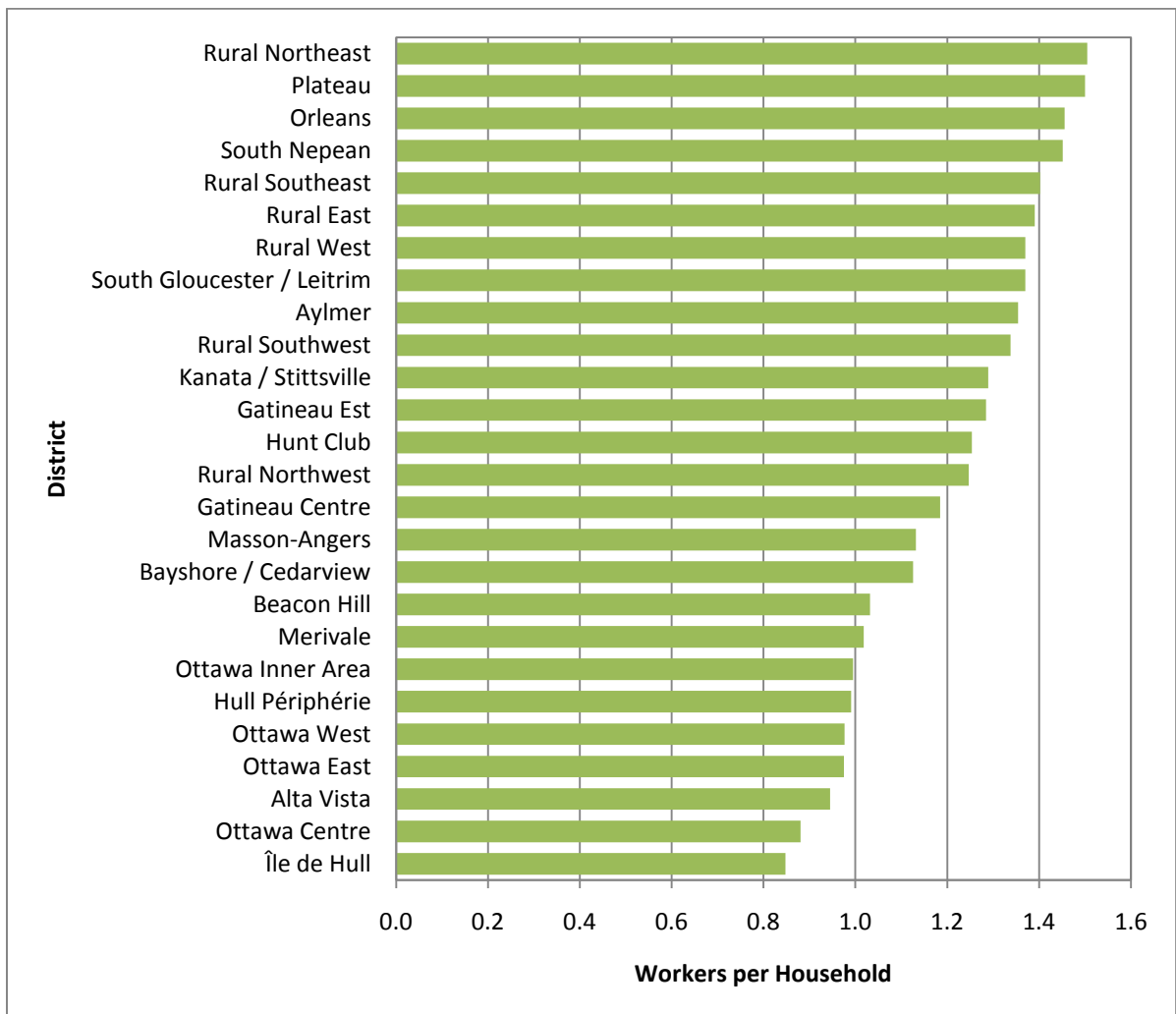
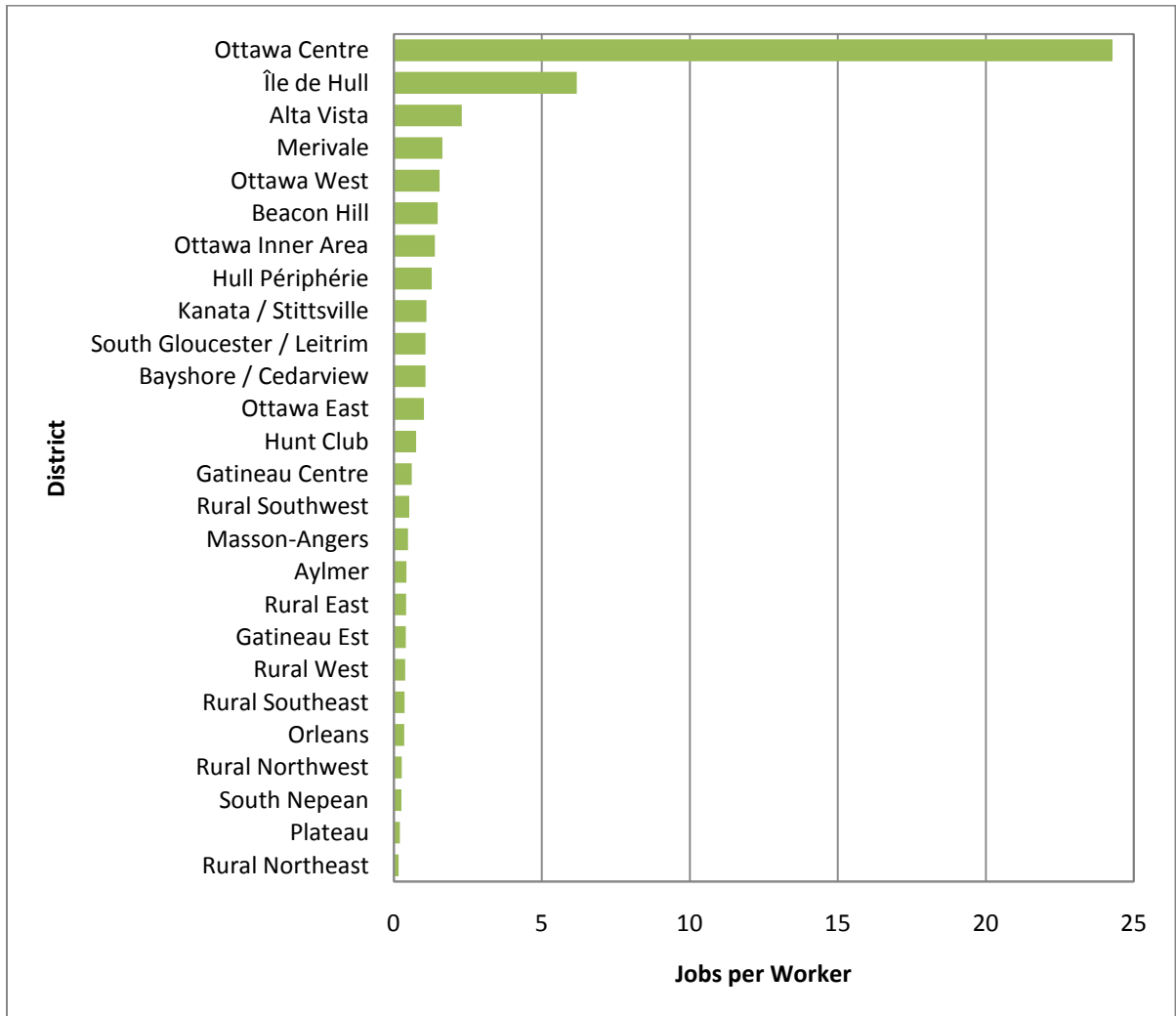
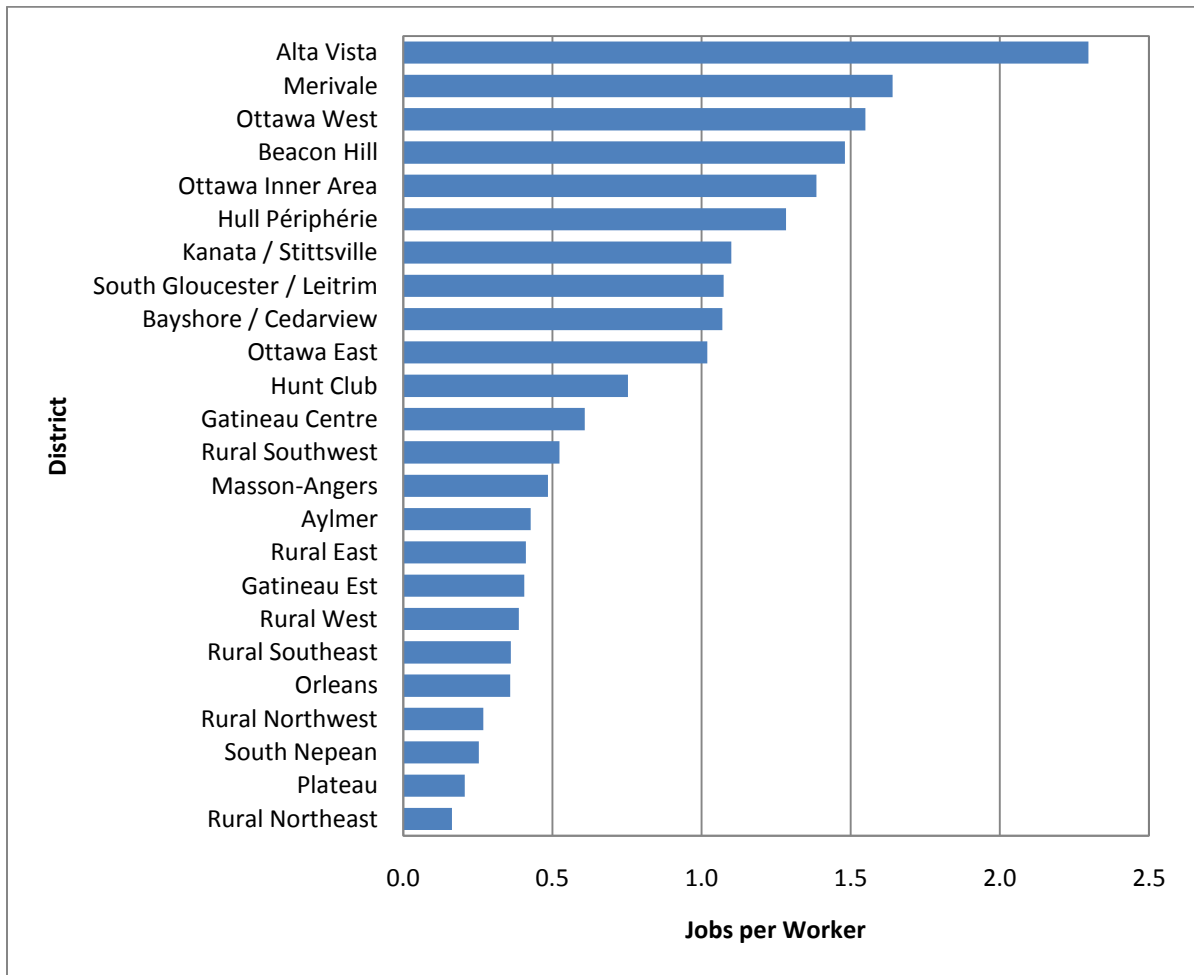


Exhibit 2-11: Workers / household by district, 2005

In contrast to this relative similarity, the district numbers of jobs per resident worker features a huge difference between downtown Ottawa, with 24 jobs for each worker who lives in the district, to rural areas with a small fraction of a job per worker. The full spread of district ratios is given in Exhibit 2-12, which expresses the comparison of jobs and workers presented in Exhibit 2-4 in terms of ratios.



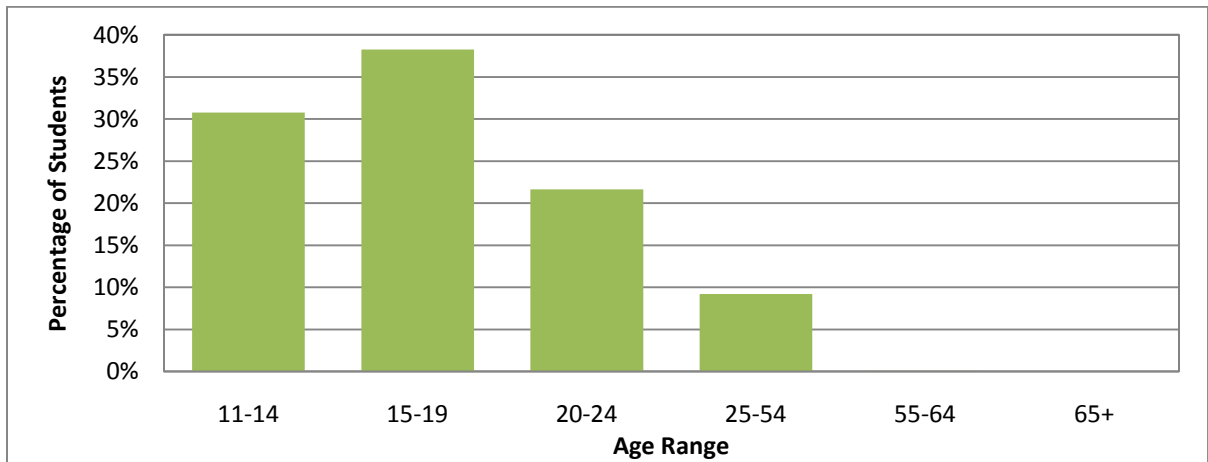
**Exhibit 2-12: Jobs/resident worker by district, 2005**



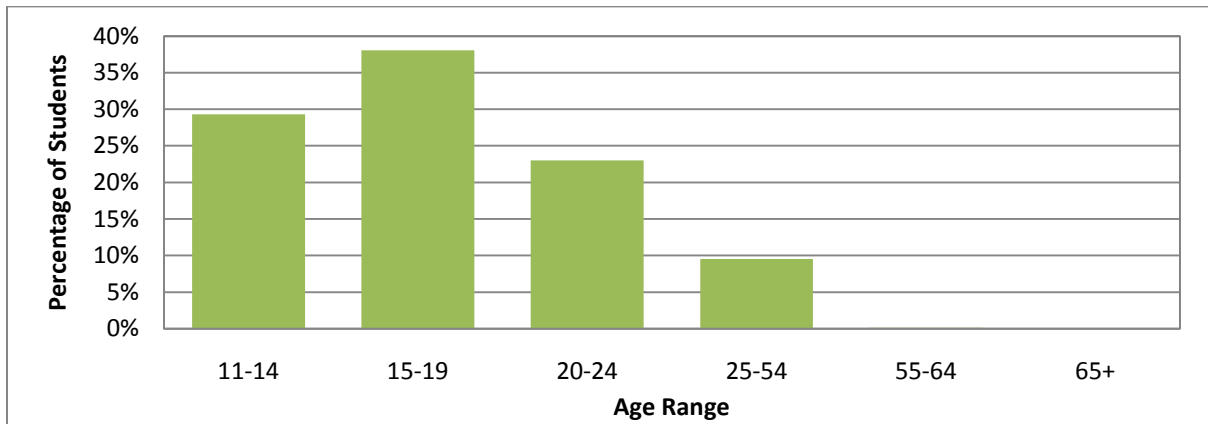
**Exhibit 2-13: Jobs/resident worker by district (excluding downtown cores), 2005**

Exhibit 2-13, above, shows the same numbers but excludes the two downtowns of Ottawa and Hull. This is because those two districts have such a high job to resident worker ratio that it is difficult to distinguish between the ratios of the remaining districts (as in Exhibit 2-12) when all are shown together. However, after removing the downtowns from the chart, we see that there is a wide variation, with inner Ottawa suburbs attracting more workers than live there, outer Ottawa and Gatineau suburbs maintaining a relatively even balance, and the rural areas housing up to several times more workers than they employ.

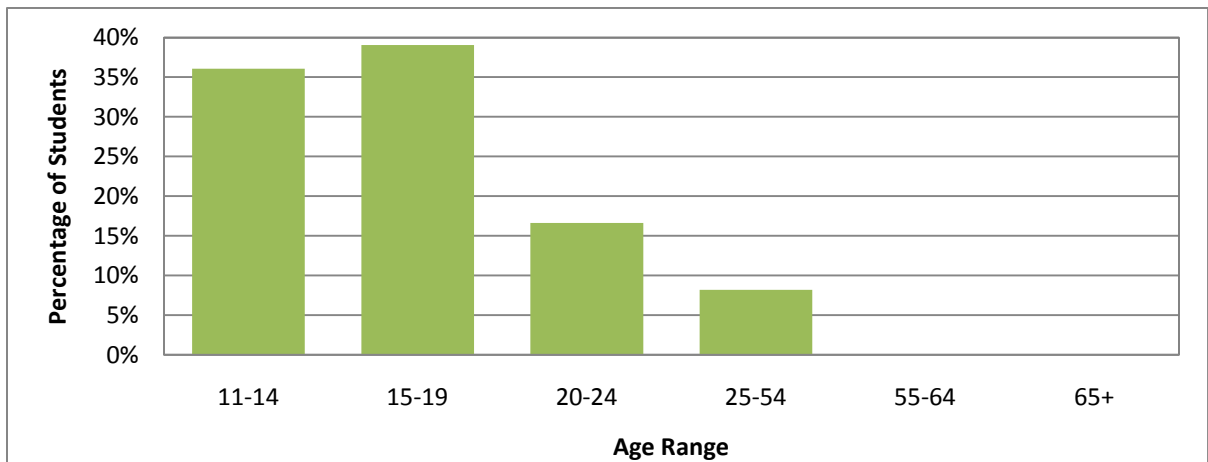
Moving on from looking at workers to looking at students, the total number of students in the survey area is 200,257. This includes 156,944 in Ontario and 43,313 in Québec. These are distributed by age based on place of residence as seen in Exhibit 2-14 to Exhibit 2-16. We can note from this significantly higher proportion of post-secondary (20-24) and adult (25-54) students in Ontario relative to Québec, and a correspondingly higher proportion of elementary / junior high school (11-14) students in Québec than in Ontario. The dominant single group throughout the NCR is high-school students.



**Exhibit 2-14: NCR resident student distribution by age group, 2005**



**Exhibit 2-15: Ontario resident student distribution by age group, 2005**

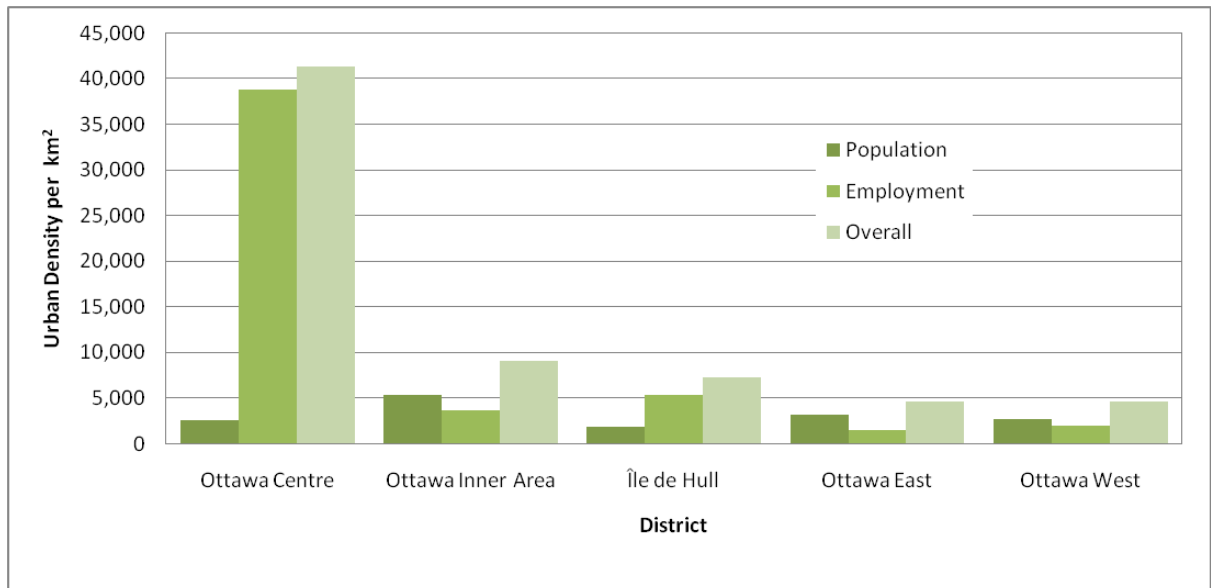


**Exhibit 2-16: Québec resident student distribution by age group, 2005**

## 2.2 Urban densities

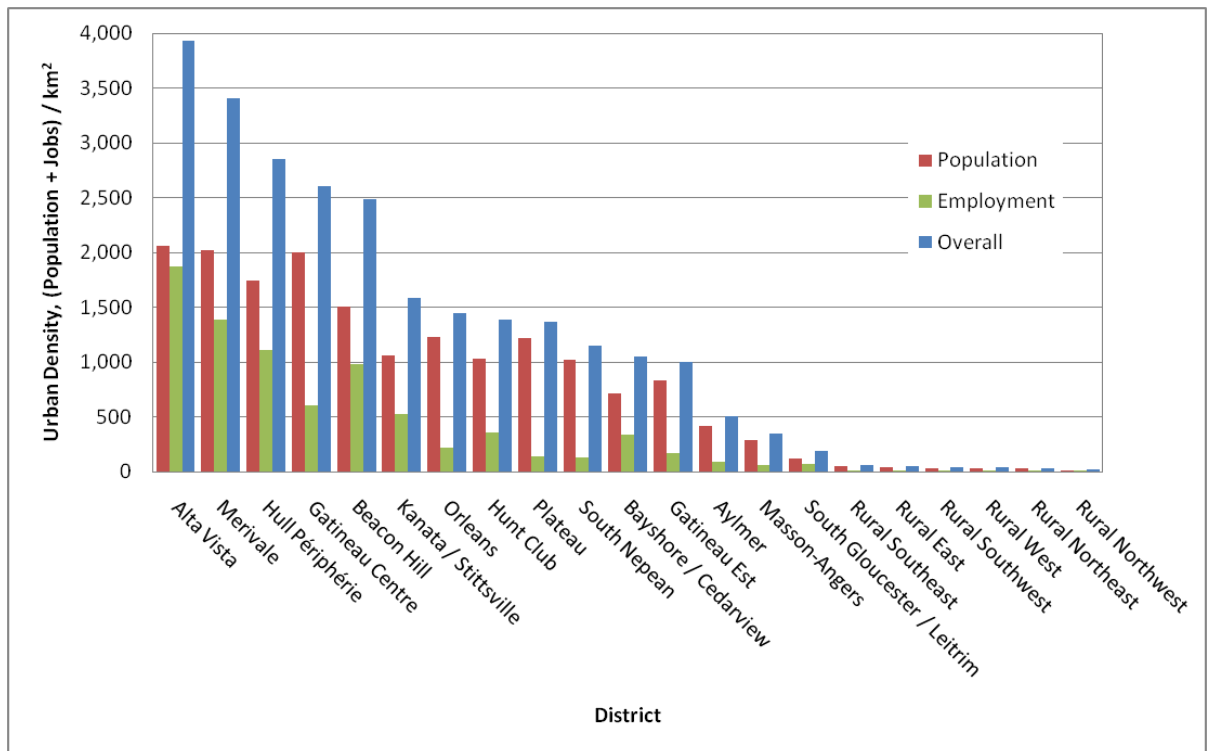
For categorizing urban densities, the districts are separated into two classes, as there is a marked distinction between the congregation of population and jobs in city centres compared with suburban and rural areas. The spread ranges from over 41,000 residents and jobs combined per square kilometre in Ottawa Centre (by far the densest of the districts) to less than 17 residents and jobs per square kilometre in the Rural Northwest.

Overall, the densities are 323 people and jobs per square kilometre for the whole NCR, 477 for the Ontario component and 150 for the Québec part, although the significance of these numbers is reduced by the impact on density of the huge size of the rural districts in comparison with the urban ones. However, the greater density of the Ontario part is also apparent from both Exhibit 2-17 and Exhibit 2-18, below, as four of the five densest districts (and eleven out of the fifteen densest) are in Ontario. Exhibit 2-18 shows three categories of district based on density with evident demarcation points between them; urban (more than 2,500 people and jobs per square kilometre), suburban (1,000 to 2,000 people and jobs per square kilometre) and rural (500 or fewer people and jobs per square kilometre).



**Exhibit 2-17: Urban density (population and jobs)/sq km (central districts), 2005**





**Exhibit 2-18: Urban density (population and jobs) / sq km (suburban/rural districts), 2005**

If we do not consider rural areas (those with a density of less than 1,000 people and jobs per square kilometre, or those with a density lower than Gatineau Est in the above chart), the overall density of the urban portion of the NCR is 2,411 people and jobs per square kilometre (2,422 on the Ontario side and 2,368 in Québec). This includes 1,502 people per square kilometre, and 909 jobs per square kilometre.

Looking across Canada, this density approximates closely to other urban areas, such as Montréal (2,700 people and jobs per square kilometre), Vancouver (2,500) and Calgary (2,200). Only Toronto, at 4,000, is significantly denser (TAC, 2009, p. 28)<sup>2</sup>.

### 2.3 Household characteristics

The survey examines households in several different ways; these include number of people comprising the household, number of vehicles available for household use, and

<sup>2</sup> Density figures refer to the Existing Urban Area (EUA), i.e., the continually urbanized area around the city centre, but not rural areas or neighbouring municipalities with an intervening undeveloped sector. Full maps can be found in [Transportation Association of Canada, Urban Transportation Indicators Fourth Survey Final Report, TAC, December 2009, Appendix B].

type of structure that the household inhabits. Details of these attributes are displayed in Exhibit 2-19, Exhibit 2-20 and Exhibit 2-21, below. These are also displayed showing the percentage of all households that fall into each category in Exhibit 2-22, Exhibit 2-23 and Exhibit 2-24.

For the NCR as a whole, as well as for Québec and Ontario individually, there is a similar profile between number of people in household and [number of vehicles + 1], although the number of zero-car households is lower in the Québec part of the region (9% compared with 13% for Ontario). This may be linked to the lower population density of 110 residents per square km in Québec, compared with 299 residents per square km in Ontario. The average number of vehicles per household is also distinctly (8%) higher in Québec, averaging 1.49 compared with 1.38 in Ontario, although the average number of people per household is similar between the provinces (2.49 in Ontario, 2.43 in Québec). The patterns of dwelling types also show similarities apart from a much greater percentage of semi-detached houses as opposed to townhouses in Québec.

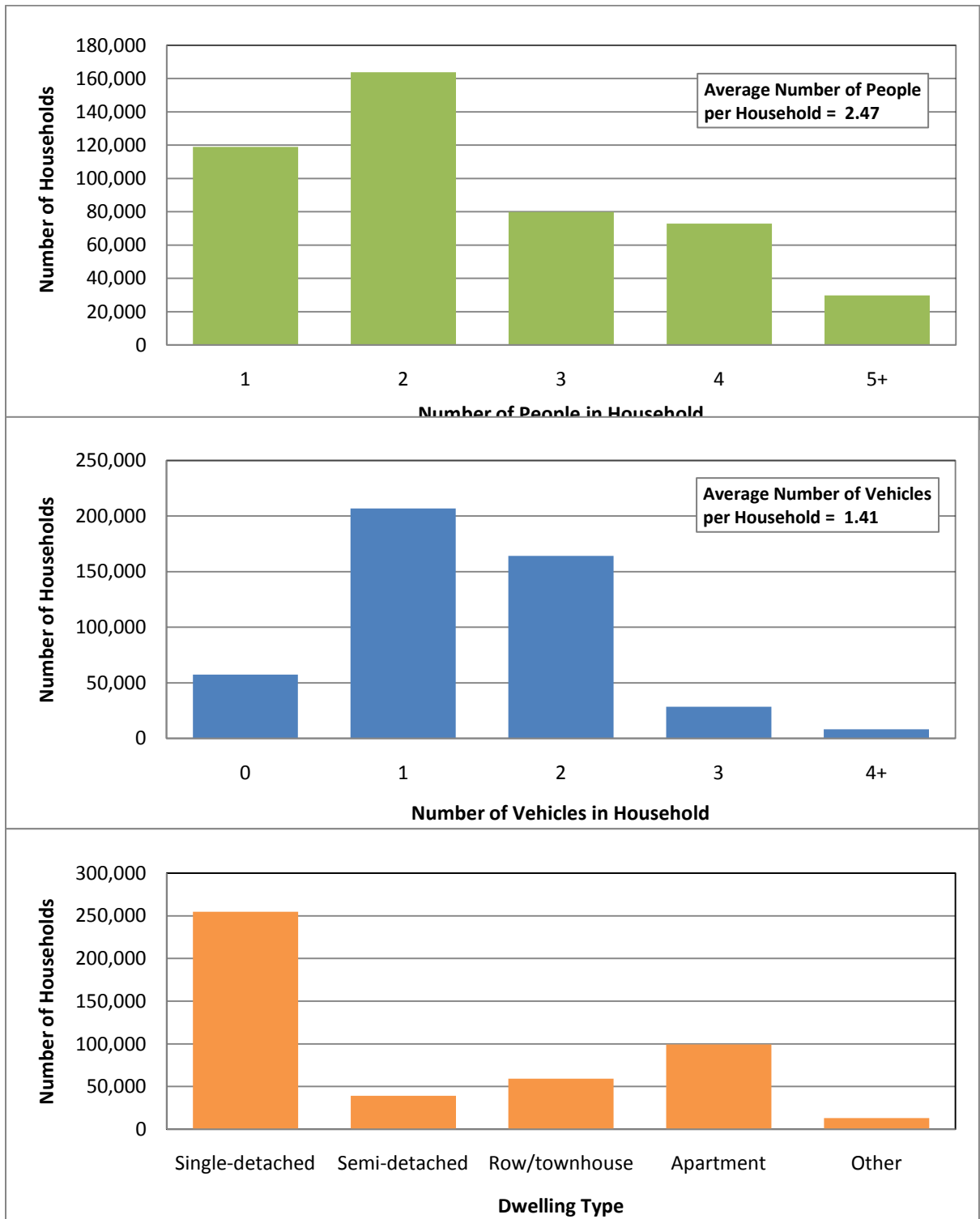


Exhibit 2-19: NCR household characteristics (absolute numbers), 2005

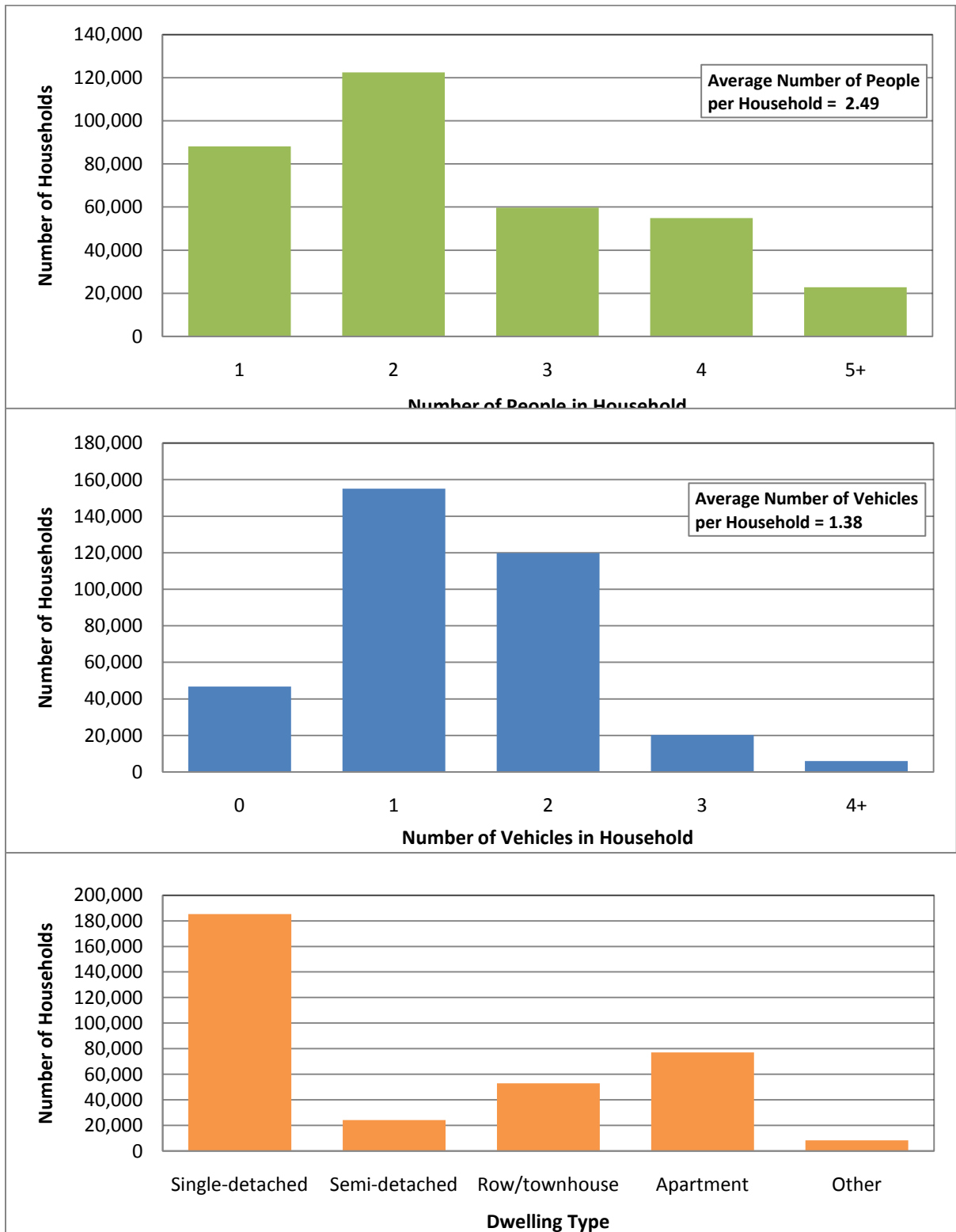
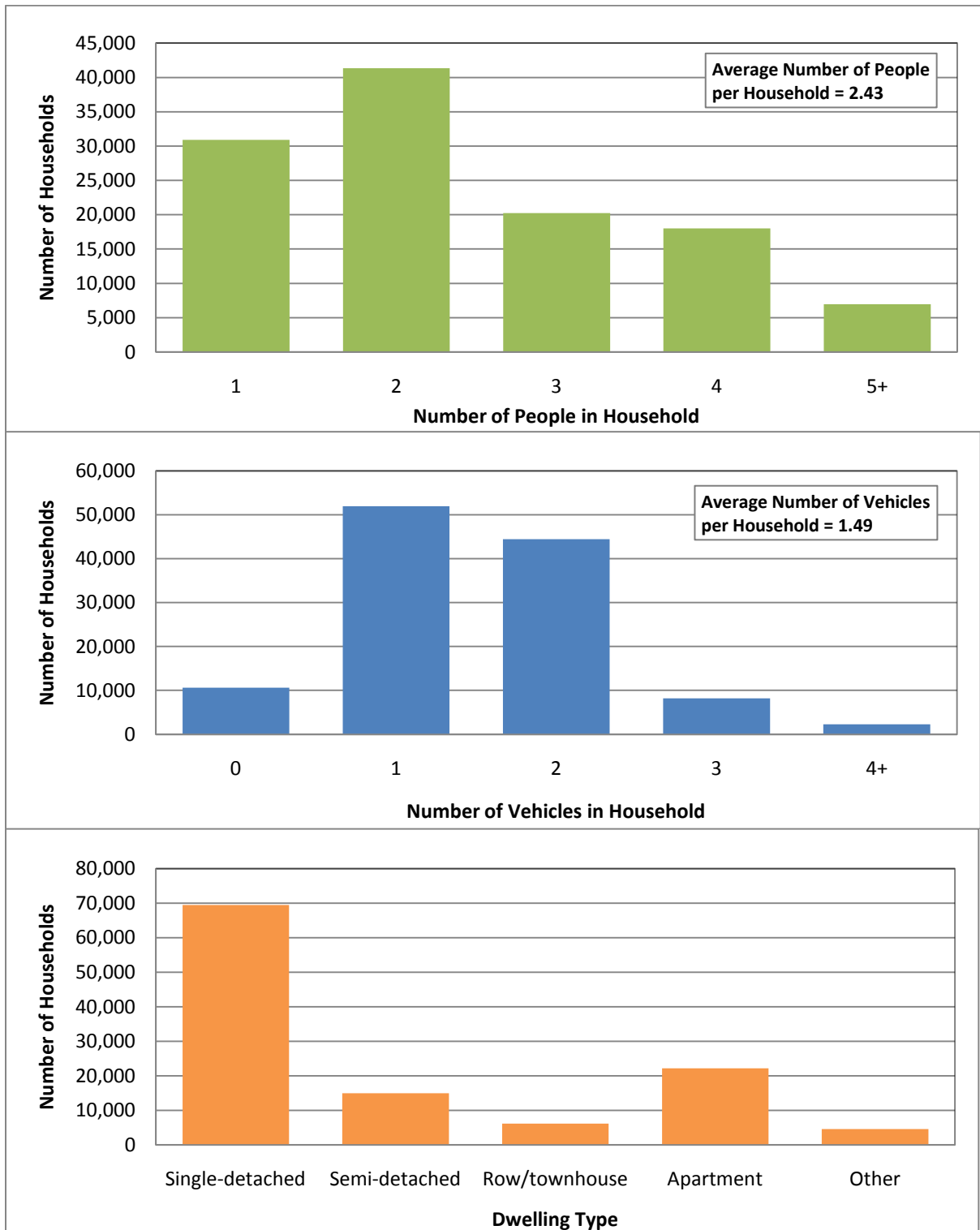


Exhibit 2-20: Ontario household characteristics (absolute numbers), 2005



**Exhibit 2-21: Québec household characteristics (absolute numbers), 2005**

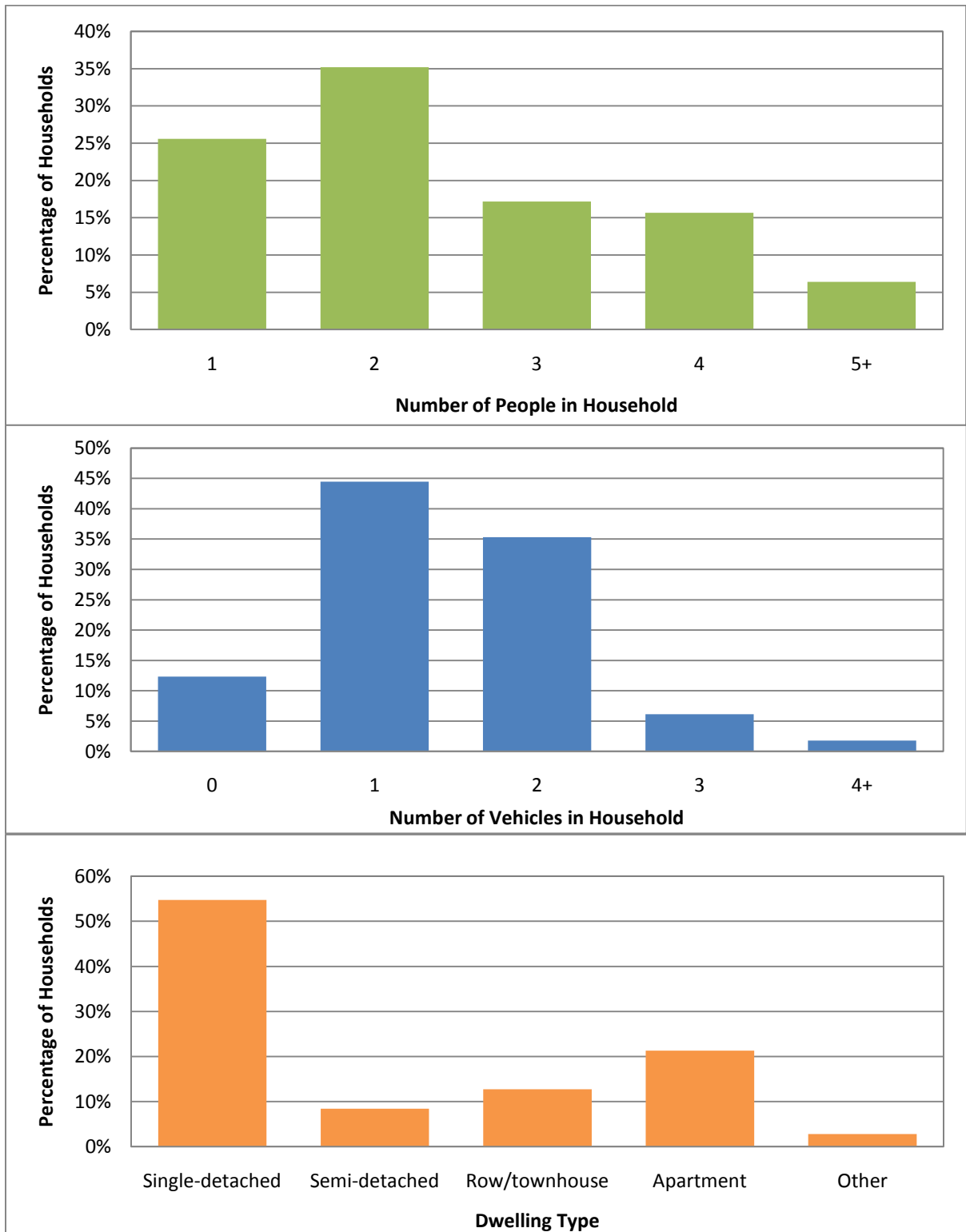


Exhibit 2-22: NCR household characteristics (percentage of households), 2005

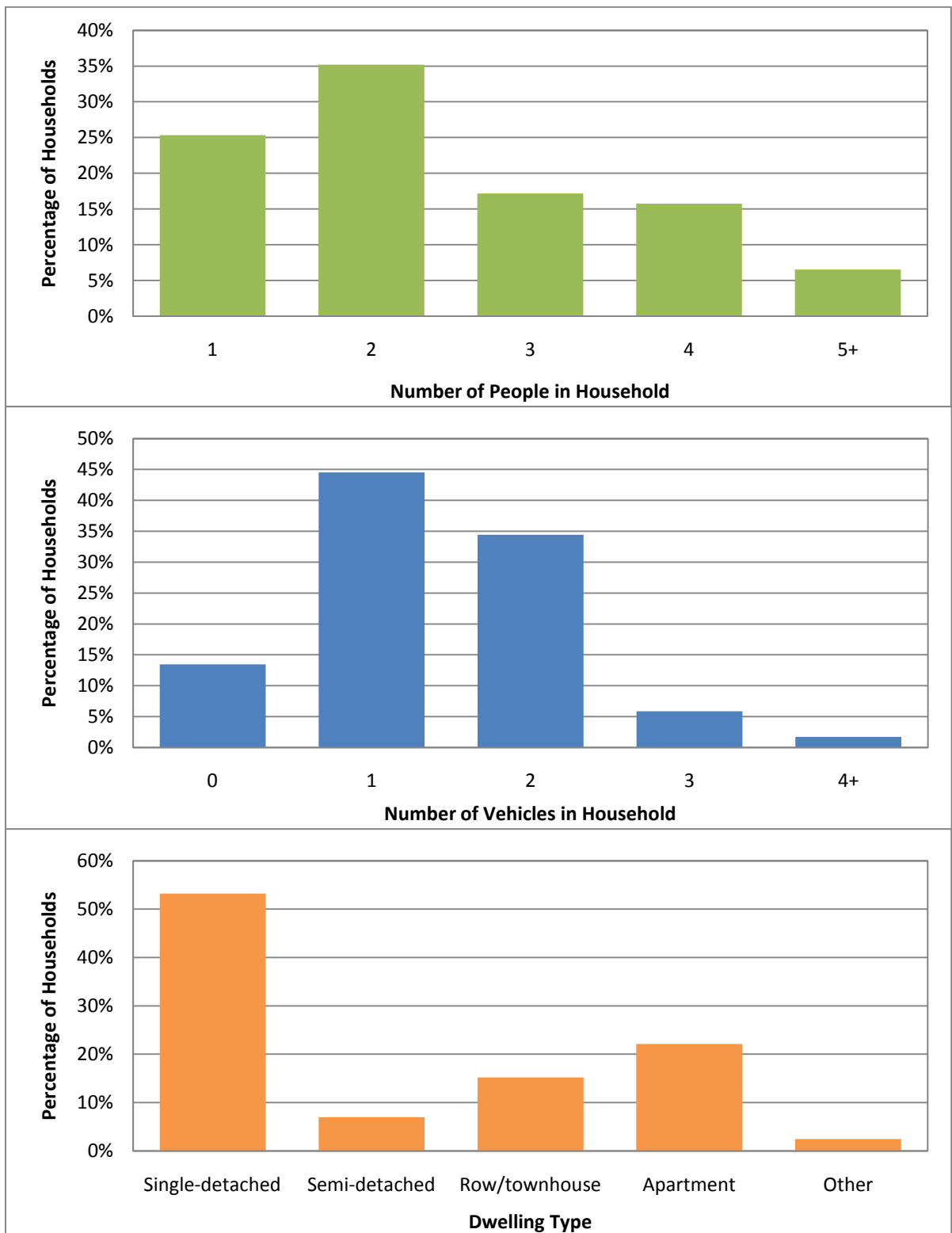
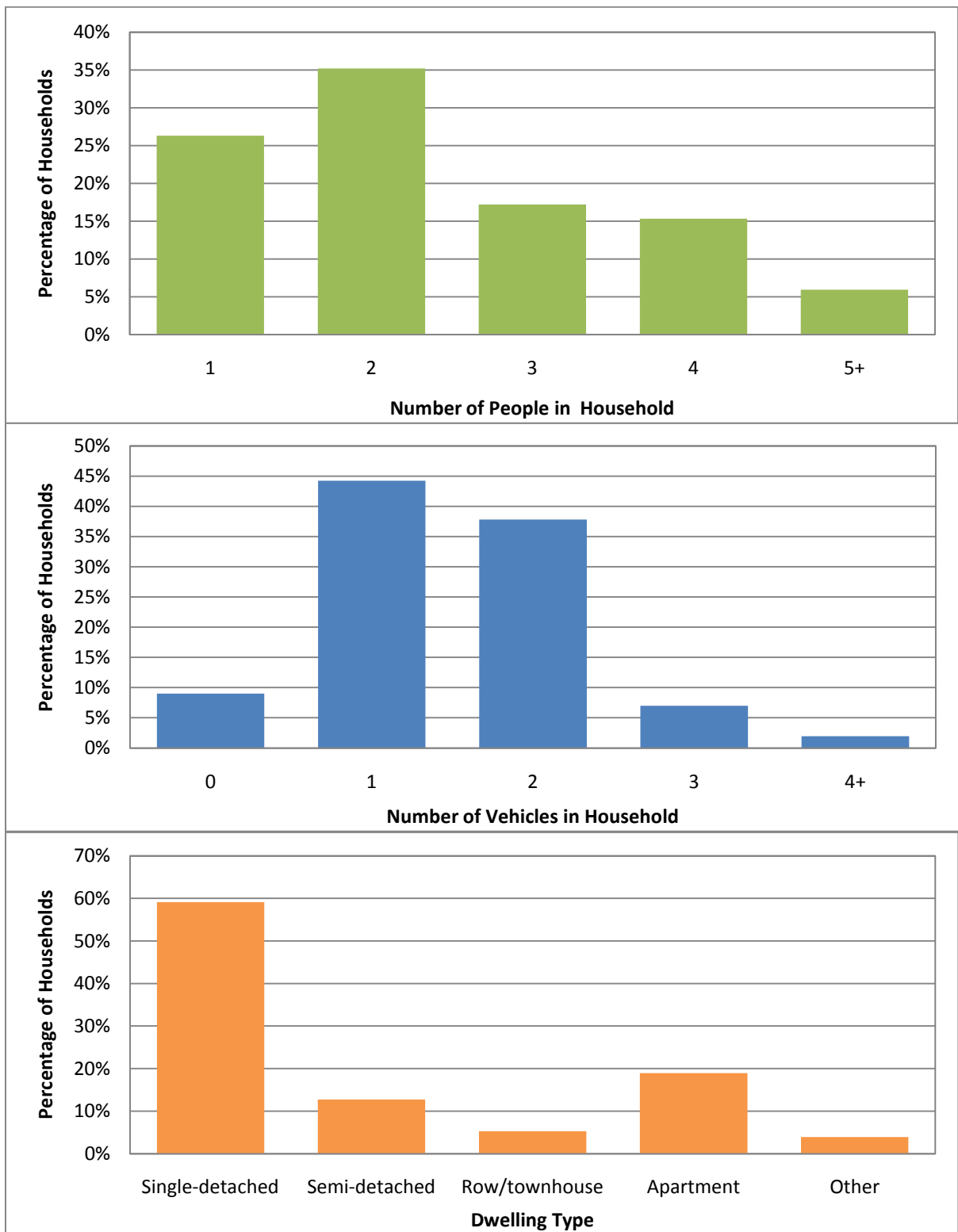


Exhibit 2-23: Ontario household characteristics (percentage of households), 2005



**Exhibit 2-24: Québec household characteristics (percentage of households), 2005**



In Exhibit 2-25 and Exhibit 2-26, the variation across the districts is shown both for average household size and average number of vehicles per household. In the case of vehicles per household, the pattern closely follows the inverse of the urban density pattern shown in Exhibit 2-17 and Exhibit 2-18. In contrast, household size is not so consistent, with Orléans, far from the least dense area, having the highest average number of people per household. Households in the central area of both Ottawa and Gatineau, however, do appear to be on average appreciably smaller than those in suburban areas, with all the districts that average under two people per household located in central areas.

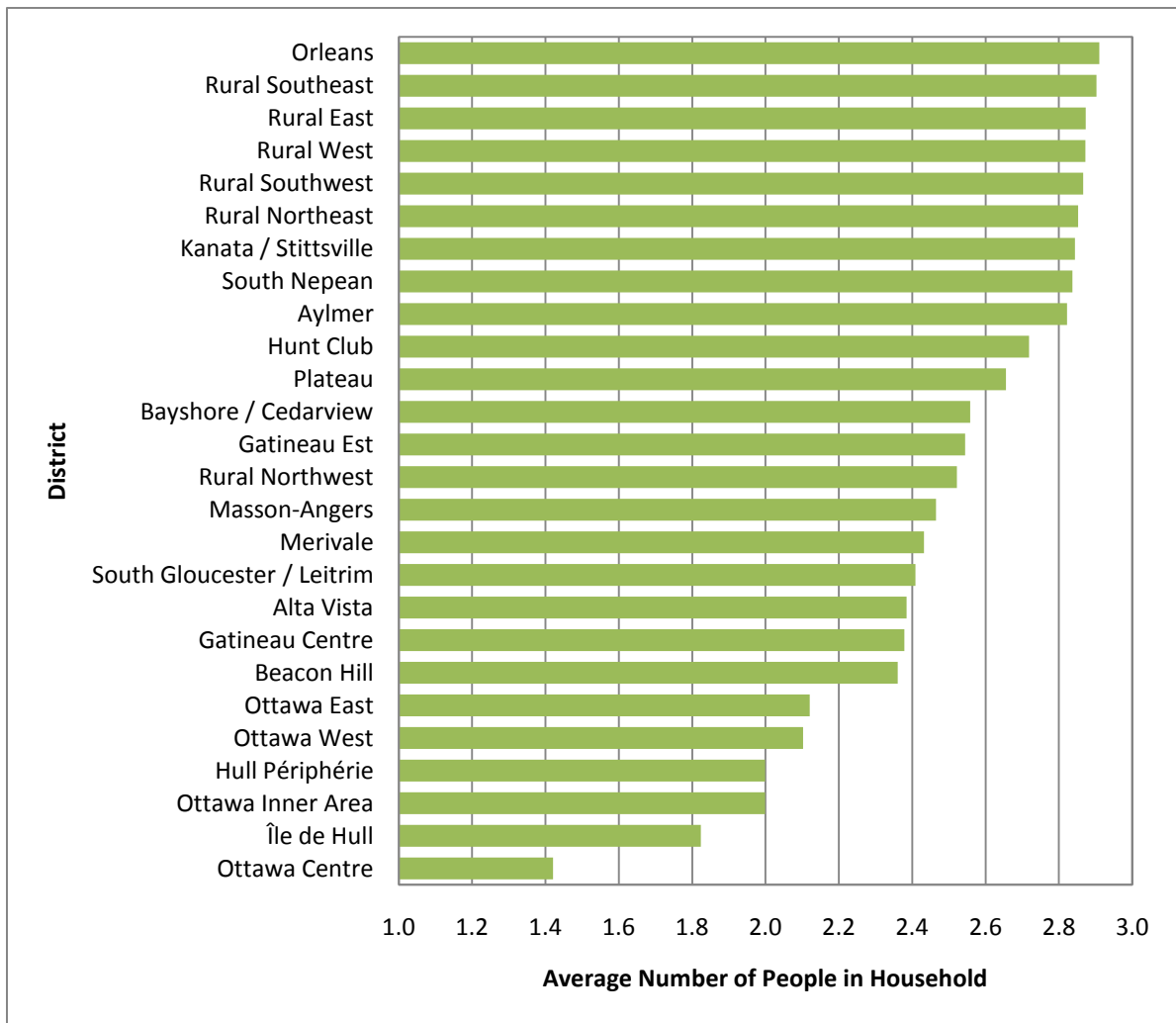


Exhibit 2-25: Average people per household by district, 2005

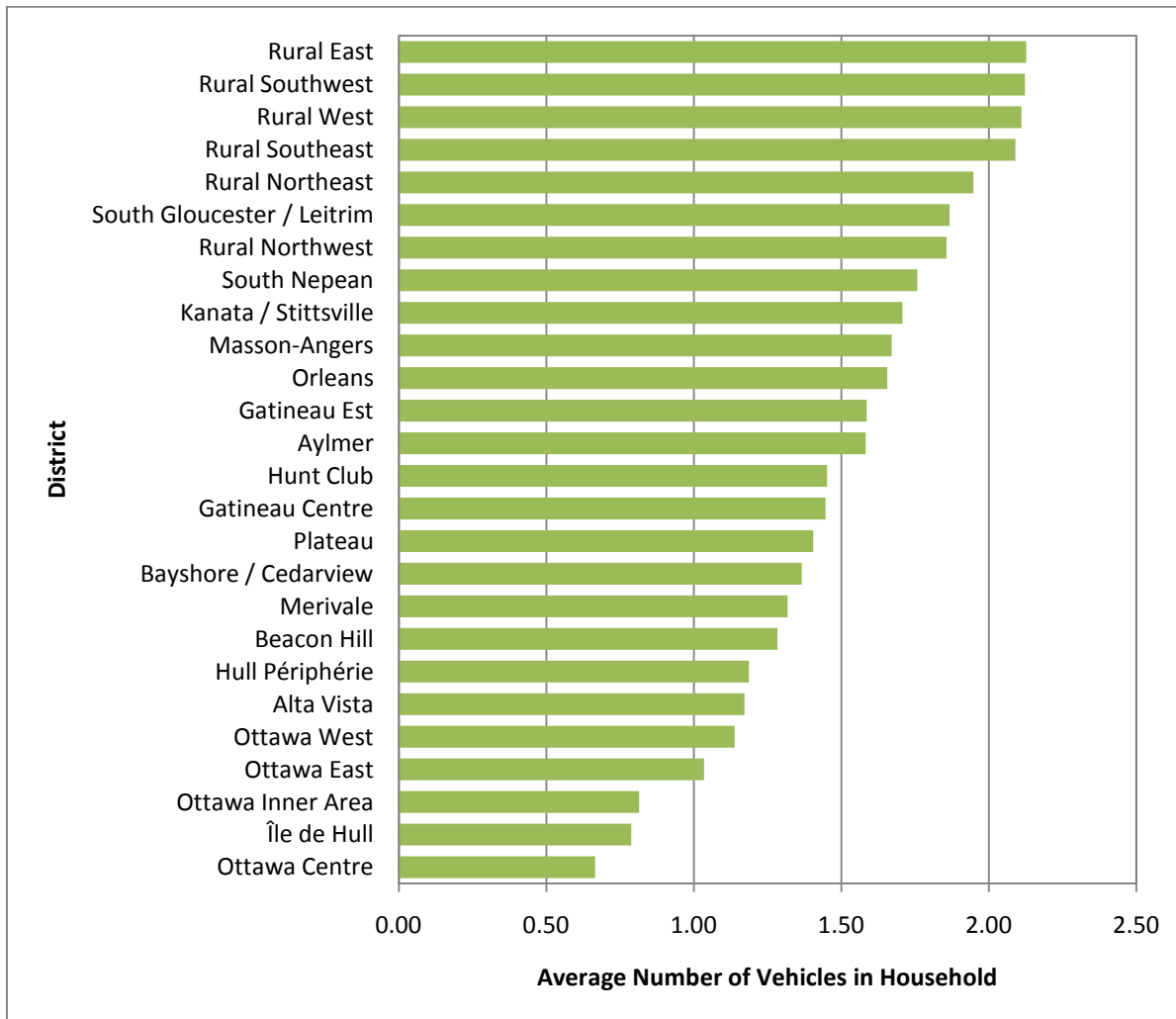


Exhibit 2-26: Average vehicles per household by district, 2005

## 2.4 Conclusion

Overall, this section has provided an overview of the findings of the 2005 survey in demographic terms, identifying the extent of the difference in profiles between rural areas, which have as few as 0.2 jobs per resident worker and an urban density of 17 people and jobs per square kilometre, and central Ottawa, with almost 30 jobs per resident worker and a density of 41,000 people and jobs per square kilometre. The Ontario part of the NCR as a whole has considerably higher urban density, three times greater than the Québec part (though the two are similar if rural districts are excluded), and there is a lower percentage of zero-car households and closely-grouped houses in Québec. Vehicles per household increase in accordance with a corresponding decrease in population and employment density.

Across the NCR as a whole, jobs are divided along a male/female split of approximately 55/45. As expected, occupation status varies greatly by age group, reaching 80% of the

population in the main workers' category of 25 to 54. The average number of workers per household by district drops in the urban cores but otherwise remains around the 1 to 1.5 range across the region.

The next section focuses on linking these population, employment and household attributes through the analysis of trip patterns.

### 3. Transportation Activity

This section expands on the demographic information presented previously by looking at trip flow patterns in terms of origin and destination, time-of-day, and how the purposes of trips affect their distribution.

#### 3.1 Trip distribution patterns

The average length of a trip varies considerably depending on its point of origin or destination and the density of that origin or destination. Exhibit 3-1, below, indicates the extent of this disparity, from an average trip length of 14.7 km in the rural Ontario portion of the NCR to only 5.9 km in the urban Ontario proportion (downtown Ottawa). Distributions by destination district types are virtually identical when aggregated to this level. This is considered in more detail for work trips in Exhibit 3-17.

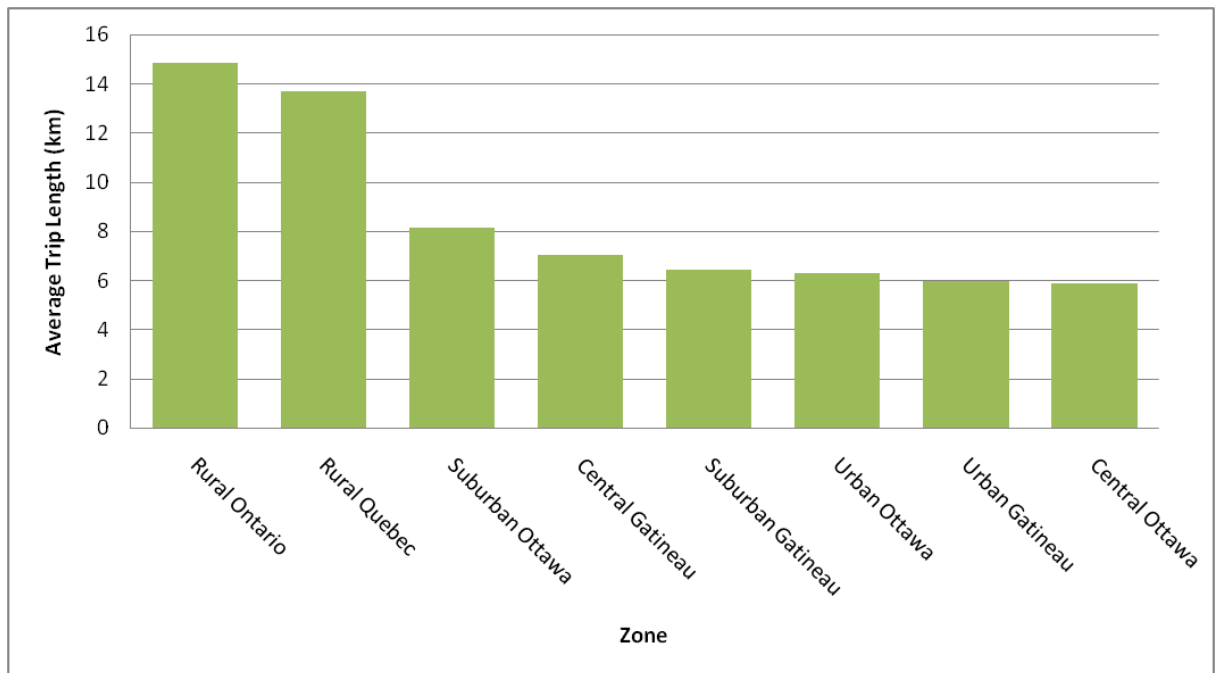


Exhibit 3-1: Trip length distribution by origin district type, 2005

The following plots show the major one-way flows (more than 1,000 trips) between districts in the AM and PM peak periods, to illustrate significant travel patterns for each district.

To avoid too many overlapping flows, the Urban Ottawa district was divided into east and west; where east includes Alta Vista, Beacon Hill, Hunt Club and Ottawa East, and west includes Bayshore, Merivale and Ottawa West. Consequently, there are seven different areas analysed together in the plots:

1. Central Ottawa (Ottawa Centre and Ottawa Inner Area), Exhibit 3-2 and Exhibit 3-9;
2. Urban Ottawa East (Alta Vista, Beacon Hill, Hunt Club and Ottawa East), Exhibit 3-3 and Exhibit 3-10;
3. Urban Ottawa West (Bayshore/Cedarview, Merivale and Ottawa West), Exhibit 3-4 and Exhibit 3-11;
4. Suburban Ottawa [Outside Greenbelt] (Kanata/Stittsville, Orléans, South Gloucester/Leitrim and South Nepean), Exhibit 3-5 and Exhibit 3-12;
5. Central Gatineau and Urban Gatineau (Ile de Hull and Hull Périphérie)— displayed together as there are only two districts to show), Exhibit 3-6 and Exhibit 3-13;
6. Suburban Gatineau (Aylmer, Gatineau Centre, Gatineau Est and Plateau), Exhibit 3-7 and Exhibit 3-14;
7. Rural Areas (Masson-Angers and Rural Northeast, Northwest, East, Southeast, Southwest and West), Exhibit 3-8 and Exhibit 3-15.

Flows from each district are colour-coded for display purposes. The flow lines in the following exhibits are classified in three sizes, with consistent scale for all exhibits:

- ◆ Thick indicates flows higher than 5,000 people per peak period
- ◆ Medium indicates flows between 2,000 and 4,999 people per peak period
- ◆ Thin indicates flows between 1,000 and 1,999 people per peak period
- ◆ Flows less than 1,000 are not shown.

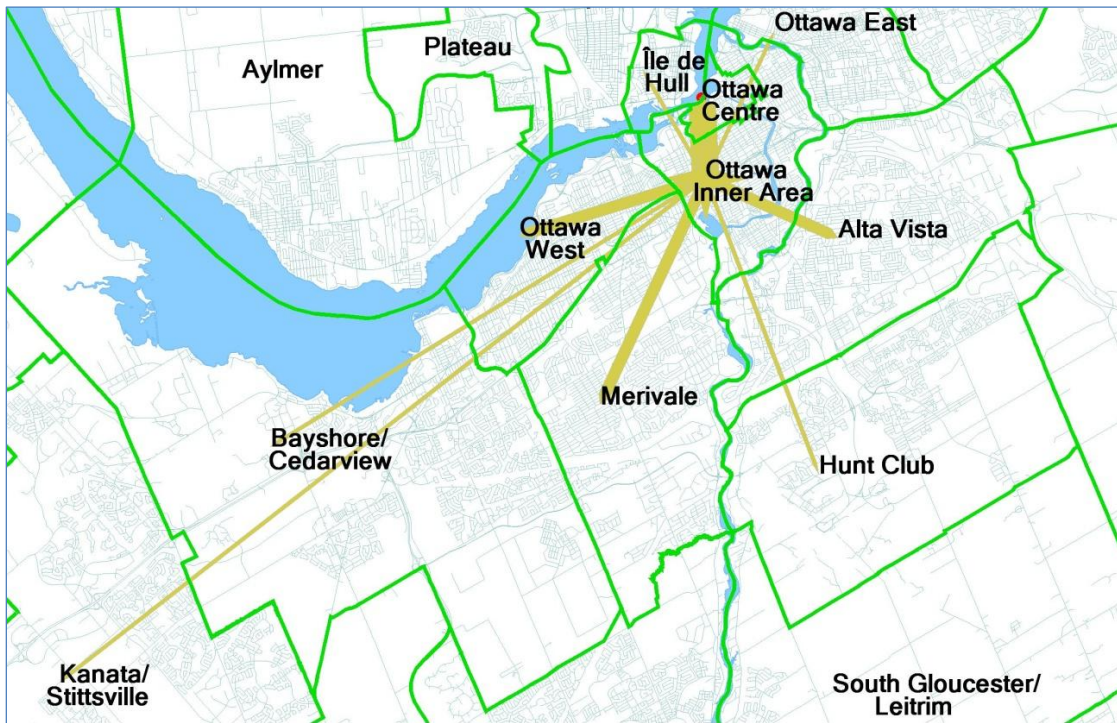


Exhibit 3-2: AM peak inter-district flows from central Ottawa, 2005

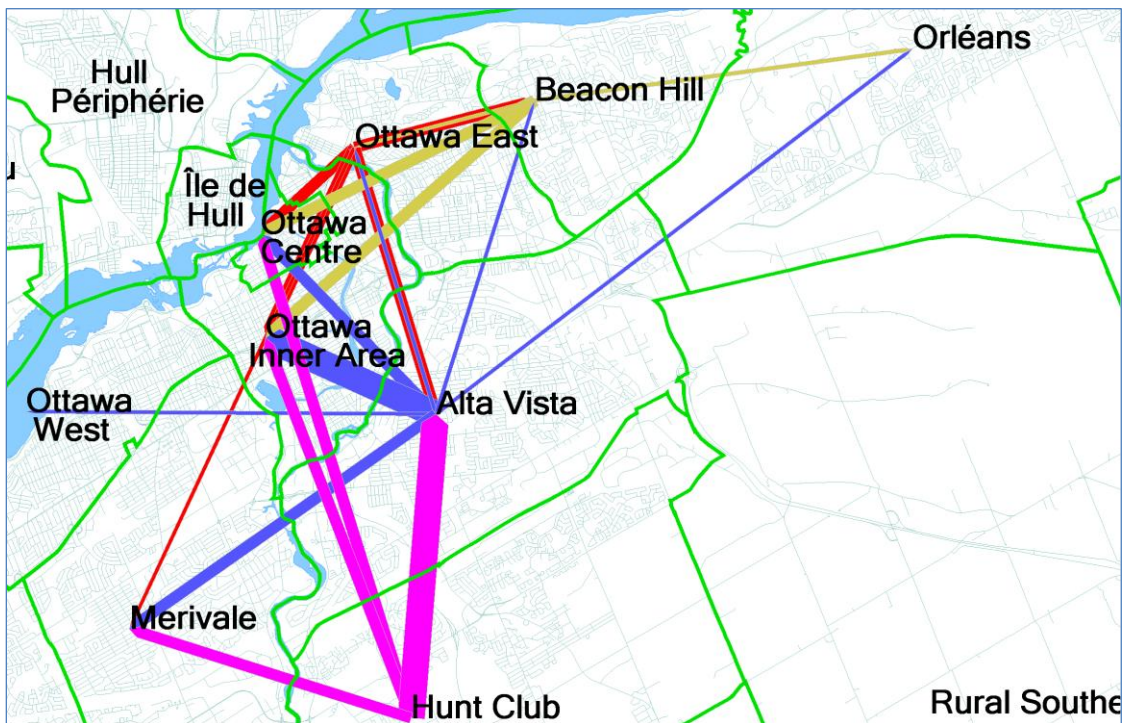


Exhibit 3-3: AM peak inter-district flows from urban Ottawa (east), 2005



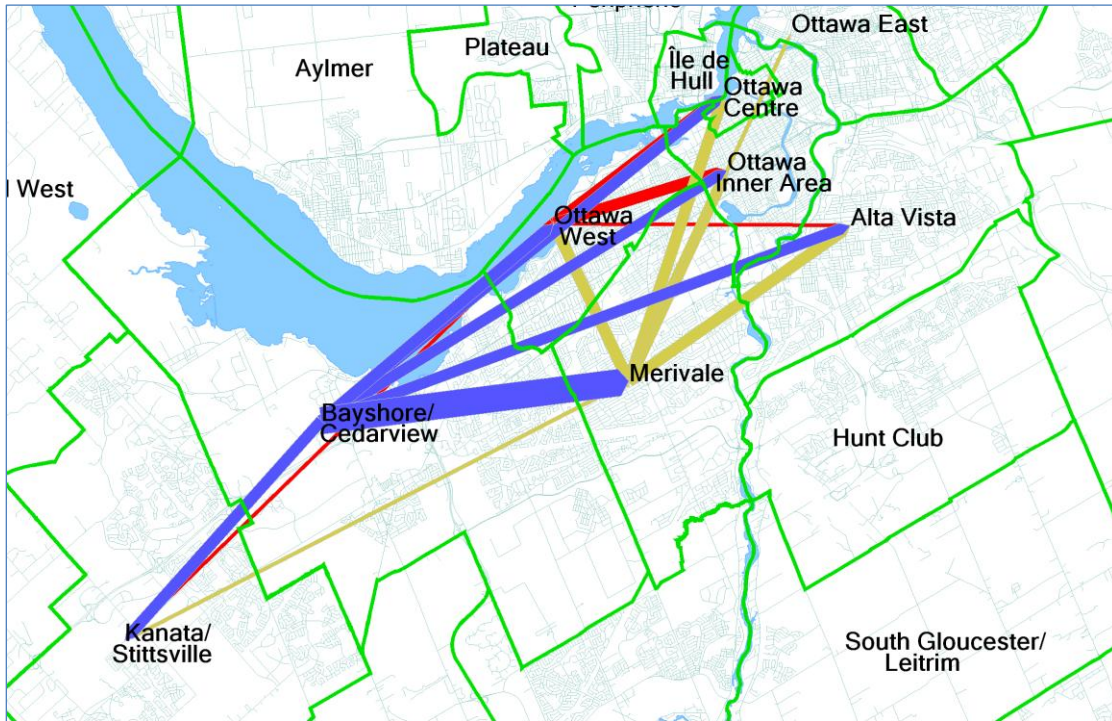


Exhibit 3-4: AM peak inter-district flows from urban Ottawa (west), 2005

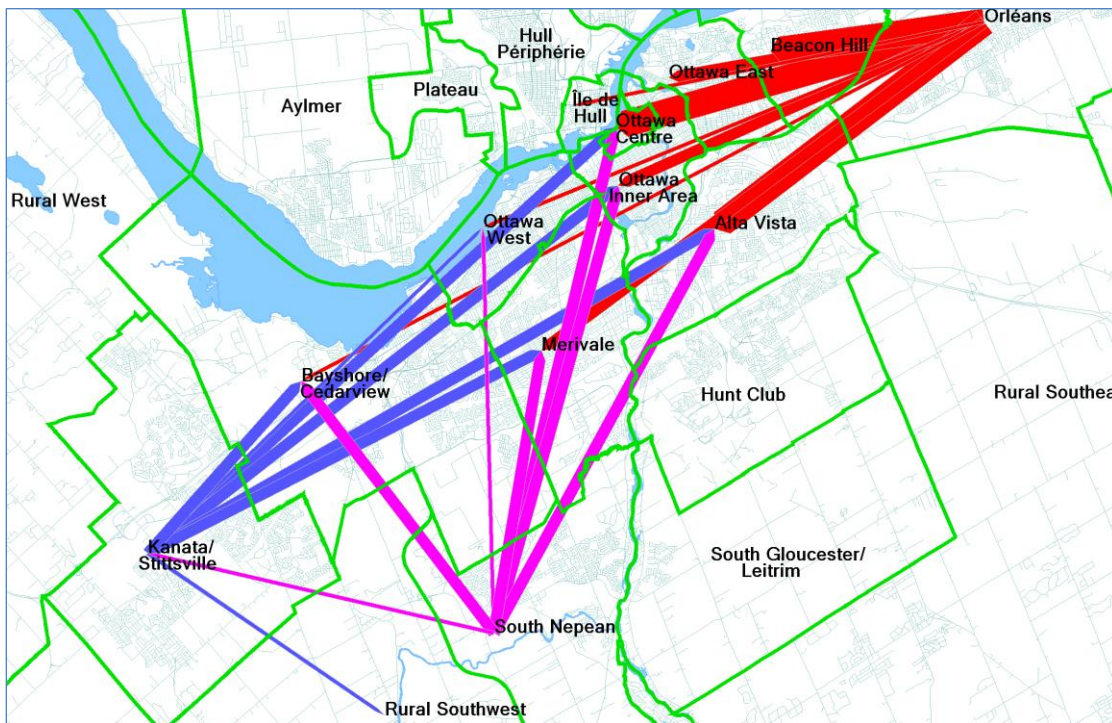


Exhibit 3-5: AM peak inter-district flows from suburban Ottawa, 2005



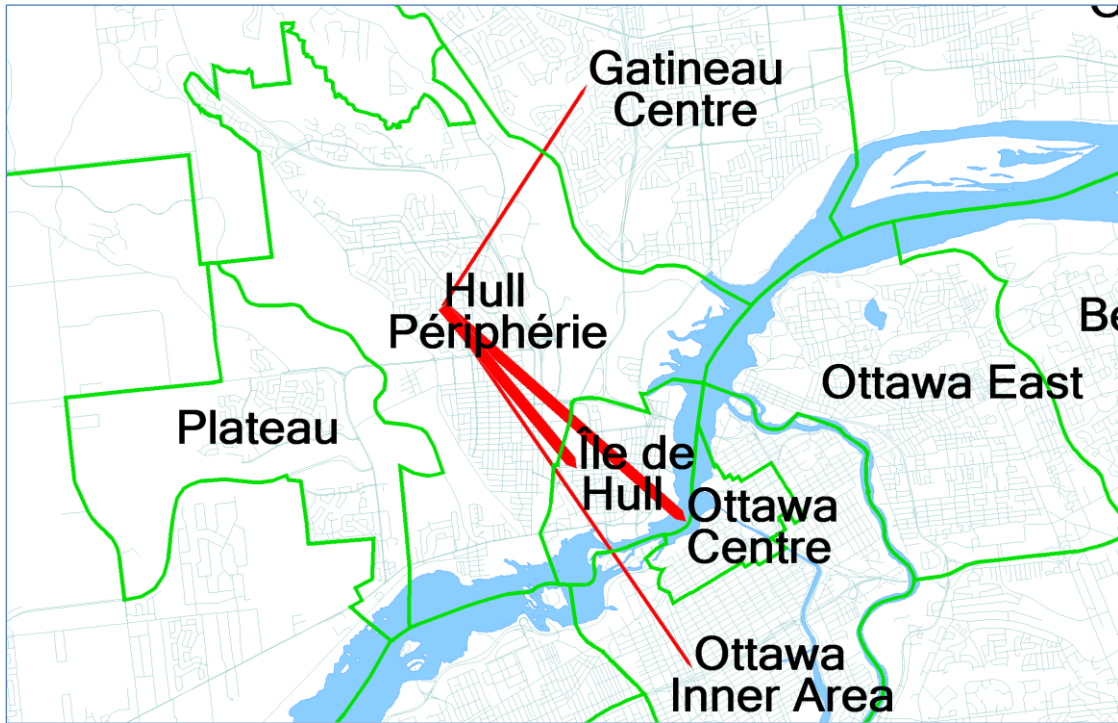


Exhibit 3-6: AM peak inter-district flows from central/urban Gatineau, 2005

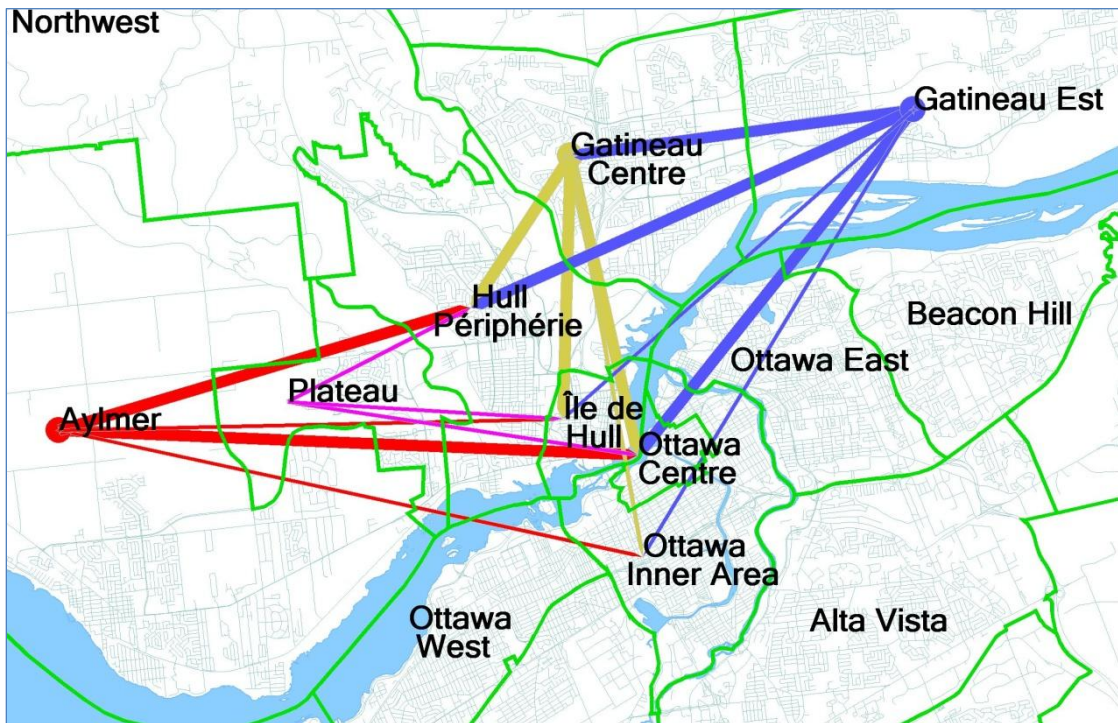


Exhibit 3-7: AM peak inter-district flows from suburban Gatineau, 2005



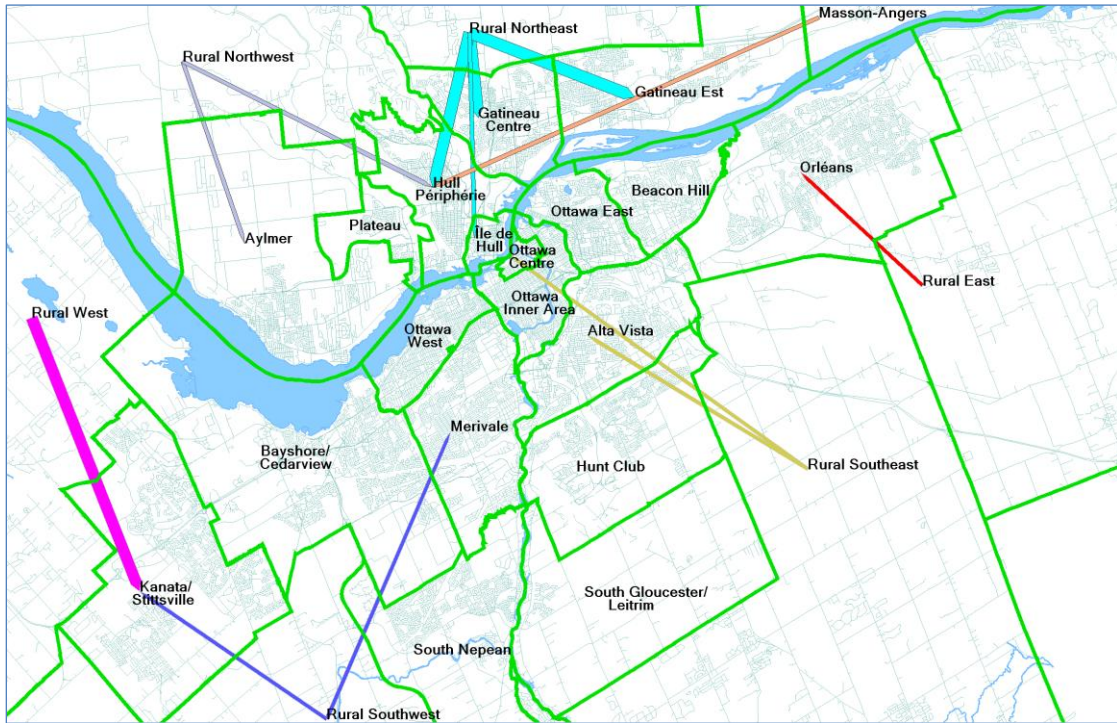


Exhibit 3-8: AM peak inter-district flows from rural NCR districts, 2005

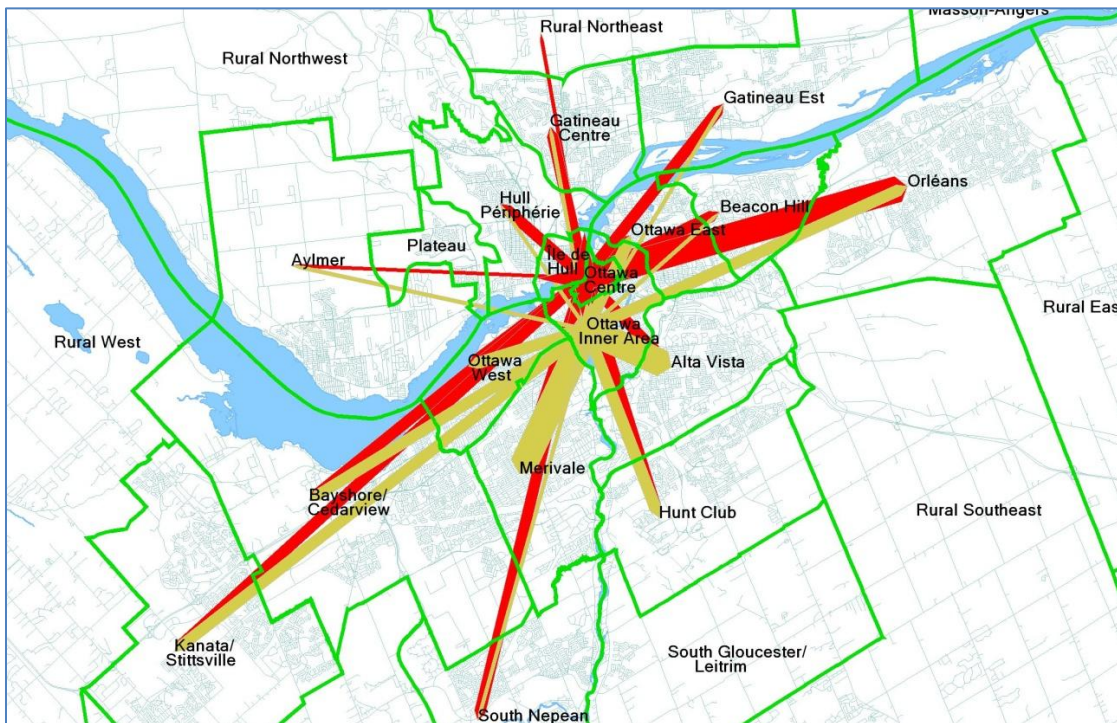


Exhibit 3-9: PM peak inter-district flows from central Ottawa, 2005



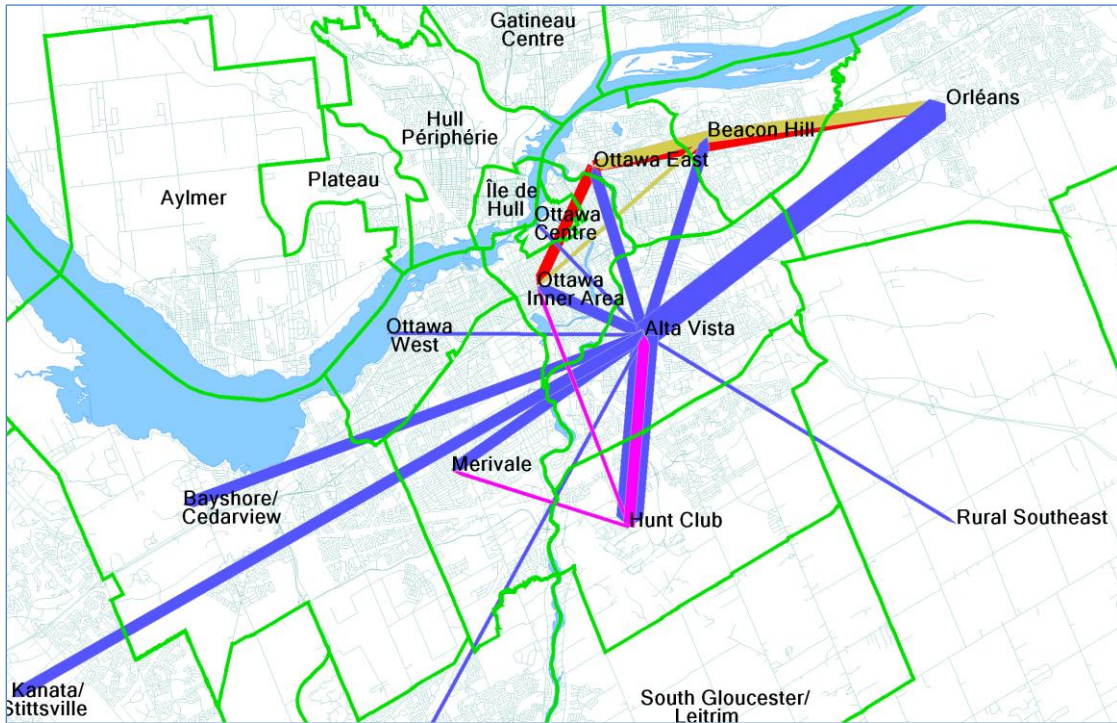


Exhibit 3-10: PM peak inter-district flows from urban Ottawa (east), 2005

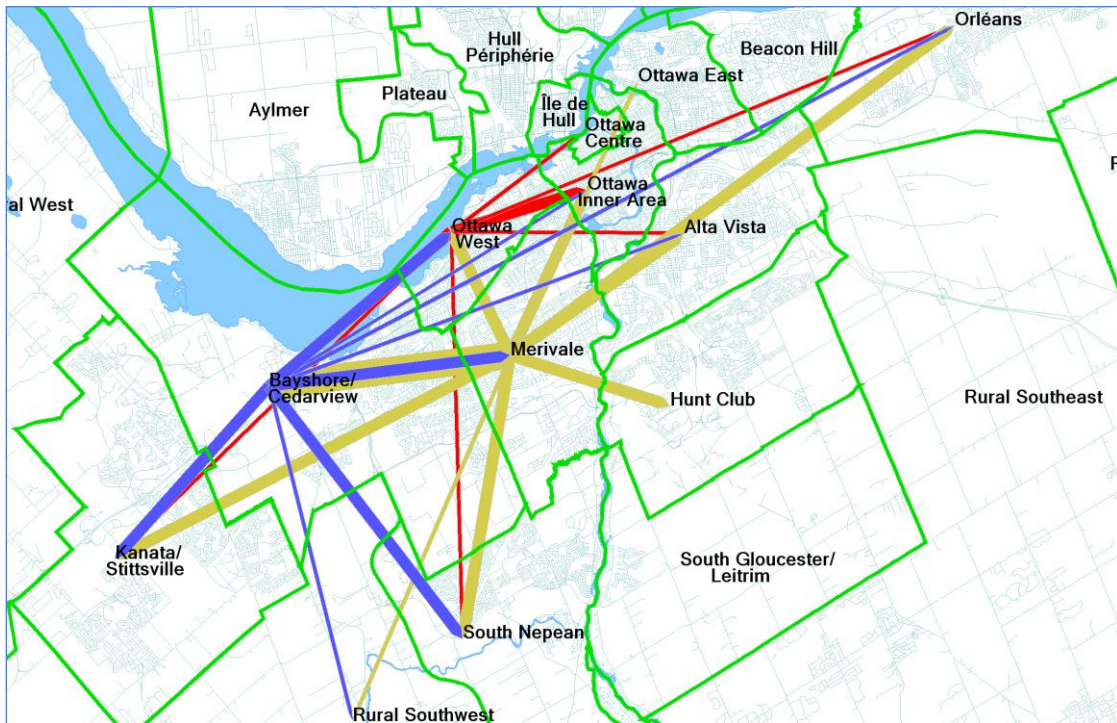


Exhibit 3-11: PM peak inter-district flows from urban Ottawa (west), 2005



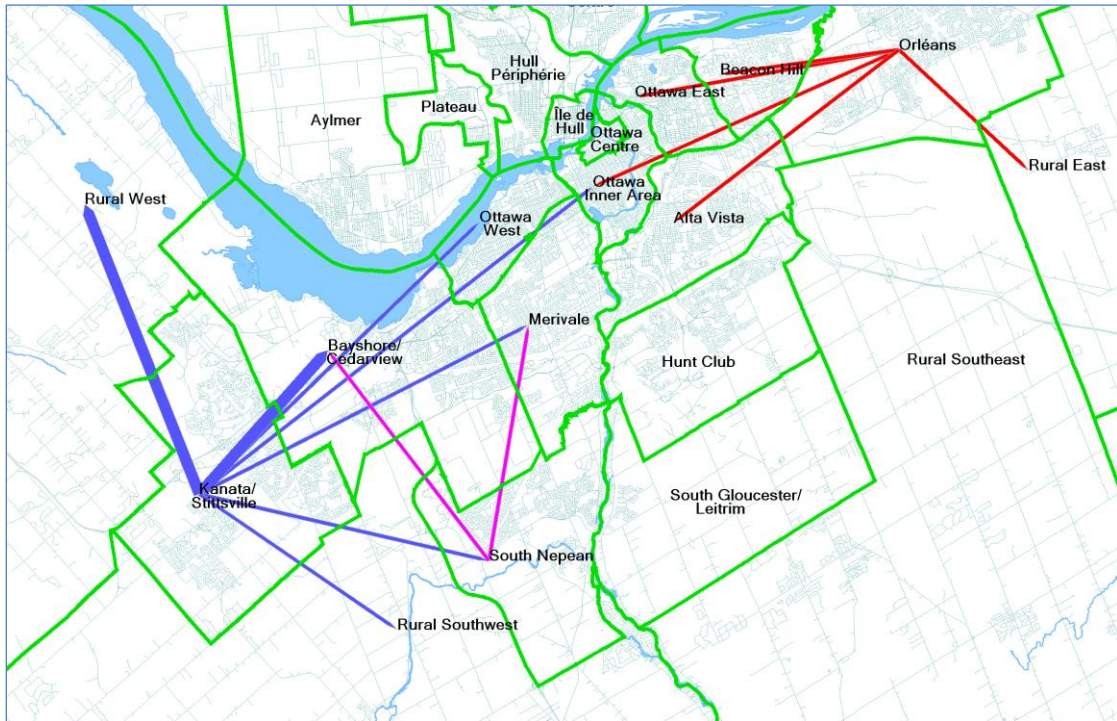


Exhibit 3-12: PM peak inter-district flows from suburban Ottawa, 2005

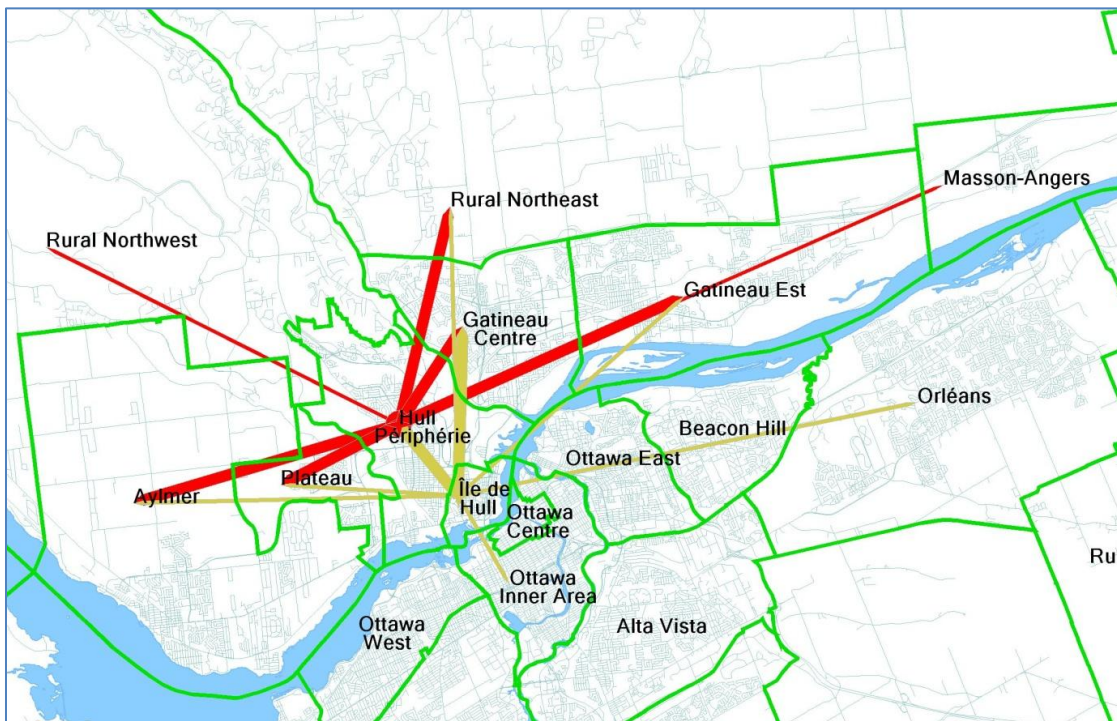


Exhibit 3-13: PM peak inter-district flows from central/urban Gatineau, 2005



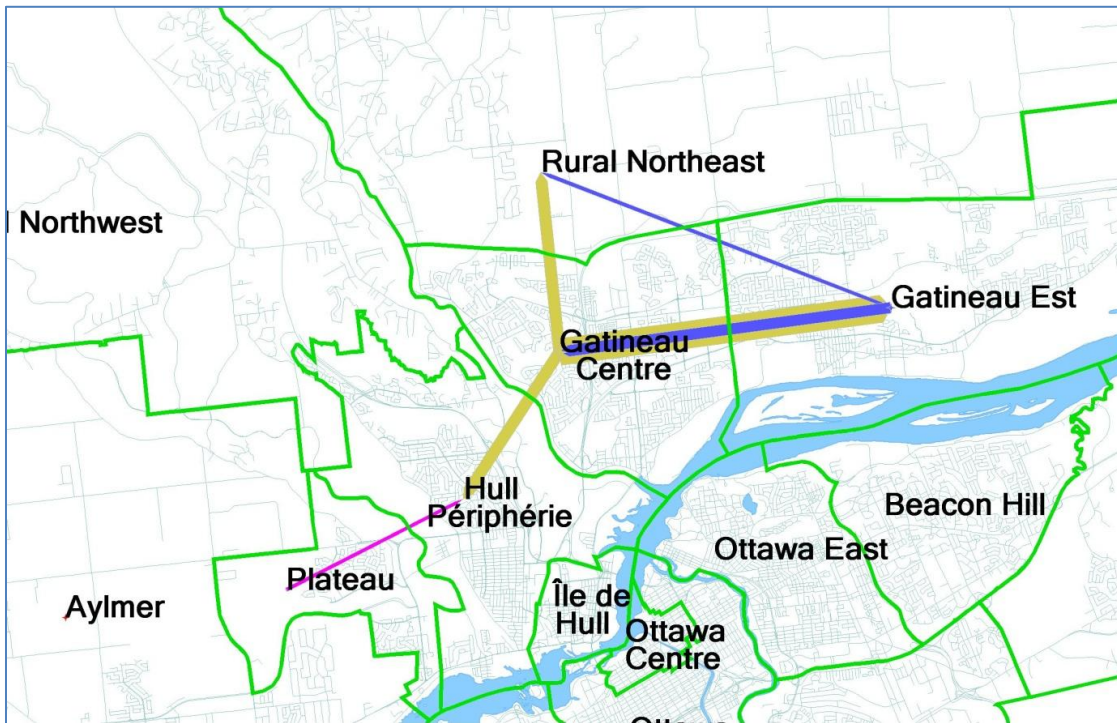


Exhibit 3-14: PM peak inter-district flows from suburban Gatineau, 2005

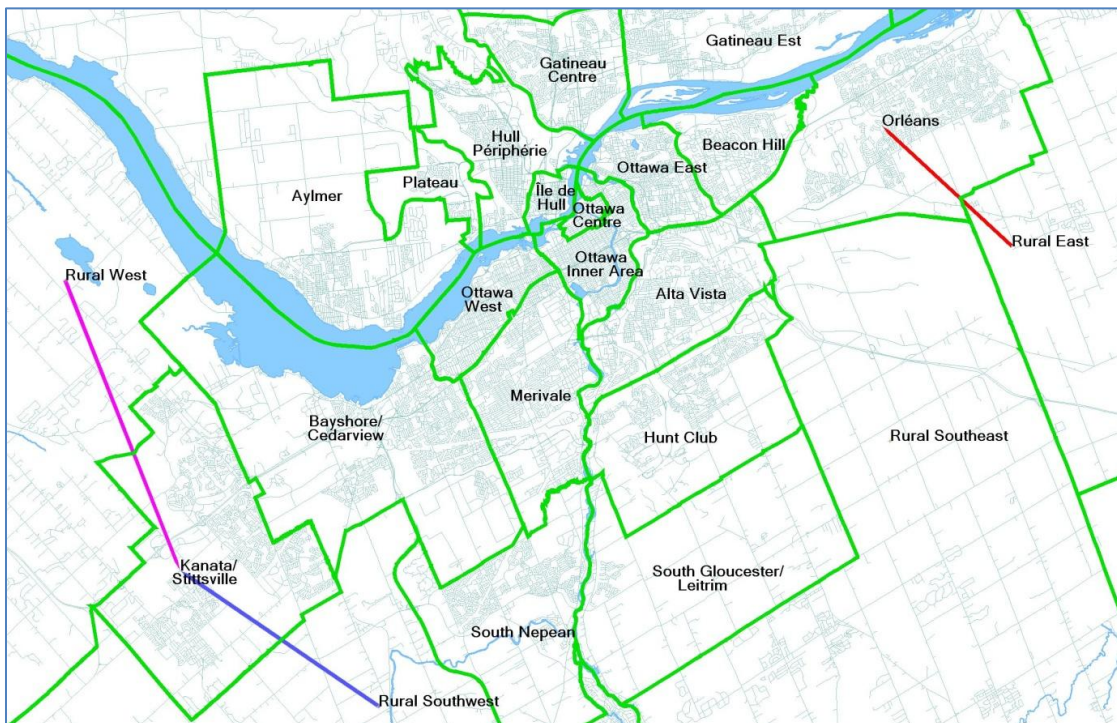


Exhibit 3-15: PM peak inter-district flows from rural NCR districts, 2005

As could be expected, there are many high-volume flows from the central cores to outlying areas in the PM peak, and many flows from high-population suburbs such as Orléans and South Nepean, where Exhibit 2-4 showed a labour force considerably greater than the number of jobs. Orléans and Kanata/Stittsville also attract trips from the neighbouring rural districts in the PM, but there are flows in the opposite direction in the PM as well and no corresponding opposite flow in the morning (except for Kanata-Rural Southwest), so they are not likely to be dominated by work trips.

The Québec side of the river shows a much simpler flow pattern than the Ottawa side, with AM peak trips from rural and suburban areas to Île de Hull and central Ottawa (including “Ottawa Centre” and “Ottawa Inner Area”) and PM peak trips in the opposite direction. Significant cross-river trips are noted between Orléans and Île de Hull, as well as between central Ottawa and almost all Québec districts, likely to be largely due to the commuting patterns of federal office workers.

Details of the trip flow numbers between aggregated districts (urban, rural, and so on), are given for each of the three time periods in Table 3-1 to Table 3-3, below. Also shown are trip rates (based on population of the origin district for AM and off-peak trips, and population of the destination district for PM trips) and the percentage of all trips that each OD pairing represents. The tables are colour-coded so that the highest-volume flows appear darker for quick reference (we can note that these are mainly intra-area trips or those to or from Central Ottawa).

**Table 3-1: AM peak period trips between aggregated districts**

AM PEAK FLOWS	Central Ottawa	Central Gatineau	Urban Ottawa	Urban Gatineau	Suburban Ottawa	Suburban Gatineau	Rural Ontario	Rural Quebec	Total
Central Ottawa	28810	1750	16970	850	2160	550	430	190	51720
Central Gatineau	1180	1020	1220	840	240	550	40	90	5160
Urban Ottawa	50920	4290	131240	2370	14180	1340	3600	420	208360
Urban Gatineau	4390	3920	2970	9480	330	3100	110	620	24920
Suburban Ottawa	24420	1970	46860	1580	56900	700	4130	220	136770
Suburban Gatineau	12570	6360	11410	12640	1750	31710	480	1930	78840
Rural Ontario	5280	390	12710	260	7710	260	11730	50	38380
Rural Quebec	2870	2400	3000	5030	530	8830	80	7880	30620
<b>Total</b>	<b>130440</b>	<b>22090</b>	<b>226380</b>	<b>33040</b>	<b>83790</b>	<b>47030</b>	<b>20610</b>	<b>11400</b>	<b>574760</b>
AM PEAK TRIP RATES (BY ORIGIN RESIDENTS)	Central Ottawa	Central Gatineau	Urban Ottawa	Urban Gatineau	Suburban Ottawa	Suburban Gatineau	Rural Ontario	Rural Quebec	Total
Central Ottawa	0.30	0.02	0.18	0.01	0.02	0.01	0.00	0.00	0.55
Central Gatineau	0.13	0.12	0.14	0.10	0.03	0.06	0.00	0.01	0.59
Urban Ottawa	0.12	0.01	0.31	0.01	0.03	0.00	0.01	0.00	0.49
Urban Gatineau	0.09	0.08	0.06	0.19	0.01	0.06	0.00	0.01	0.50
Suburban Ottawa	0.09	0.01	0.18	0.01	0.22	0.00	0.02	0.00	0.52
Suburban Gatineau	0.08	0.04	0.07	0.08	0.01	0.20	0.00	0.01	0.50
Rural Ontario	0.06	0.00	0.15	0.00	0.09	0.00	0.14	0.00	0.46
Rural Quebec	0.04	0.03	0.04	0.07	0.01	0.13	0.00	0.11	0.44
<b>Total</b>	<b>0.11</b>	<b>0.02</b>	<b>0.20</b>	<b>0.03</b>	<b>0.07</b>	<b>0.04</b>	<b>0.02</b>	<b>0.01</b>	<b>0.50</b>
AM PEAK PERCENTAGES	Central Ottawa	Central Gatineau	Urban Ottawa	Urban Gatineau	Suburban Ottawa	Suburban Gatineau	Rural Ontario	Rural Quebec	Total
Central Ottawa	5.0%	0.3%	3.0%	0.1%	0.4%	0.1%	0.1%	0.0%	9.0%
Central Gatineau	0.2%	0.2%	0.2%	0.1%	0.0%	0.1%	0.0%	0.0%	0.9%
Urban Ottawa	8.9%	0.7%	22.8%	0.4%	2.5%	0.2%	0.6%	0.1%	36.3%
Urban Gatineau	0.8%	0.7%	0.5%	1.6%	0.1%	0.5%	0.0%	0.1%	4.3%
Suburban Ottawa	4.2%	0.3%	8.2%	0.3%	9.9%	0.1%	0.7%	0.0%	23.8%
Suburban Gatineau	2.2%	1.1%	2.0%	2.2%	0.3%	5.5%	0.1%	0.3%	13.7%
Rural Ontario	0.9%	0.1%	2.2%	0.0%	1.3%	0.0%	2.0%	0.0%	6.7%
Rural Quebec	0.5%	0.4%	0.5%	0.9%	0.1%	1.5%	0.0%	1.4%	5.3%
<b>Total</b>	<b>22.7%</b>	<b>3.8%</b>	<b>39.4%</b>	<b>5.7%</b>	<b>14.6%</b>	<b>8.2%</b>	<b>3.6%</b>	<b>2.0%</b>	

In the AM peak period (considering trips starting from 6:30 AM to 8:59 AM), almost a quarter of trips are headed to central Ottawa, while almost the same proportion originates outside the greenbelt. Of the trips to central Ottawa, the great majority (over 80%) come from the other Ontario districts. Interprovincial travel makes up 10.5% of all trips (7.5% to Ontario, 3.0% to Québec).

**Table 3-2: PM peak period trips between aggregated districts**

PM PEAK FLOWS	Central Ottawa	Central Gatineau	Urban Ottawa	Urban Gatineau	Suburban Ottawa	Suburban Gatineau	Rural Ontario	Rural Quebec	Total
Central Ottawa	40050	1430	49050	4430	21490	11800	4360	3290	135910
Central Gatineau	1810	1180	3740	3590	1910	5790	230	2160	20410
Urban Ottawa	23530	1090	159880	3530	46850	10780	12200	3440	261300
Urban Gatineau	1210	1520	2600	12420	1310	12760	190	4750	36760
Suburban Ottawa	3850	210	20030	680	60840	1900	7370	570	95440
Suburban Gatineau	1270	850	2380	4980	770	40620	330	8300	59490
Rural Ontario	880	30	5220	90	5630	620	9690	270	22420
Rural Quebec	430	110	800	820	260	3590	100	8950	15050
Total	73030	6410	243690	30550	139050	87860	34450	31730	646770
PM PEAK TRIP RATES (BY DEST RESIDENTS)	Central Ottawa	Central Gatineau	Urban Ottawa	Urban Gatineau	Suburban Ottawa	Suburban Gatineau	Rural Ontario	Rural Quebec	Total
Central Ottawa	0.42	0.16	0.12	0.09	0.08	0.08	0.05	0.05	0.12
Central Gatineau	0.02	0.13	0.01	0.07	0.01	0.04	0.00	0.03	0.02
Urban Ottawa	0.25	0.12	0.38	0.07	0.18	0.07	0.14	0.05	0.23
Urban Gatineau	0.01	0.17	0.01	0.25	0.00	0.08	0.00	0.07	0.03
Suburban Ottawa	0.04	0.02	0.05	0.01	0.23	0.01	0.09	0.01	0.08
Suburban Gatineau	0.01	0.10	0.01	0.10	0.00	0.26	0.00	0.12	0.05
Rural Ontario	0.01	0.00	0.01	0.00	0.02	0.00	0.12	0.00	0.02
Rural Quebec	0.00	0.01	0.00	0.02	0.00	0.02	0.00	0.13	0.01
Total	0.77	0.73	0.57	0.62	0.53	0.56	0.41	0.46	0.56
PM PEAK PERCENTAGES	Central Ottawa	Central Gatineau	Urban Ottawa	Urban Gatineau	Suburban Ottawa	Suburban Gatineau	Rural Ontario	Rural Quebec	Total
Central Ottawa	6.2%	0.2%	7.6%	0.7%	3.3%	1.8%	0.7%	0.5%	21.0%
Central Gatineau	0.3%	0.2%	0.6%	0.6%	0.3%	0.9%	0.0%	0.3%	3.2%
Urban Ottawa	3.6%	0.2%	24.7%	0.5%	7.2%	1.7%	1.9%	0.5%	40.4%
Urban Gatineau	0.2%	0.2%	0.4%	1.9%	0.2%	2.0%	0.0%	0.7%	5.7%
Suburban Ottawa	0.6%	0.0%	3.1%	0.1%	9.4%	0.3%	1.1%	0.1%	14.8%
Suburban Gatineau	0.2%	0.1%	0.4%	0.8%	0.1%	6.3%	0.1%	1.3%	9.2%
Rural Ontario	0.1%	0.0%	0.8%	0.0%	0.9%	0.1%	1.5%	0.0%	3.5%
Rural Quebec	0.1%	0.0%	0.1%	0.1%	0.0%	0.6%	0.0%	1.4%	2.3%
Total	11.3%	1.0%	37.7%	4.7%	21.5%	13.6%	5.3%	4.9%	

The PM peak period flows (representing trips that start from 3:30 PM to 5:59 PM) approximate the reverse of the AM flows, with central Ottawa now serving as a source for over 20% of trips but a destination for just 11%. The largest destination grouping is the suburban Ottawa area (outside the greenbelt), while the urban areas attract and produce similar numbers of trips to AM—they are reasonably balanced at both peak times of day. Overall, trip volumes are around 12% higher in PM than in AM, with the interprovincial percentage, at 9.8%, almost the same (the directionality, of 3.0% to Ontario and 6.8% to Québec, is reversed).



**Table 3-3: Midday off-peak period trips between aggregated districts**

MIDDAY OFF PEAK FLOWS	Central Ottawa	Central Gatineau	Urban Ottawa	Urban Gatineau	Suburban Ottawa	Suburban Gatineau	Rural Ontario	Rural Quebec	Total
Central Ottawa	70320	1100	44130	1980	9350	3960	2350	910	134100
Central Gatineau	1650	2090	1340	3150	580	2110	20	580	11510
Urban Ottawa	47370	1290	259700	2630	35100	5490	8900	2180	362660
Urban Gatineau	2150	2340	2340	21410	670	10420	160	2910	42400
Suburban Ottawa	10030	420	35140	600	93290	790	8890	560	149710
Suburban Gatineau	3510	1600	4610	10020	850	53940	160	6900	81580
Rural Ontario	2260	60	9440	90	8530	280	15240	140	36030
Rural Quebec	1060	350	1750	2510	360	5530	90	13150	24810
Total	138340	9250	358440	42380	148740	82510	35810	27330	842810

MIDDAY OFF-PEAK TRIP RATES (BY ORIGIN RESIDENTS)	Central Ottawa	Central Gatineau	Urban Ottawa	Urban Gatineau	Suburban Ottawa	Suburban Gatineau	Rural Ontario	Rural Quebec	Total
Central Ottawa	0.74	0.01	0.47	0.02	0.10	0.04	0.02	0.01	1.41
Central Gatineau	0.19	0.24	0.15	0.36	0.07	0.24	0.00	0.07	1.32
Urban Ottawa	0.11	0.00	0.61	0.01	0.08	0.01	0.02	0.01	0.85
Urban Gatineau	0.04	0.05	0.05	0.43	0.01	0.21	0.00	0.06	0.86
Suburban Ottawa	0.04	0.00	0.13	0.00	0.36	0.00	0.03	0.00	0.57
Suburban Gatineau	0.02	0.01	0.03	0.06	0.01	0.34	0.00	0.04	0.52
Rural Ontario	0.03	0.00	0.11	0.00	0.10	0.00	0.18	0.00	0.43
Rural Quebec	0.02	0.01	0.03	0.04	0.01	0.08	0.00	0.19	0.36
Total	0.12	0.01	0.31	0.04	0.13	0.07	0.03	0.02	0.73

OFF-PEAK PERCENTAGES	Central Ottawa	Central Gatineau	Urban Ottawa	Urban Gatineau	Suburban Ottawa	Suburban Gatineau	Rural Ontario	Rural Quebec	Total
Central Ottawa	8.3%	0.1%	5.2%	0.2%	1.1%	0.5%	0.3%	0.1%	15.9%
Central Gatineau	0.2%	0.2%	0.2%	0.4%	0.1%	0.3%	0.0%	0.1%	1.4%
Urban Ottawa	5.6%	0.2%	30.8%	0.3%	4.2%	0.7%	1.1%	0.3%	43.0%
Urban Gatineau	0.3%	0.3%	0.3%	2.5%	0.1%	1.2%	0.0%	0.3%	5.0%
Suburban Ottawa	1.2%	0.0%	4.2%	0.1%	11.1%	0.1%	1.1%	0.1%	17.8%
Suburban Gatineau	0.4%	0.2%	0.5%	1.2%	0.1%	6.4%	0.0%	0.8%	9.7%
Rural Ontario	0.3%	0.0%	1.1%	0.0%	1.0%	0.0%	1.8%	0.0%	4.3%
Rural Quebec	0.1%	0.0%	0.2%	0.3%	0.0%	0.7%	0.0%	1.6%	2.9%
Total	16.4%	1.1%	42.5%	5.0%	17.6%	9.8%	4.2%	3.2%	

In the midday period (covering trips that start from 9:00 AM to 3:29 PM) there are more trips overall than in either individual peak, but only by around 20%, and the time period is twice as long. All the groups of districts are reasonably balanced in trips in and out, with 61% of trips taking place within the same district grouping, compared to 50% in the PM peak period and 47% in the AM peak period, indicating that trips are shorter on average in the off-peak. 5.2% of trips cross the provincial boundary; 2.5% Québec-Ontario, and 2.7% Ontario-Québec.



### 3.2 Trip time distributions

The peak to off-peak conversion factor represents the volume from the sum of the two peak periods (AM and PM) divided by the off-peak volume (the part of the day in between AM and PM peaks, from 9:00 AM to 3:30 PM). Therefore, a factor greater than 1 indicates that more trips using that particular mode take place during the peak periods than in the intermediate off-peak. A factor less than 1 means the opposite.

Table 3-4 shows that some modes are very closely focused on the peak periods, while others are more evenly distributed over the course of the day. School buses could be expected to have a high peak-period focus as they only run at specific times of day (before and after school), and transit also is concentrated on peak periods indicating more of a focus on work/school commuting for transit usage as opposed to discretionary trips. Motorcycles have a very small absolute number (hence survey sample) so it is difficult to reach a conclusion from their factor. Meanwhile, walking and taxi travel are much less oriented towards the peak periods. It can be inferred from the difference between the auto-drive and auto-passenger numbers that ridesharing may be more likely to take place during the peak periods and driving alone may be more likely during the off-peak. This time-occupancy relationship is investigated further in Exhibit 4-31.

We can see from the “all modes” value that, overall, there are 44% more trips during the peak periods than during the intervening off-peak. There are more transit trips during either peak period individually than in the intervening off-peak.

**Table 3-4: NCR peak to off-peak variability by mode**

Mode	Peak trips / Midday Off-peak trips Ratio
School bus	2.46
Motorcycle	2.32
Public transit	2.20
Bicycle	1.70
Auto-passenger	1.58
Other	1.42
Auto-driver	1.34
Walk	0.96
Taxi	0.52
All Modes	1.44

With a similar, but graphical, representation of the time-of-day influence on trips by mode, we can also see the differences between the two peak periods and between the modes via a 24-hour midnight-to-midnight profile of hourly demand (based on trip start times). This modal difference is elaborated with additional charts in Section 4.2. For now,

it is interesting to note that while both auto-drive and transit feature a two-peak profile, the PM peak is sharper for auto (maximum hourly volume of 165,000 in PM and 137,000 in AM) whereas the transit peak is sharper in the AM (maximum hourly volume of 47,800, compared with 43,800 in the PM). This indicates that trip purposes with a higher auto mode share are more prevalent in the PM than in the AM peak, which is investigated further in the next section. While the AM peak looks similar (time-wise, not volume-wise) for all the modes, every mode appears to have a slightly different PM peak period distribution, with the school bus peak beginning first, then walking, then transit, and finally auto. There is also a “mini-peak” at midday, which is especially noticeable for walk trips (though also present for drive trips); this suggests lunchtime activity.

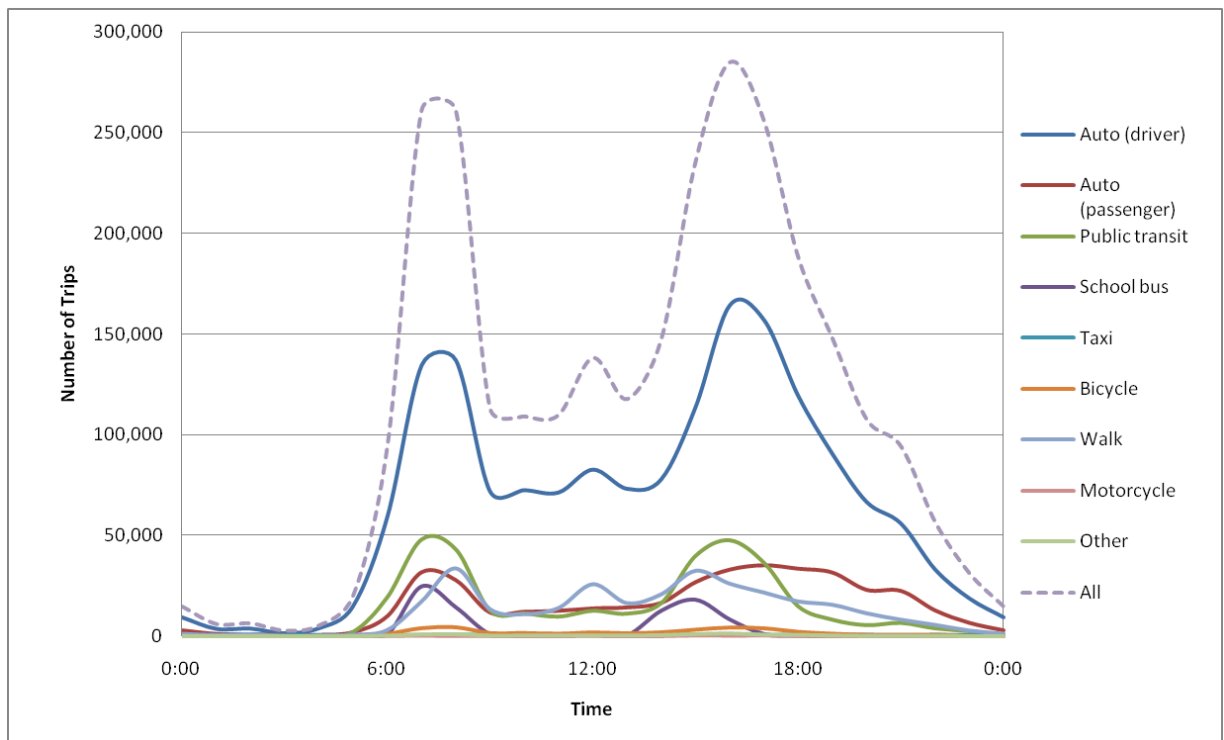


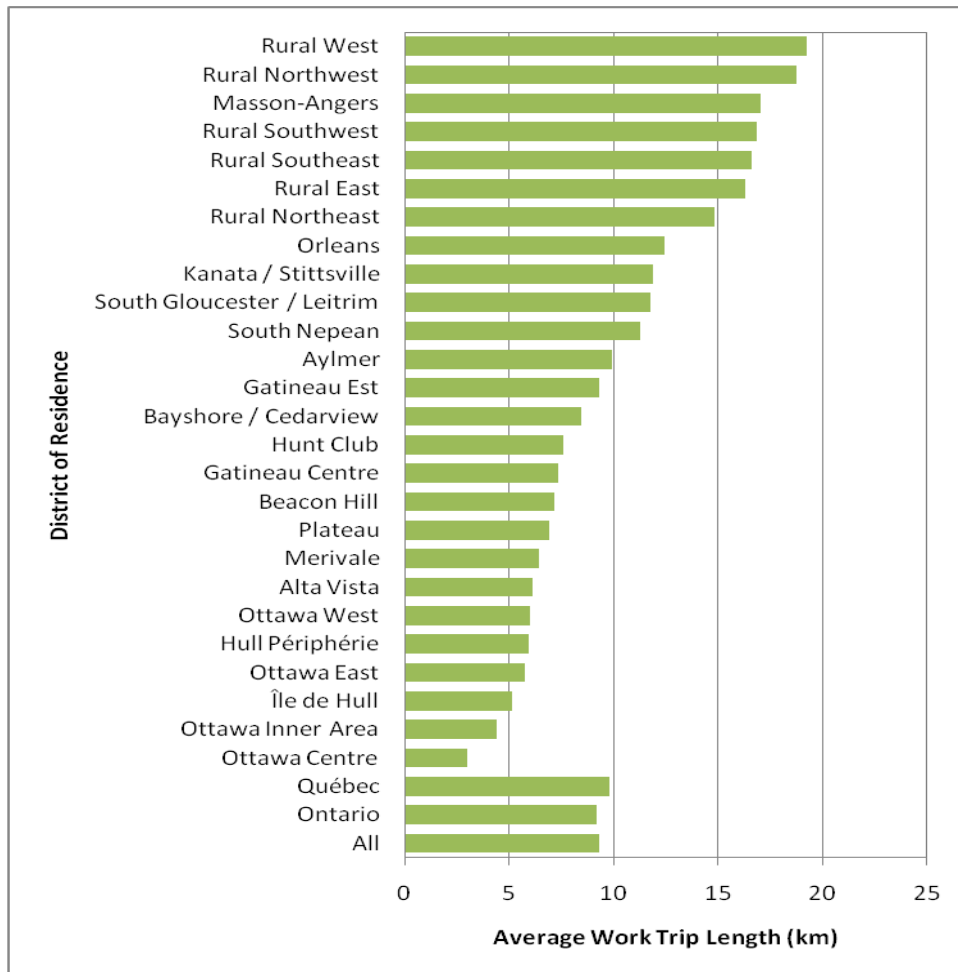
Exhibit 3-16: NCR hourly trip variations by mode, 2005

### 3.3 Work trip profiles

The average distance travelled to get to work by district is indicated in Exhibit 3-17. The chart has a profile close to opposite that of the jobs chart (Exhibit 2-4); while similar to that of the vehicles per household chart, in high-employment urban areas such as central Ottawa (Ottawa Centre and Ottawa Inner Area) and Île de Hull the average work trip is less than 5 km. At the other extreme, those living in rural areas travel around 15 km on average to get to work. In between, the results are mixed: for example, Alta Vista, with its high population and jobs, average 5 km, while Kanata/Stittsville, with its almost even balance of jobs and workers, averages 8.5 km. Again, this suggests that the jobs/worker balance does not necessarily mean that people live and work in the same district.

The mean distance travelled to work is 9.33 km (9.18 in Ontario and 9.78 in Québec). However, if we look just at the urban area as defined in Section 2.2, the mean distance drops to 8.02 km.

For CMAs across Canada, Montréal, Vancouver and Calgary show similar commuting distances, with Toronto averaging approximately 1 km longer, despite its greater urban density (TAC, 2009, p. 31).



**Exhibit 3-17: Length of trip to work by place of residence, 2005**

Exhibit 3-18, below, shows how the percentage of the population who work at home or telecommute instead of making a work trip varies by district. It is interesting to see that there is apparently no correlation with density or location of the district, as the rural areas are found at both the top and bottom of the chart. The Rural West, with a density of much less than 1 job/resident worker, has effectively the same percentage of home-workers as Ottawa Centre with more than 20 jobs for each resident worker. The overall average for the NCR is 9.6%, and most districts are within a small range of this figure.

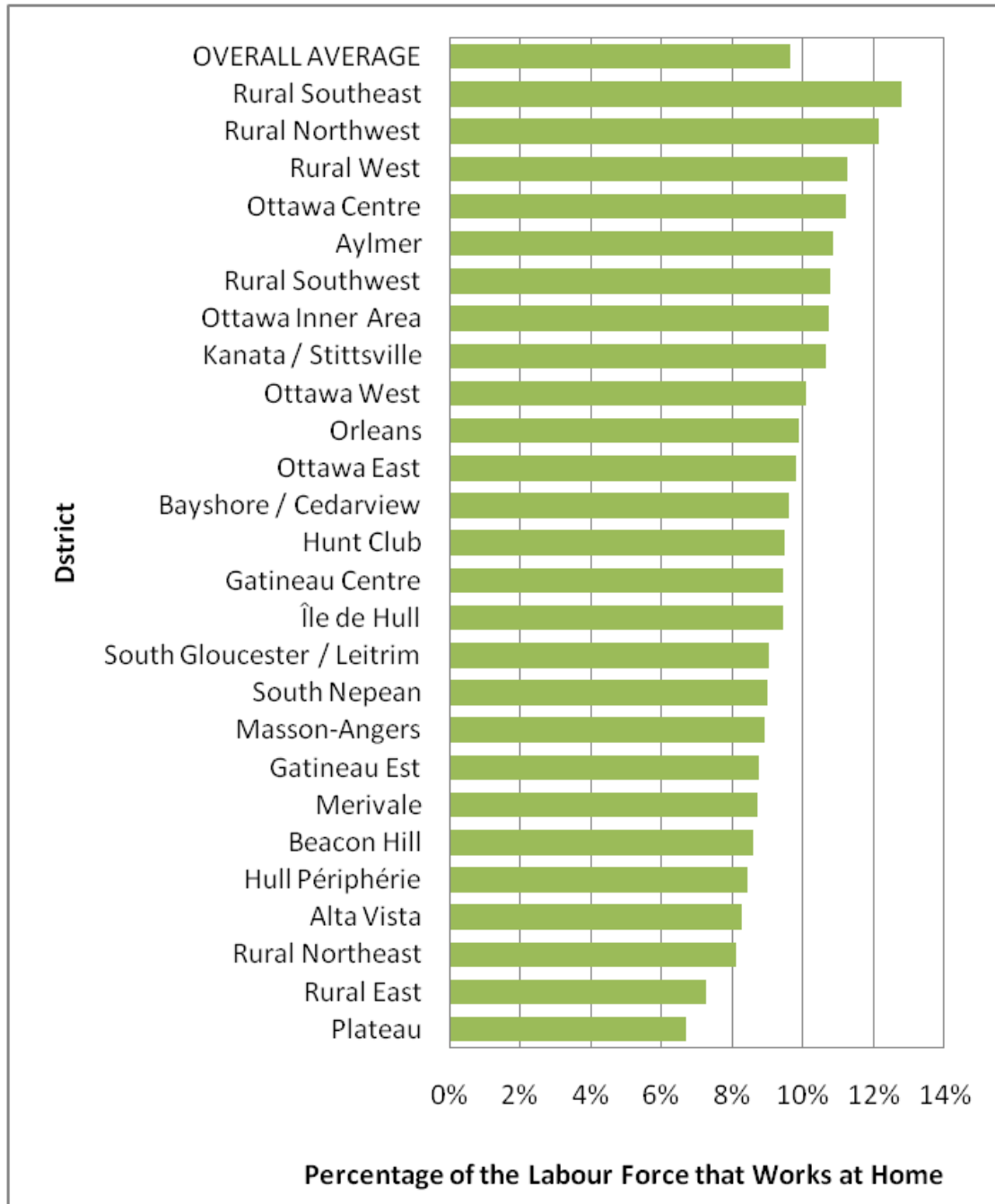
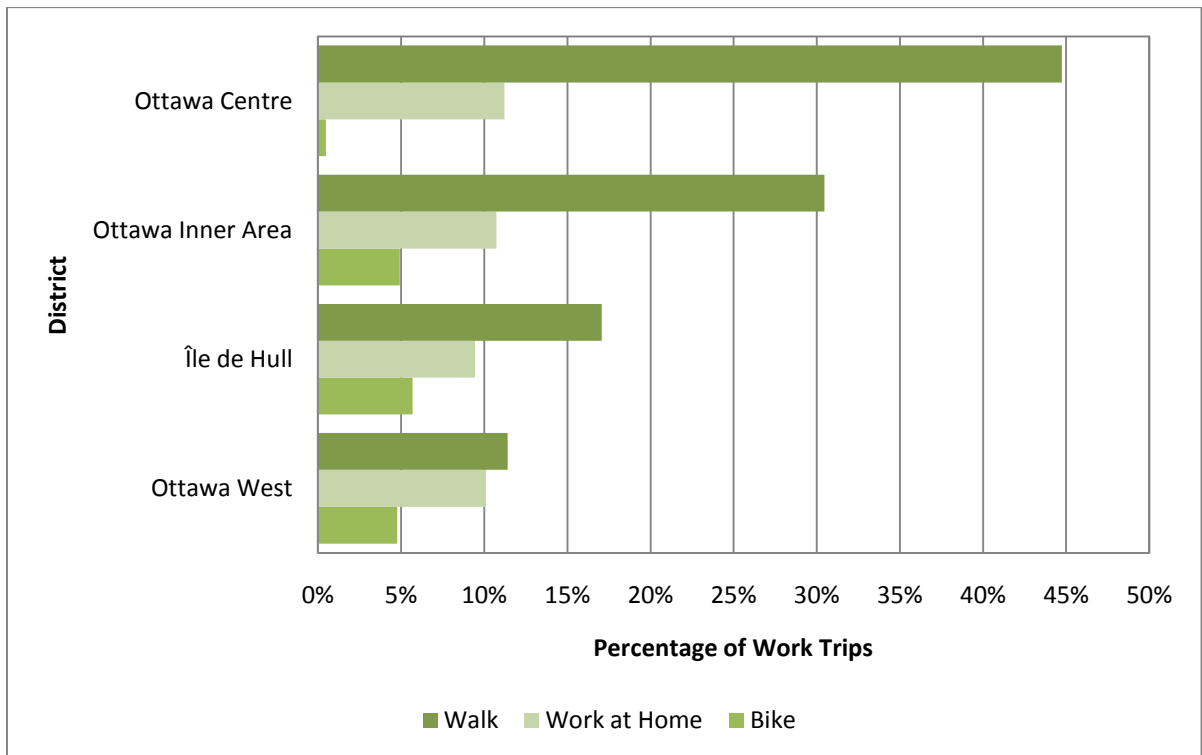


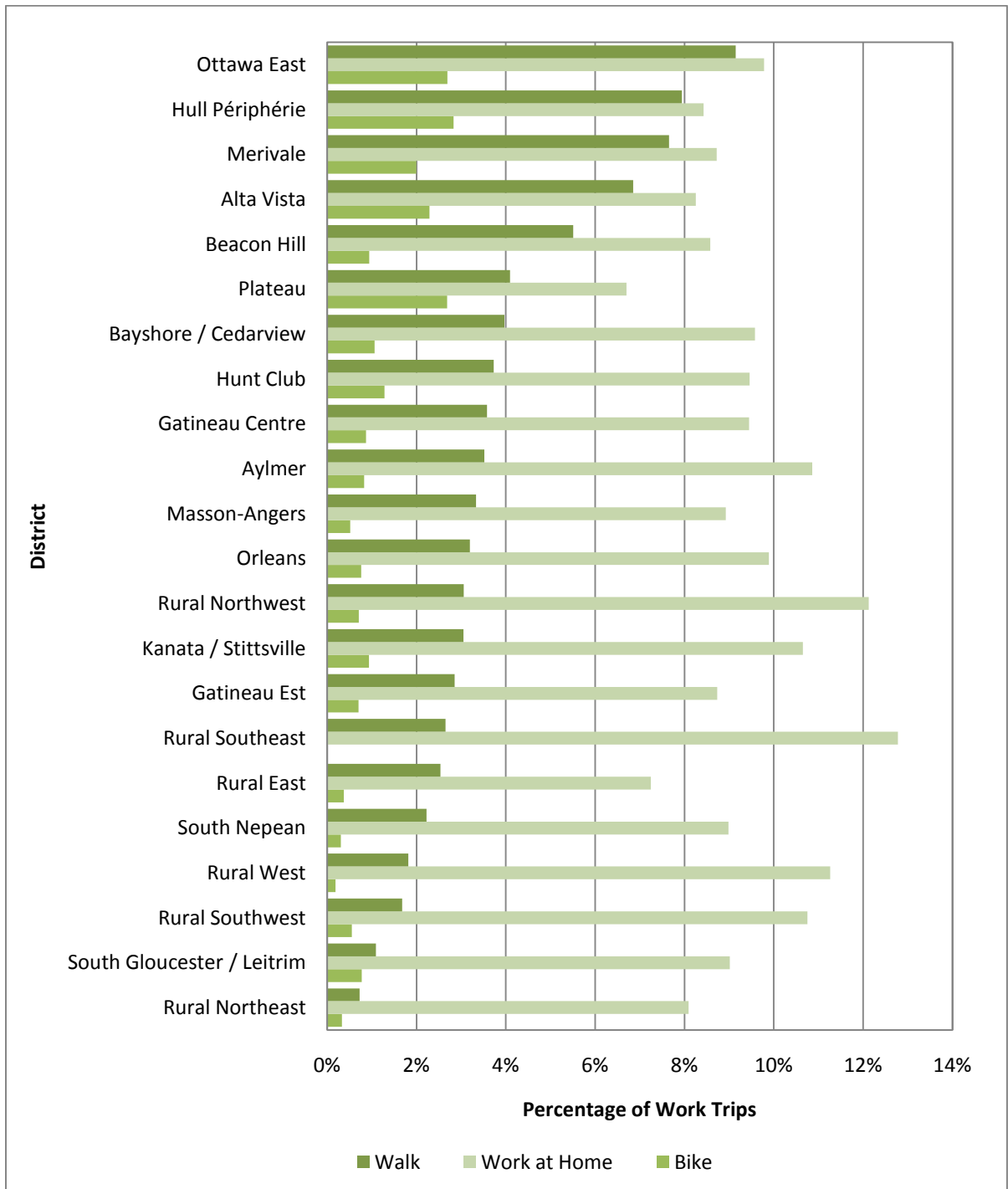
Exhibit 3-18: Rate of working at home / telecommuting by place of residence, 2005

The percentage of those working at home can also be compared with people who travel to work by non-motorized means (walking or cycling). This comparison is separated into two parts, Exhibit 3-19 and Exhibit 3-20, because of the great difference in percentage of non-motorized travellers between dense urban areas and much more spread out suburban and rural districts. As seen previously, there is no especial relation between density and percentage of the labour force working at home.

In Ottawa Centre, 56% of resident workers do not use motorized means to reach their jobs (including 11% working at home) while in the Rural Northeast only 9% do not use motorized means (including 8% working at home). This illustrates the extent of the difference in the viability of walking and cycling to work within the NCR—there is an evident correlation with the trip length chart in Exhibit 3-17.



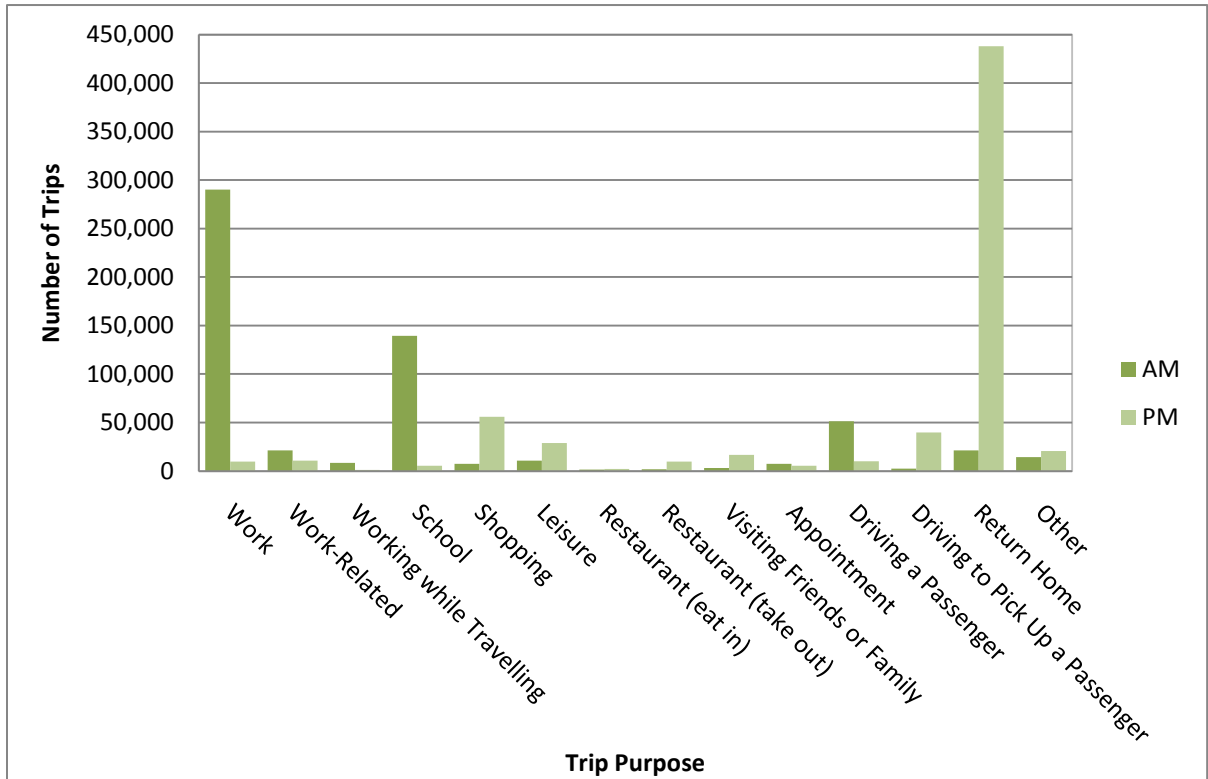
**Exhibit 3-19: Percentage of non-motorized commuters (walk + bike + work at home) by place of residence in urban areas, 2005**



**Exhibit 3-20: Percentage of non-motorized commuters (walk + bike + work at home) by place of residence in suburban and rural areas, 2005**

### 3.4 Trips by purpose

Exhibit 3-21 shows a detailed breakdown of trip purposes across the NCR for peak-period travel. Work and school trips dominate the AM peak, with most trips in the PM peak being to return home (presumably mainly from work and school).



**Exhibit 3-21: NCR trip breakdown by detailed destination purpose (peak periods, 2005)**

Exhibit 3-22 illustrates the propensity of people belonging to specific occupation classes to make trips with each particular purpose. While, as expected, work trips are almost all made by workers and school trips are almost all made by students, workers also lead other categories such as leisure and serve passenger, although the single greatest number of shopping trips is made by non-workers. (Note that the occupation classes are self-reported by survey respondents – meaning, for example, that a self-described student also could hold a job.)

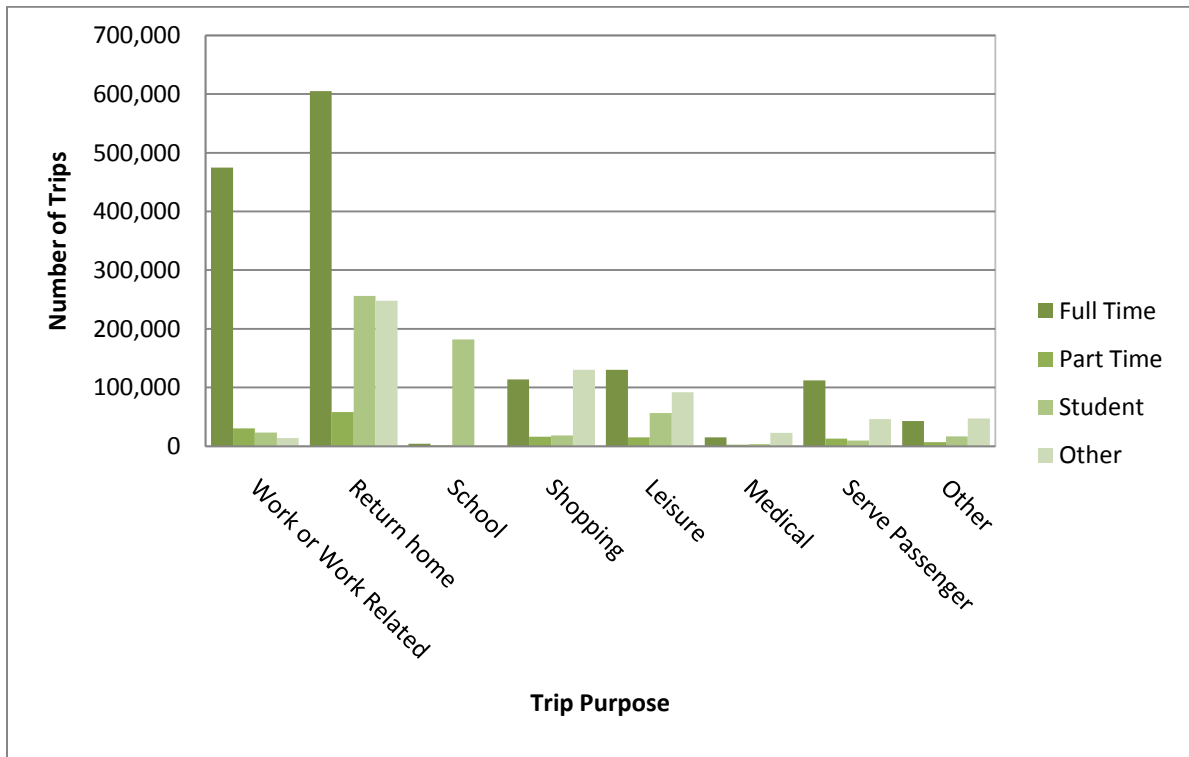


Exhibit 3-22: NCR trip breakdown by purpose and occupation status, 2005

### 3.5 Conclusion

This section has identified patterns in trip-making and major flows across the NCR, indicating that average trip length by district varies between 6 and 15 km (and is inversely related to the employment density of the district), that non-motorized trips represent a large percentage of trips in urban cores but a low to significant percentage elsewhere (but work at home rates are not affected by density), and that workers represent the highest fraction of trip-makers for all trip purposes other than school and shopping.



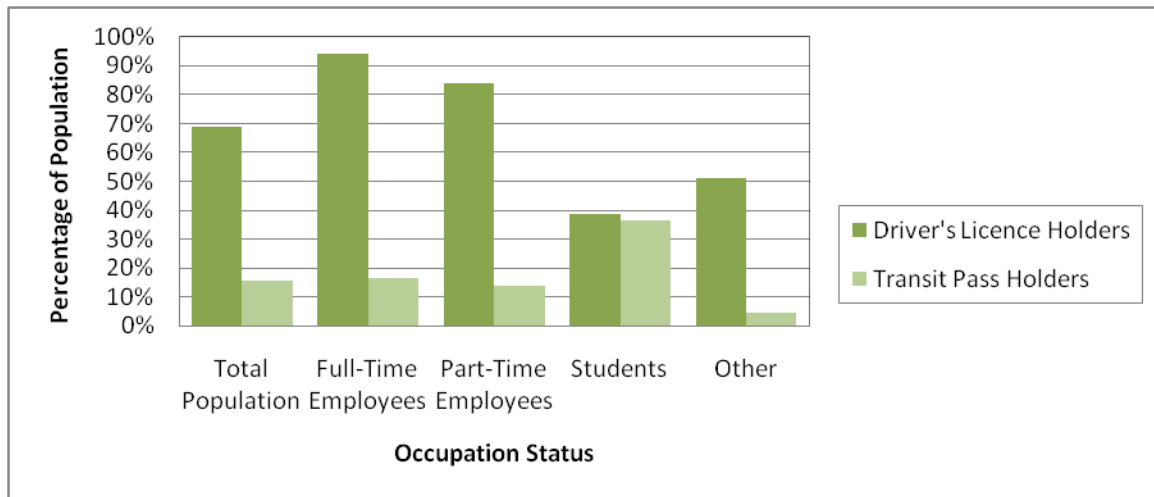
## 4. Modal Shares

This section, following on from the isolation of trip characteristics such as purposes and times, breaks trips down further into the possible modes that can be used to complete the trip. It looks at different demographic characteristics, such as occupation and possession of a driver’s licence, to assess the impact of these on what mode is chosen to travel, as well as how purpose and location influence the choice of mode.

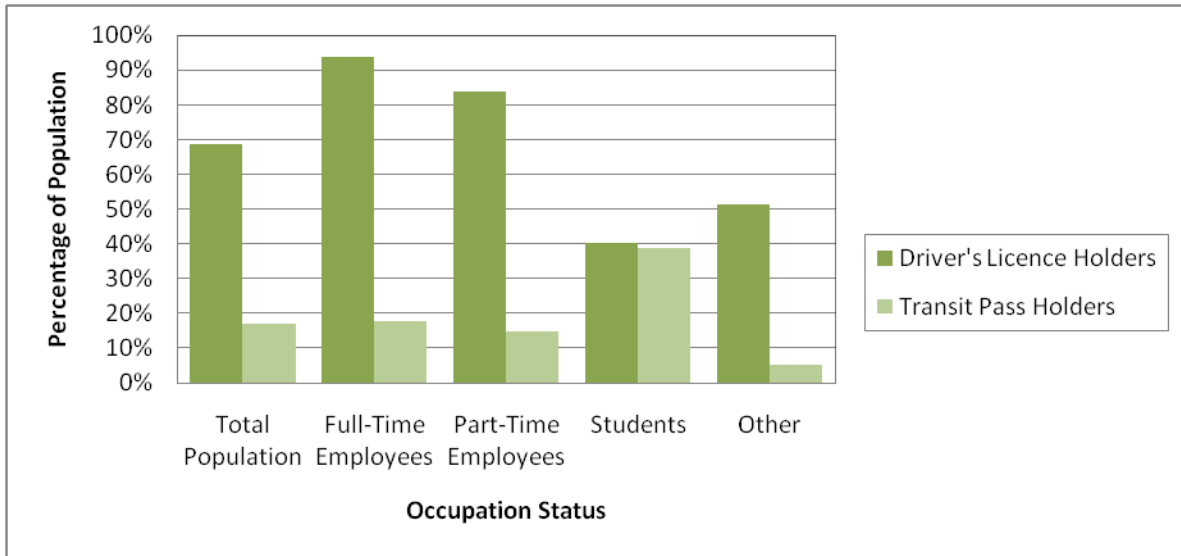
### 4.1 Mode availability

The mode chosen to make trips is to some extent determined by household or personal attributes. Without a driver’s licence or an available vehicle, the auto-drive mode is not an option, while possessing a transit pass makes choosing transit very likely. Exhibit 4-1, Exhibit 4-2 and Exhibit 4-3 describe how licence and pass possession vary between occupation groups, for the NCR, Ontario and Québec, respectively. In all three geographic categories, substantially more people have driver’s licences than transit passes except in the student category, where the numbers are close together at 35 to 40%.

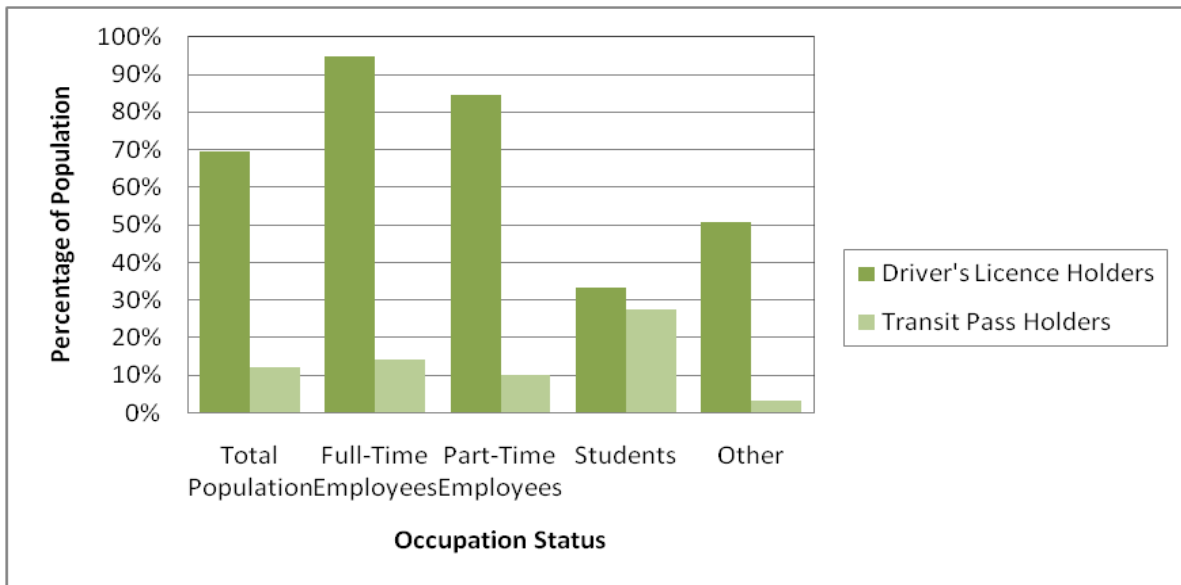
It can also be noted that while driver’s licence possession is almost the same in the Ontario and Québec sectors (69% and 70%), transit pass possession is appreciably lower in Québec (12% compared with 17% in Ontario).



**Exhibit 4-1: NCR driver’s licence and transit pass holders by occupation status, 2005**



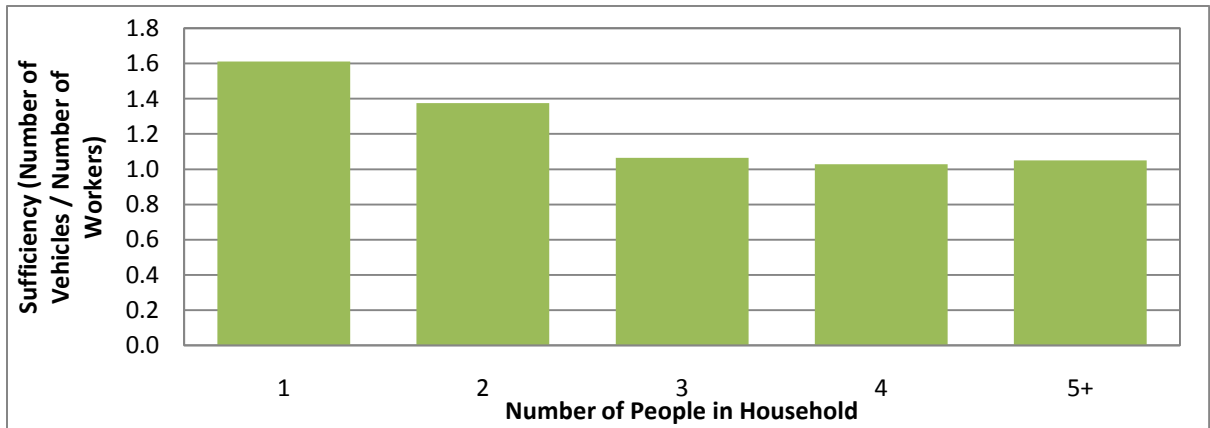
**Exhibit 4-2: Ontario driver's licence and transit pass holders by occupation status, 2005**



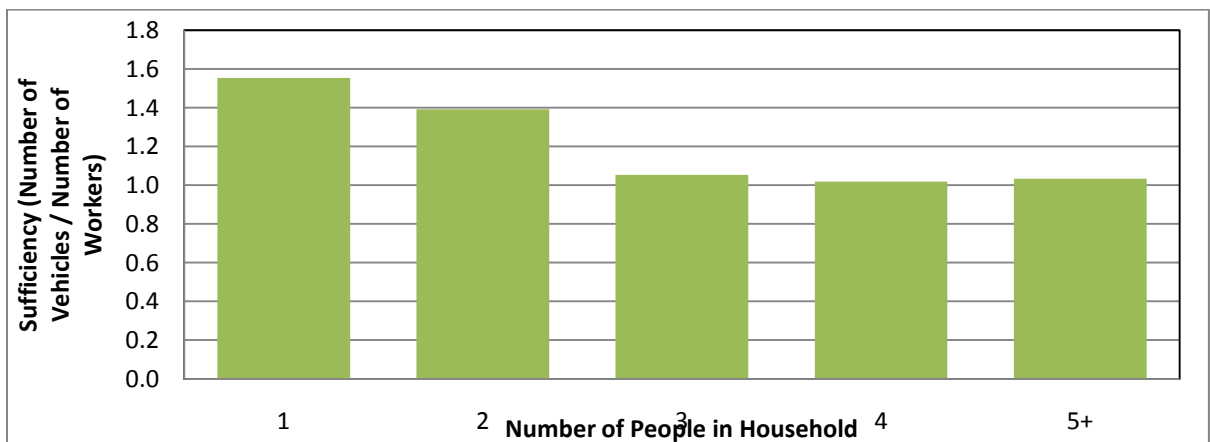
**Exhibit 4-3: Québec driver's licence and transit pass holders by occupation status, 2005**

In Exhibit 4-4, Exhibit 4-5 and Exhibit 4-6, we can see that the number of vehicles per number of workers (car sufficiency) at a household level decreases but remains relatively constant for 3 people and more without dropping below 1, even as the number of people (not specifically workers) in the household increases to 5 or more. The 1.6 approximate value for one-person households indicates the presence of a substantial number of non-workers who still have a car (such as retired people) We do not see workers in large

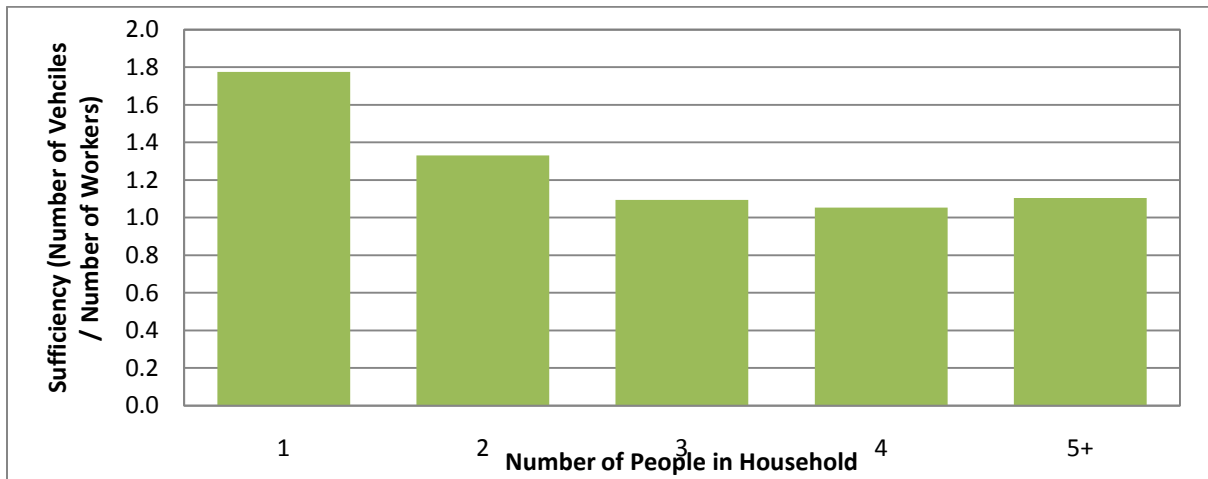
households being left without access to a car; although the car might be used by a non-worker, Exhibit 4-1 above shows that non-workers are much less likely to have drivers' licences.



**Exhibit 4-4: NCR vehicle sufficiency per worker, 2005**



**Exhibit 4-5: Ontario vehicle sufficiency per worker, 2005**



**Exhibit 4-6: Québec vehicle sufficiency per worker, 2005**

## 4.2 Mode choice overview

A general look at mode shares and how they are affected by the purpose of the trip in the NCR is shown in Exhibit 4-7, with the variation by time period instead of purpose shown subsequently in Exhibit 4-8.

From Exhibit 4-7 we see that auto drive is the preferred mode for all trip purposes other than trips to school (where transit is highest at 30%). The purposes with the highest drive share are serve passenger (reasonable, as it is usually necessary to drive in order to serve a passenger) and shopping (also reasonable, due to the requirement to carry purchases).

For work trips (the dominant purpose), 75% travel by auto (including driving, passenger, taxi, motorcycle or ‘other’), with 16% using transit, 7% walking and 2% cycling. This auto share is comparable to Toronto, Montréal, and Vancouver (all 72 to 75%) although in the larger cities with extensive rapid transit networks the transit share is higher (22% transit in Toronto and 21% transit in Montréal) and the non-motorized share lower. Vancouver, with a 17% transit share and 8% non-motorized share, has a very similar profile to the NCR (TAC, 2009).

For all trips of any purpose, transit share in the NCR drops to 13% but the non-motorized share goes up to 12% (10.5% walking and 1.5% cycling). This is in between Montréal (21% transit, 14% non-motorized) and Vancouver (12% transit, 14% non-motorized), though more comparable to Montréal in terms of having similar profiles for work and all trips. Toronto, in contrast, has a very low non-motorized share of 6%, though transit at 17% is similar to the NCR.

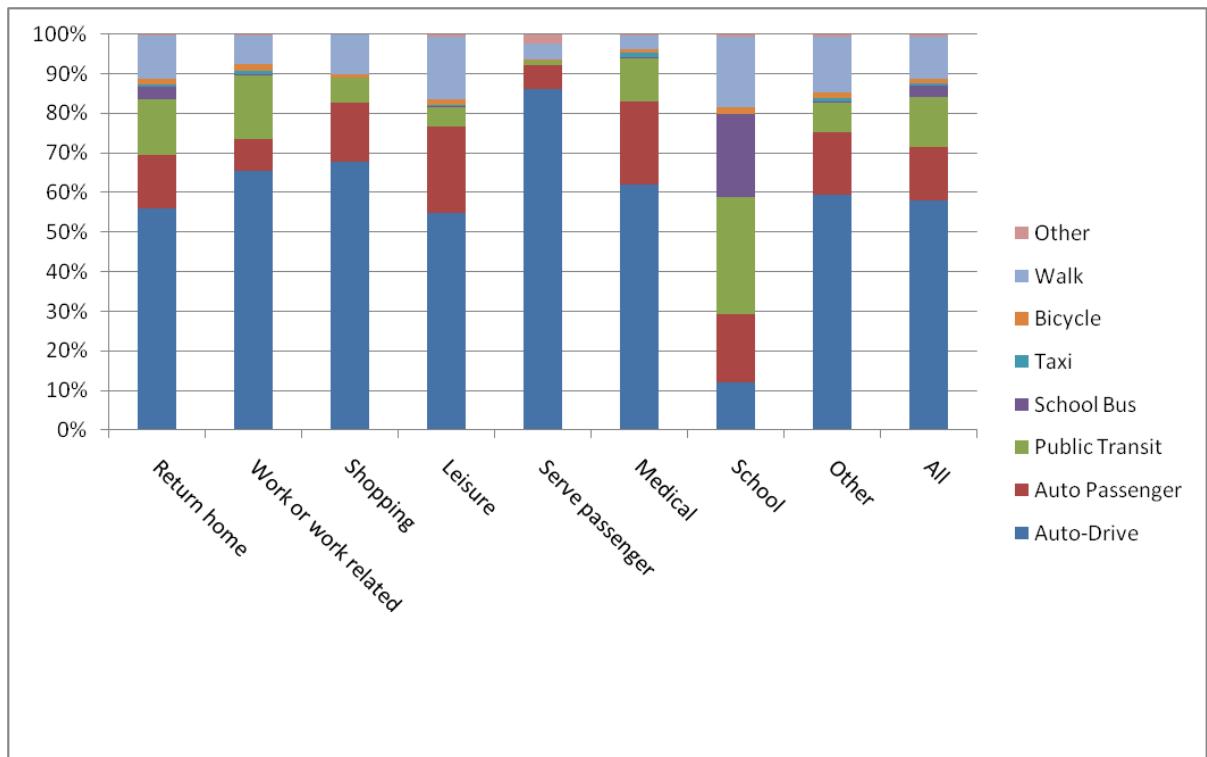


Exhibit 4-7: NCR trip breakdown by mode and purpose, 2005

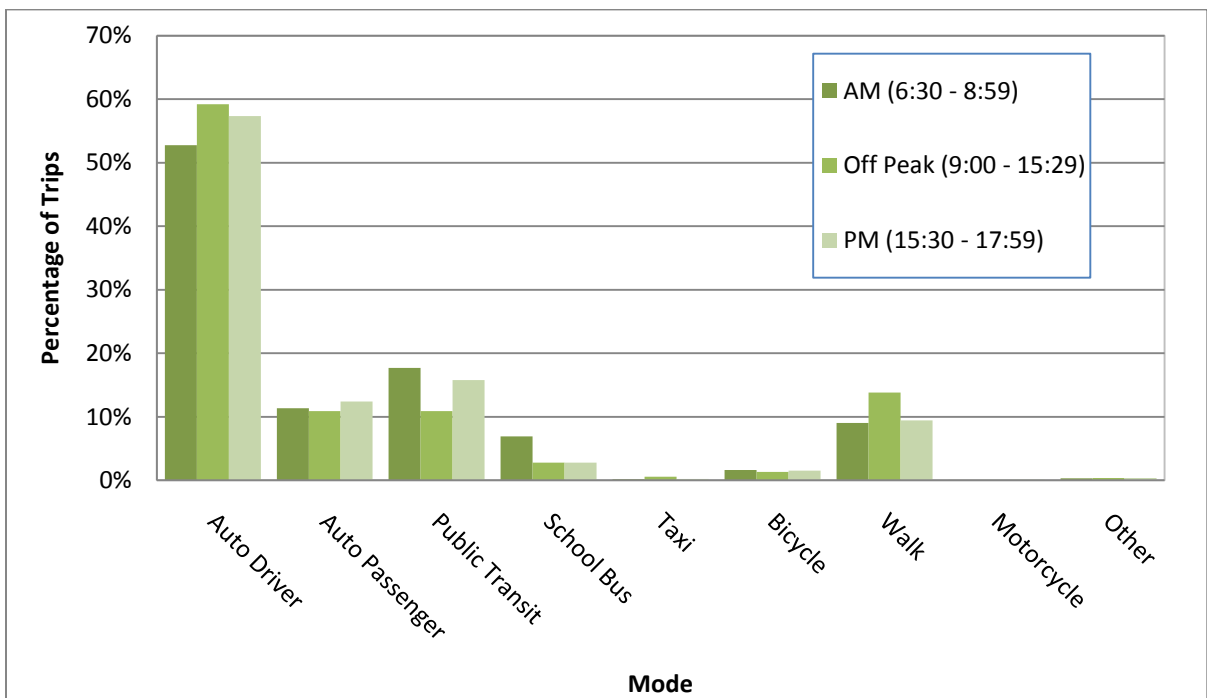


Exhibit 4-8: NCR trip breakdown by mode and time period, 2005

Examining the modes in detail as shown above (Exhibit 4-8) shows that we have in effect five modes (auto-drive, auto passenger, public transit, school bus, and walking) with others representing minimal influence. Auto-drive always represents more than half of trips, as high as 59% in the off-peak. From the time-period comparison, we also see that transit mode share decreases in the off-peak (from 18% in the AM peak or 16% in the PM peak to 11% in the off-peak) while, in general, others increase. This provides an alternate view of the information from Table 3-4 in the previous section, indicating once again that transit is much more peak-focused than the other modes. Walking, in contrast, represents a much greater proportion of trips in the off-peak (14%) than during peak periods (both 9%).

The mode shares for each of the three time periods are shown directly in Exhibit 4-9, Exhibit 4-10 and Exhibit 4-11. A higher PM peak auto-drive mode share is consistent with the higher volume of auto-drive trips observed for this time in Exhibit 3-16.

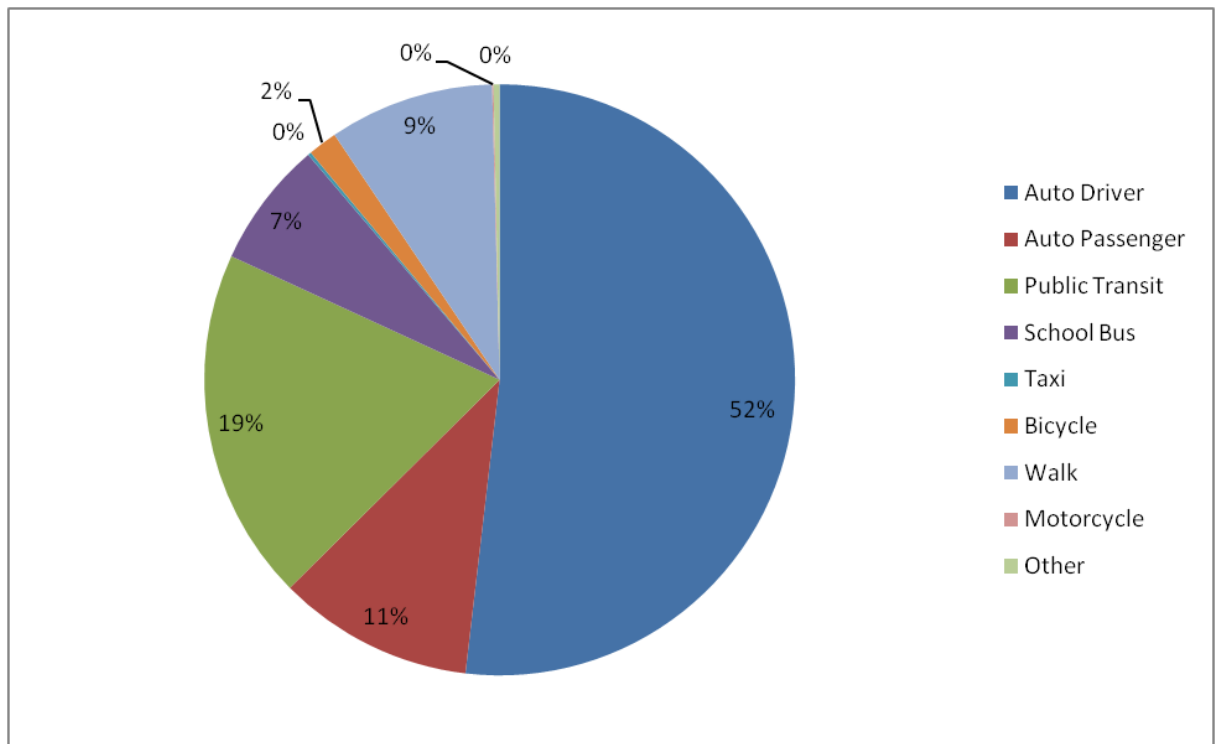
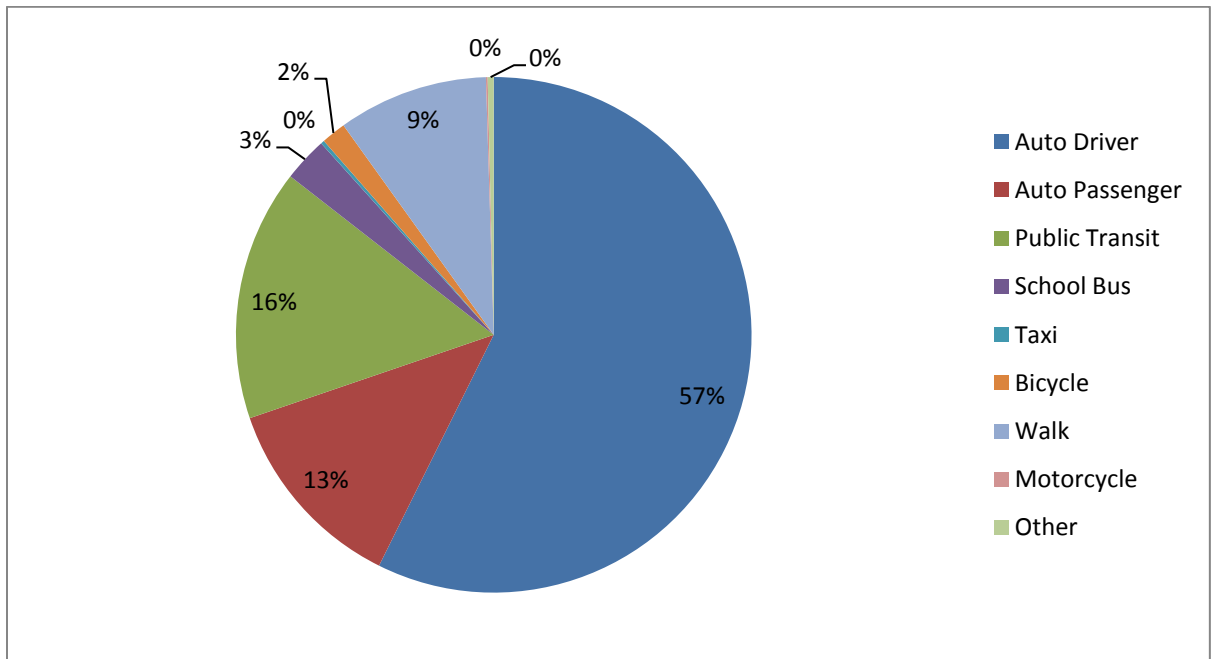
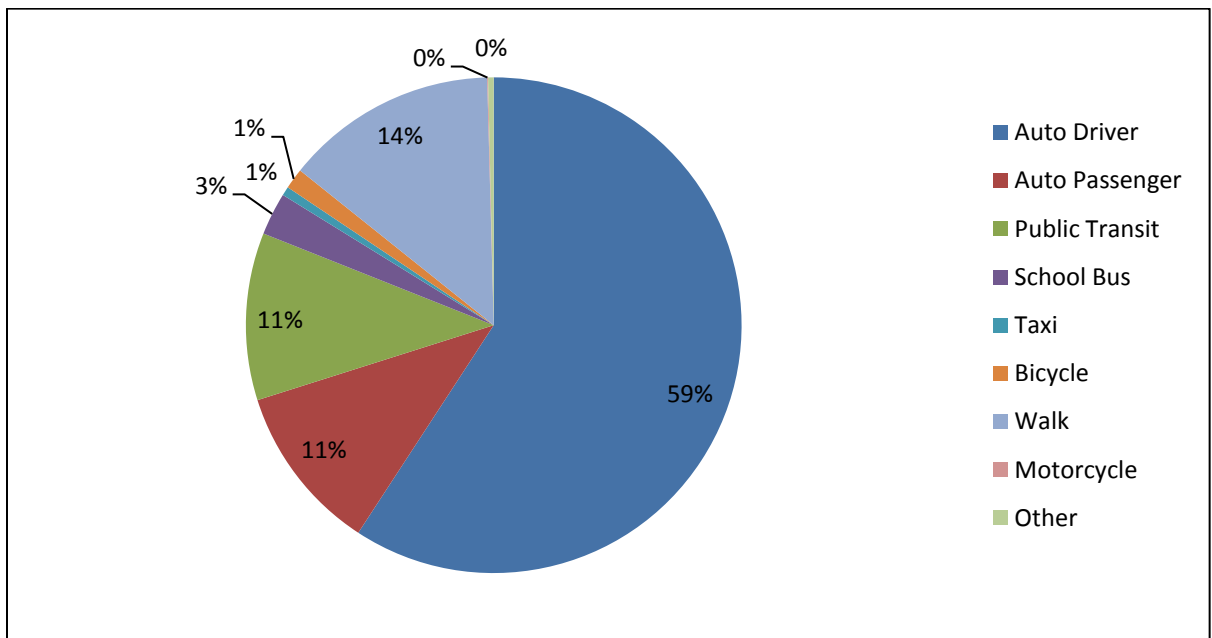


Exhibit 4-9: NCR mode share (AM peak period)



**Exhibit 4-10: NCR mode share (PM peak period)**

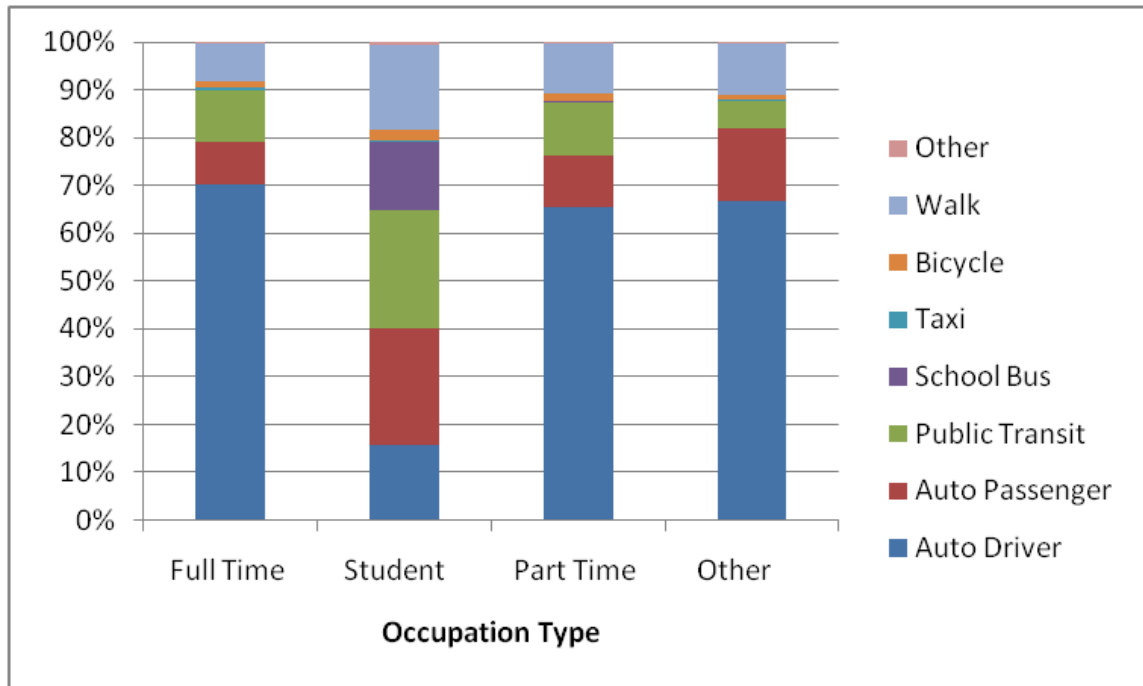


**Exhibit 4-11: NCR mode share (Midday off-peak period)**

In Exhibit 4-12, the mode shares are presented by occupation class and significant differences are observed. This chart is closely linked to Exhibit 4-7, given the link between purpose and occupation. Whereas driving accounts for 70% of full-time workers’ trips, it represents only 16% of students’ trips, behind transit (25%), passenger

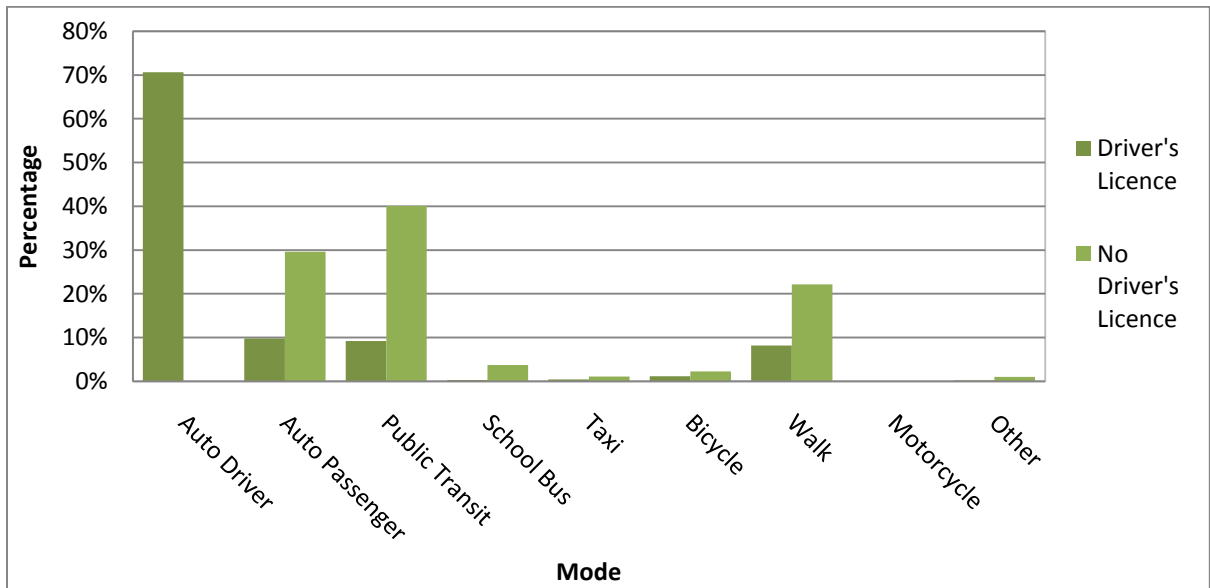


(24%) and walk (18%), and just ahead of school bus (14%). Full-time and part-time workers and non-worker/students follow similar mode share profiles. Transit usage is substantially lower for non worker/students (6%) than for either full-time or part-time workers (11%).



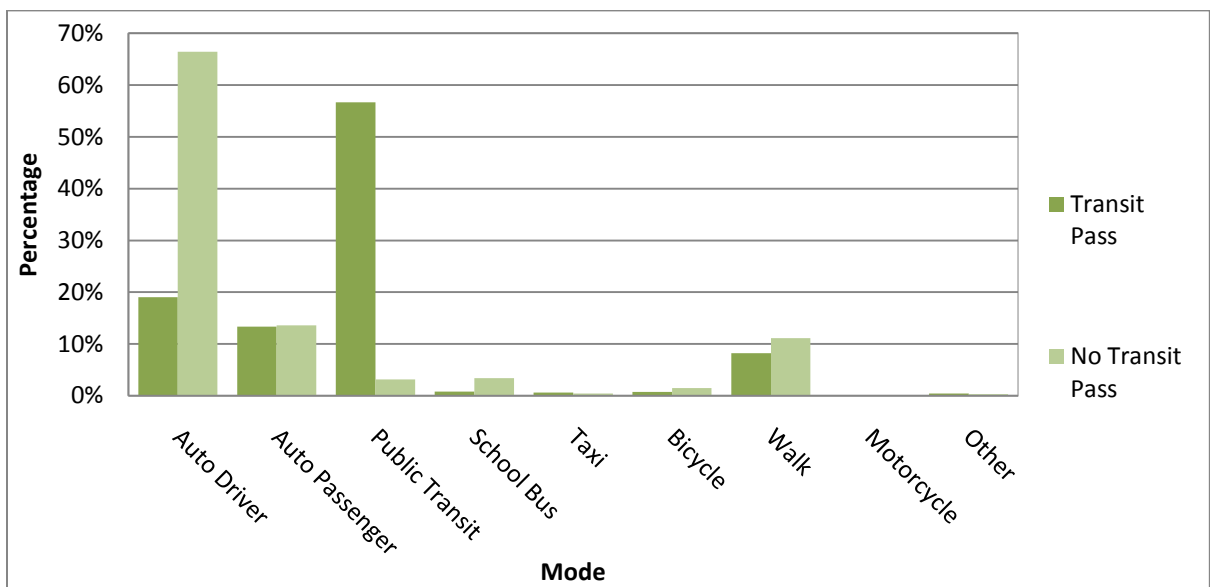
**Exhibit 4-12: NCR trip breakdown by mode and occupation status, 2005**

It is not surprising that, as seen in Exhibit 4-13, holders of a driver’s licence greatly favour the auto drive mode while those without one choose other modes, with public transit, auto passenger and walking receiving the greatest shares of trips by non-licensees. Driver’s licence possession is also linked closely to age and occupation, so the mode profiles shown are similar for these cases.



**Exhibit 4-13: NCR trip breakdown by mode and licence status, 2005**

As shown in Exhibit 4-14 below, possession of a transit pass has a large influence on the decision on what mode to take; in effect acquisition of a pass signifies an intention to use transit, or frequent use of transit enhances the likelihood of acquiring a pass. That being said, while only 5% of non-pass-holders use transit for their travel, there are still more than 40% who, despite having a pass, travel by other means. Interestingly, the auto passenger mode share remains constant with or without pass possession.



**Exhibit 4-14: NCR trip breakdown by mode and pass-holder status**

As seen in Exhibit 4-15, the gender balance is reasonably close concerning mode share but there is a definite favouring of the auto drive mode by men (63% to 54% for women) compared with the auto passenger mode (10% to 17%). Together, these numbers nearly balance out for cars as a whole (driver + passenger), meaning that the mode shares for the transit and non-motorized options are nearly the same by gender.

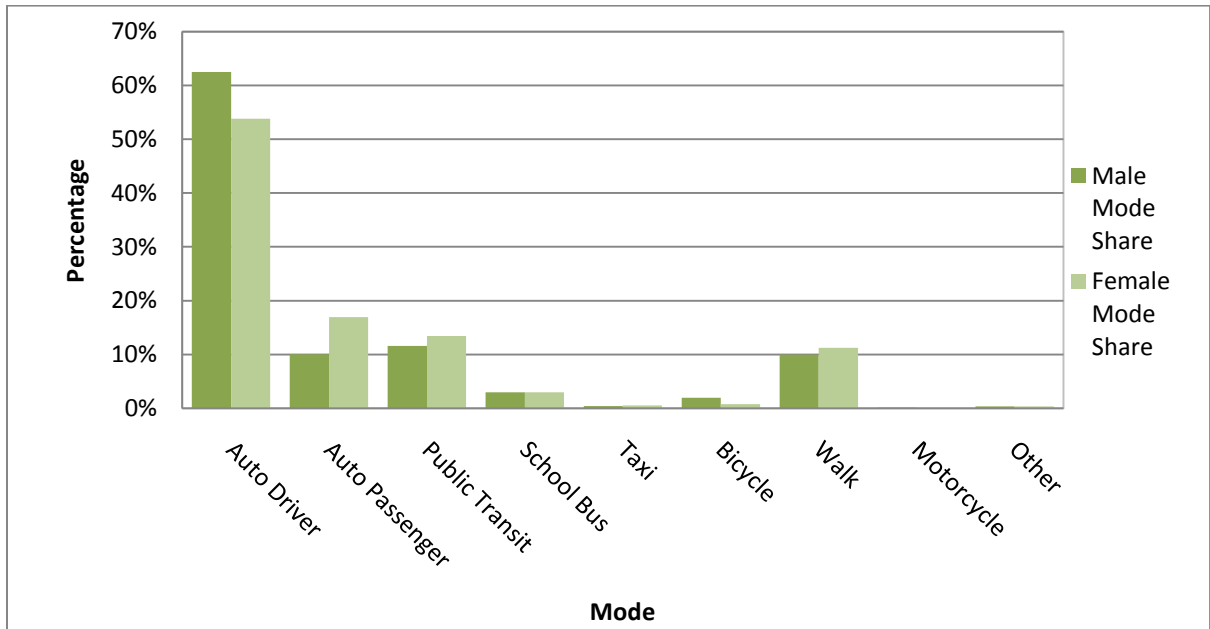
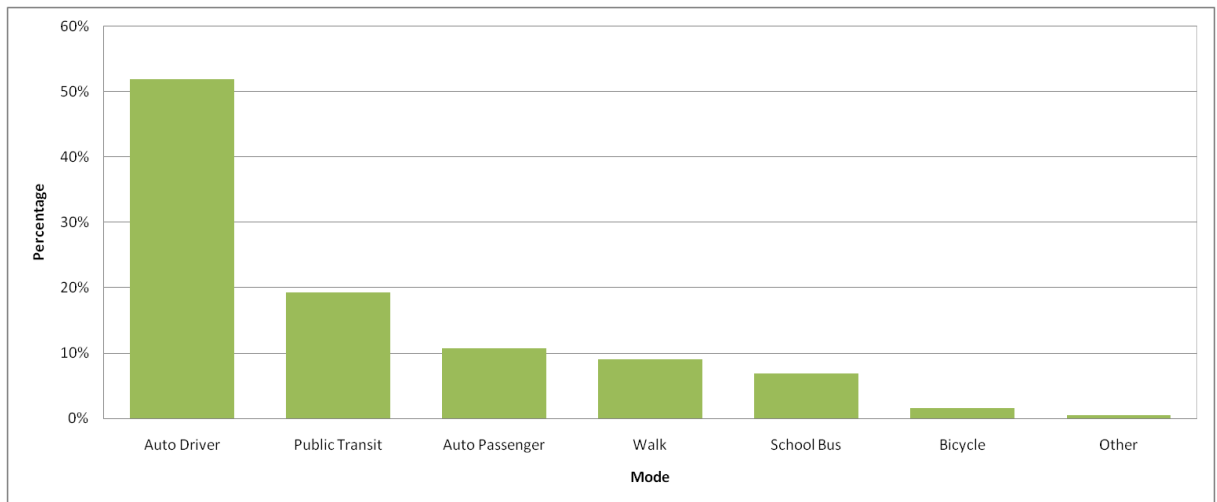


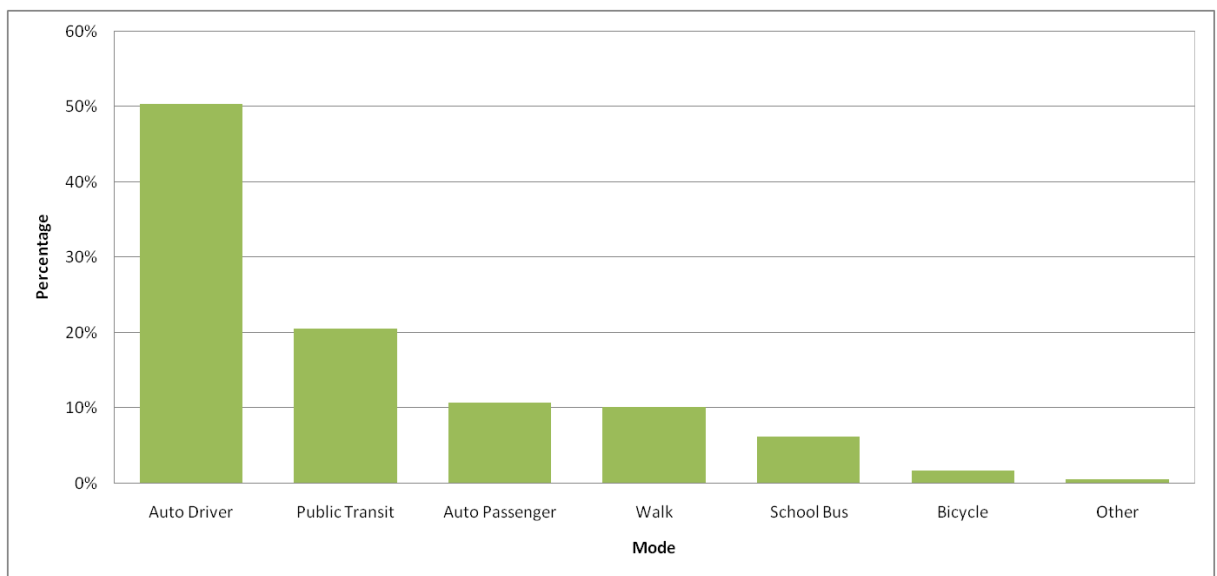
Exhibit 4-15: NCR trip breakdown by mode and gender

### 4.3 Mode choice by location

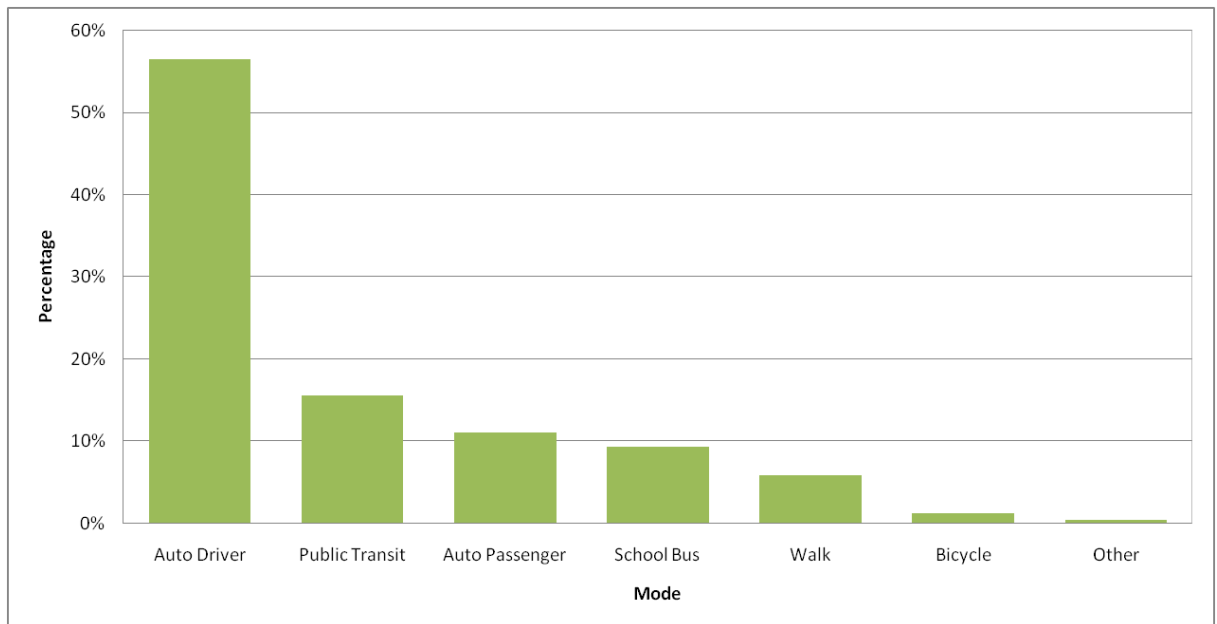
The following series of charts, from Exhibit 4-16 to Exhibit 4-20, illustrates mode shares through the region. The main difference to note at this level is the disparity between public transit mode shares in the Ontario and Québec parts of the NCR. In the AM period, Ontario has a 21% transit mode share for origin and 21% for destination, while Québec has 16% and 14% respectively.



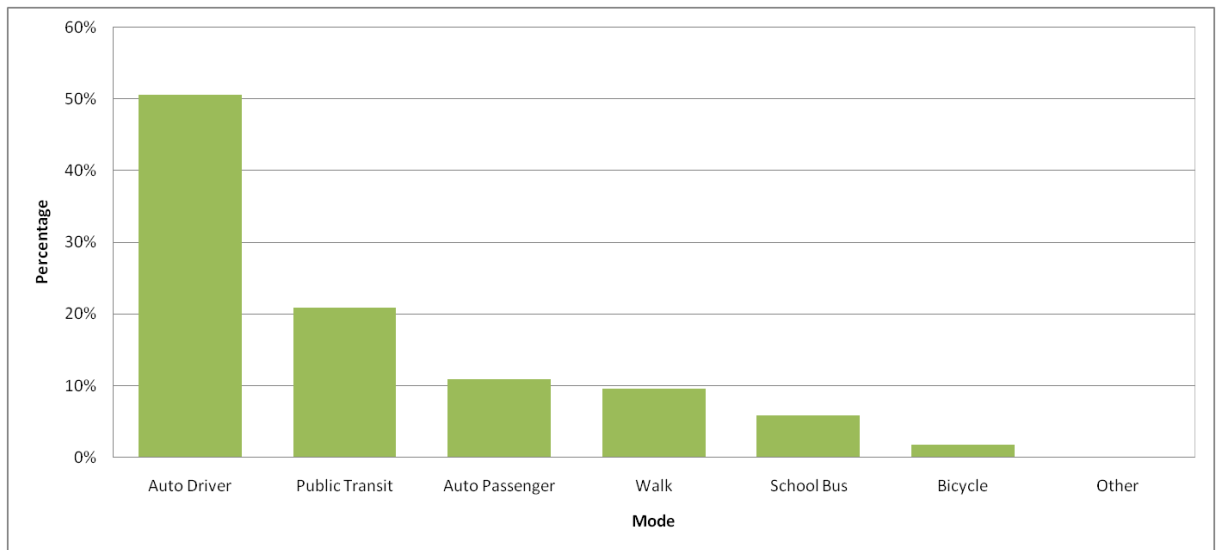
**Exhibit 4-16: AM peak period mode shares (NCR), 2005**



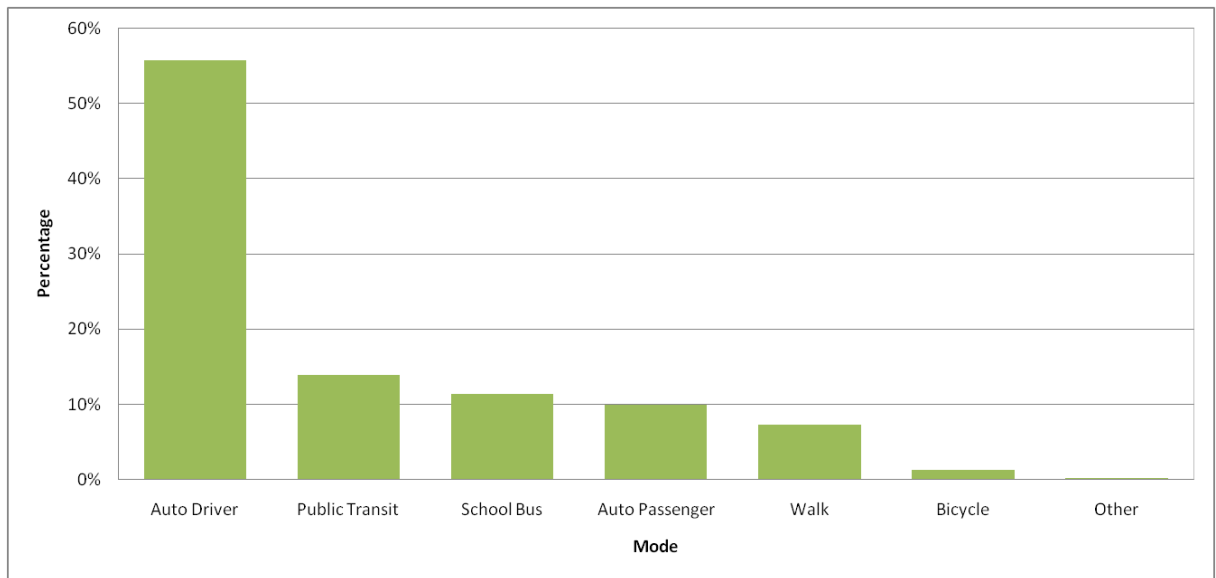
**Exhibit 4-17: AM peak period origin mode shares (Ontario), 2005**



**Exhibit 4-18: AM peak period origin mode shares (Québec), 2005**

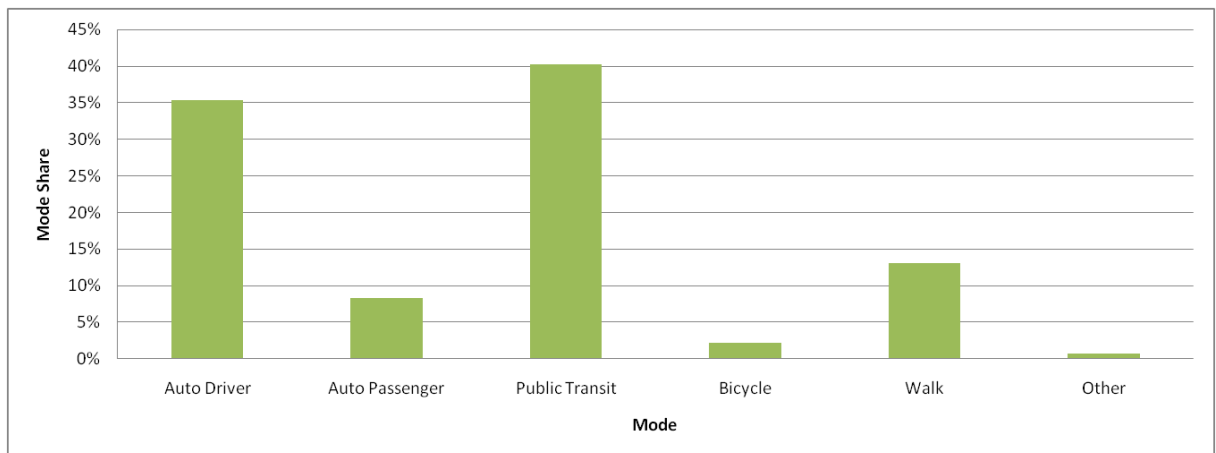


**Exhibit 4-19: AM peak period destination mode shares (Ontario), 2005**



**Exhibit 4-20: AM peak period destination mode shares (Québec), 2005**

However, if we look specifically at AM peak period trips originating in or destined to the CBD (Ottawa Centre), as shown in Exhibit 4-21, here public transit, with a mode share of 40%, is more used than auto drive, with 35%. Moreover, walk is in third place with 13% (non-motorized in total is 15% if cycling is included), while auto passenger at 8% is lower than in the regional averages.



**Exhibit 4-21: AM peak period origin + destination mode shares (Ottawa Centre), 2005**

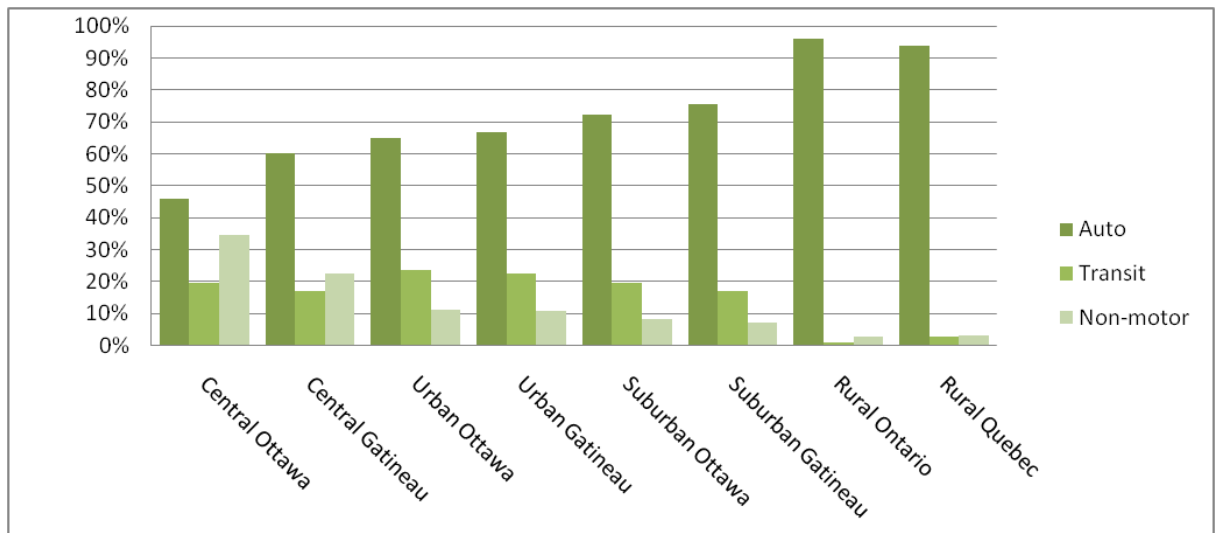
This transit mode share of 40% compares favourably with those observed in other large Canadian municipalities in 2006, such as Vancouver (30%) and Calgary (22%), less only than Montréal (45%) and Toronto (52%) (TAC, 2009, p. 35).



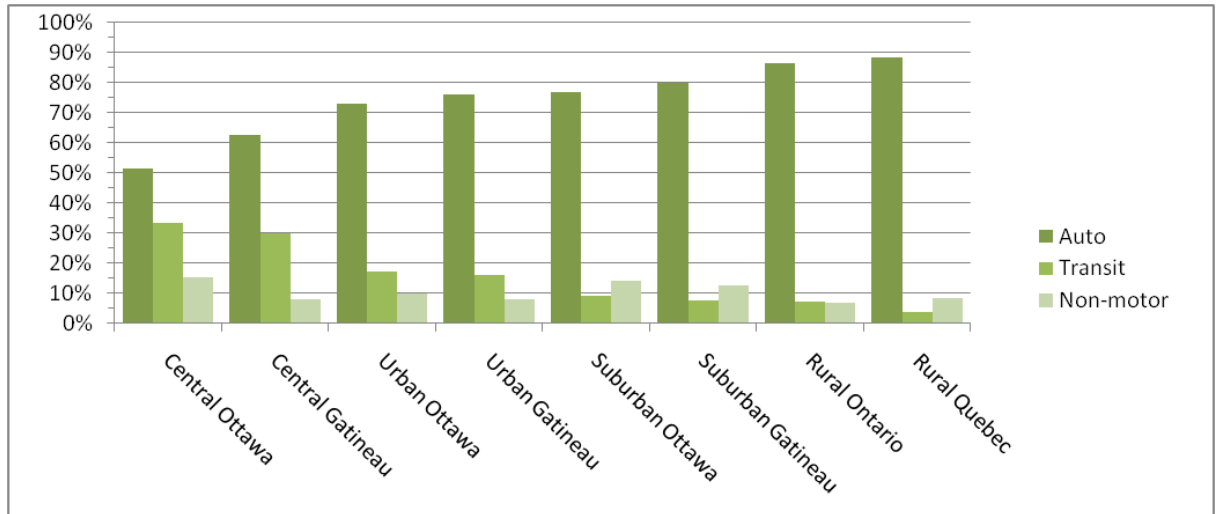
In the following charts (Exhibit 4-22 and Exhibit 4-23), we expand on the trip flow data presented in Section 3.1 to see how the AM mode share varies by origin and destination district type. Here, the modes are aggregated so that “auto” includes drive, passenger, taxi, motorcycle and ‘other,’ “non-motor” includes walk and cycle, and “transit” includes public transit. For this comparison, the school bus mode is omitted as it would make an auto against transit comparison difficult, especially in rural areas where there are considerably more school bus users than public transit users.

From the first chart, the origin mode shares clearly shift in favour of non-motorized as density increases from rural to urban, with auto showing a corresponding decrease and transit splitting into a binary classification of ‘rural’ (very low single-digit mode shares) and ‘urban’ (around the 20-25% range, but with no specific correlation to urban density). The auto-non motorized share, however, has a density-linked progression from a 46-35% share for trips from central Ottawa, to a 96-3% split for trips from rural Ontario districts.

The destination mode shares vary greatly, with the highest transit share being for the two downtown areas with a 30-33% share. Transit is closely linked to the urban density of the destination, dropping to 3% for trips to rural Québec districts. Non-motorized trips, however, do not follow this pattern at all, with trips to urban Québec (Île de Hull) and rural Québec featuring the same 8% non-motorized mode share despite the disparity in their densities evident from Exhibit 2-18. However, there are fewer than 10,000 total trips to the Québec rural districts, so achieving an 8% share does not in fact represent a particularly large number of trips.

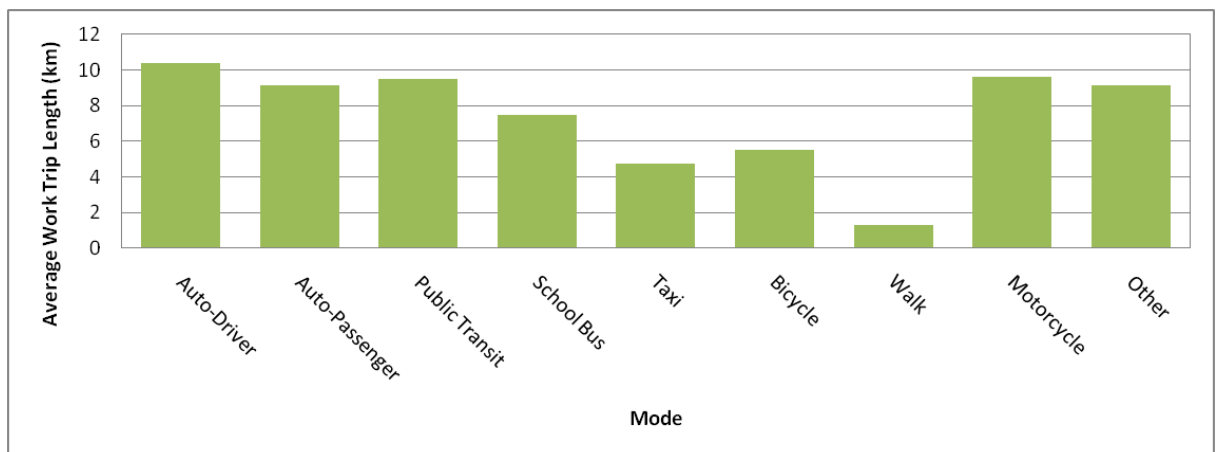


**Exhibit 4-22: AM peak period origin mode shares by district type, 2005**



**Exhibit 4-23: AM peak period destination mode shares by district type, 2005**

Exhibit 4-24, below, indicates the variation in the average length of trips to work when these are broken down by mode. Along with some expected findings (walk trips are by far the shortest and cycle trips are also substantially shorter than motorized trips, other than those by taxi) we see that auto drive work trips are on average around 10% longer than transit work trips, a noticeable but not extreme difference. Auto passenger trips, nonetheless, are shorter than those made by transit.

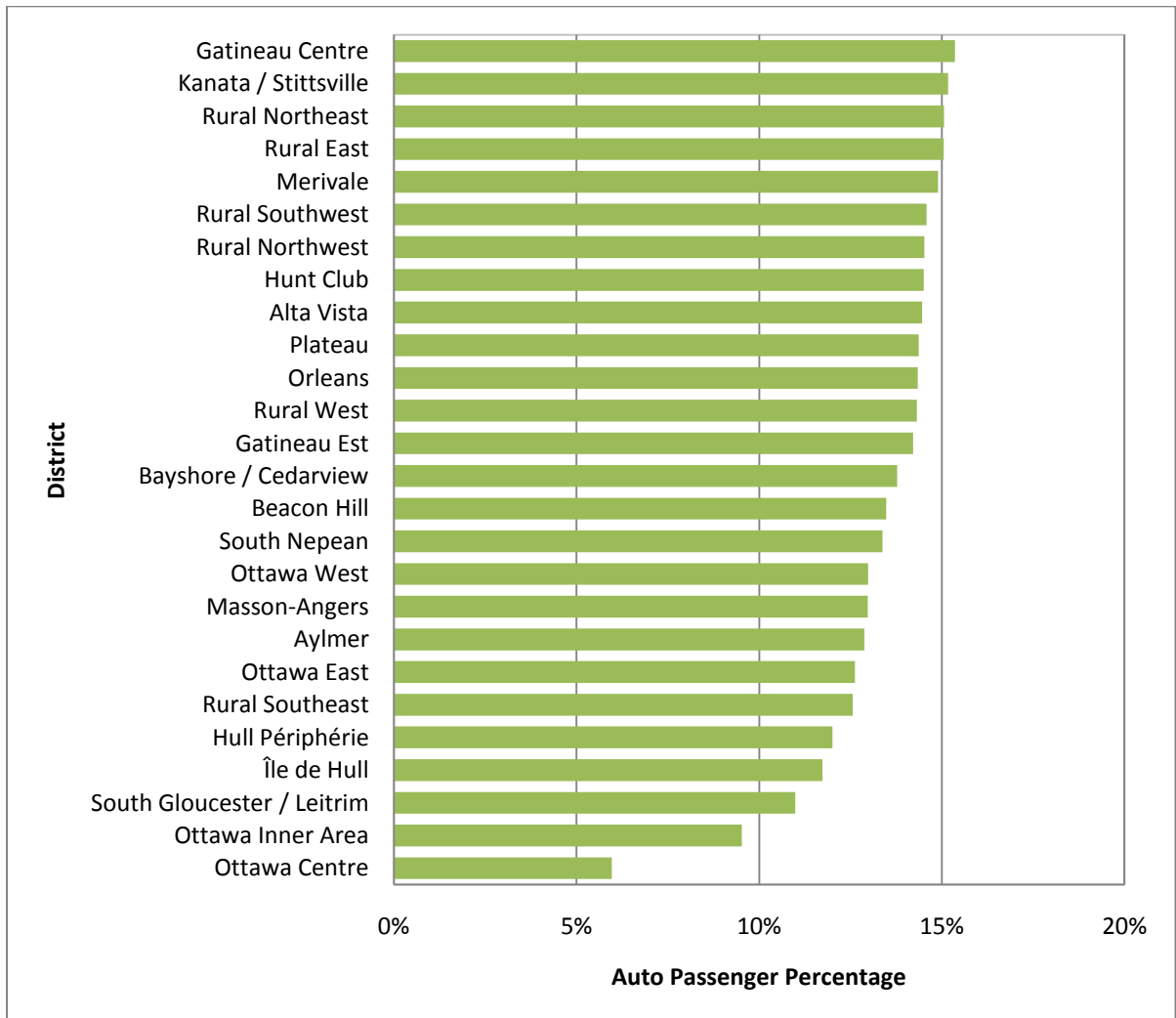


**Exhibit 4-24: NCR average work trip length by mode, 2005**

#### 4.4 Ridesharing patterns

The following analysis investigates how the popularity of ridesharing, i.e., the popularity of the auto passenger mode, is influenced by geographic, personal and household attributes, as well as the types of trips that are being made by auto passengers.

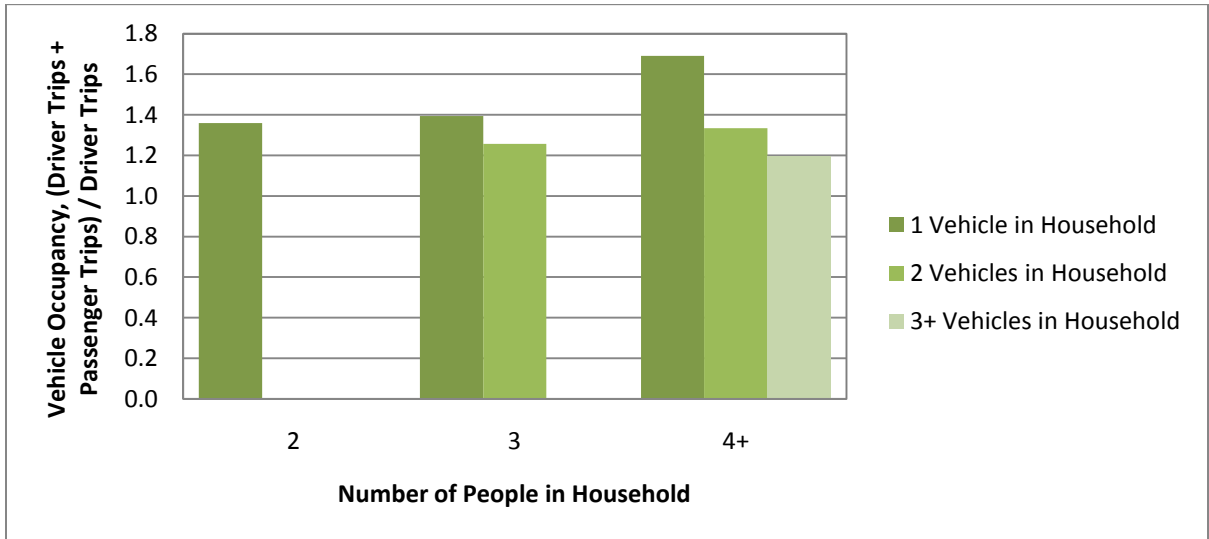
Exhibit 4-25 tabulates the auto passenger share for all trips by district of residence. The exhibit shows that over most of the districts the mode share taken up by auto passengers, indicating the amount of ridesharing that occurs, is relatively constant between 10% and 15%. The evident exception to this is Ottawa Centre, which, as was observed in Exhibit 3-19, has a very high percentage of non-motorized travel due to its greater density, making ridesharing appear to be less necessary.



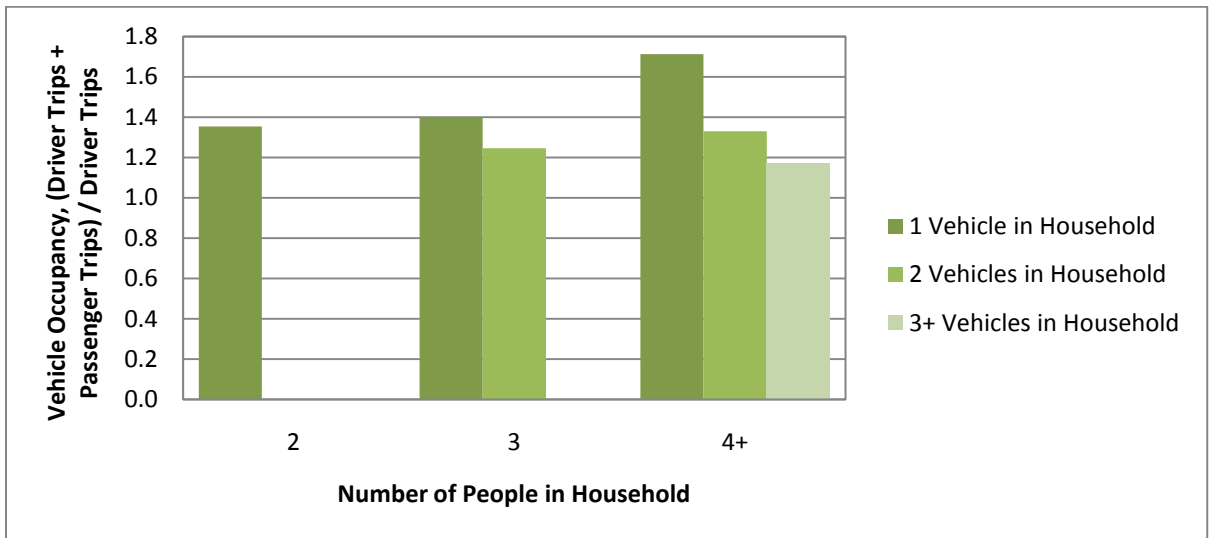
**Exhibit 4-25: Choice of auto passenger mode by geographic location of residence, 2005**

The next three charts (Exhibit 4-26 to Exhibit 4-28) give an indication for the NCR and its Ontario and Québec parts how the increasing number of vehicles per household member influences vehicle occupancy. For cases where there are more people in the household than vehicles, but where there is at least one vehicle, average occupancy shows an upward trend as the person-to-vehicle ratio increases from an occupancy of 1.2

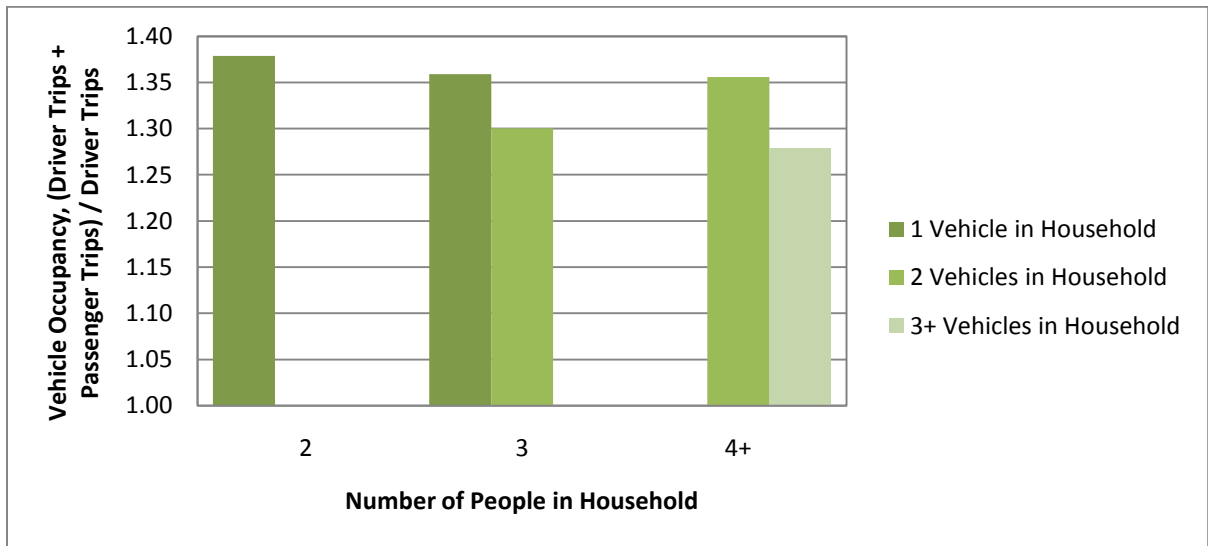
with a ratio of 4/3 to an occupancy of 1.7 with a ratio of 4 (note that there are actually no 4-person, 1-vehicle households recorded in Québec, hence this occupancy appears as 1).



**Exhibit 4-26: Ridesharing patterns by household size (NCR), 2005**

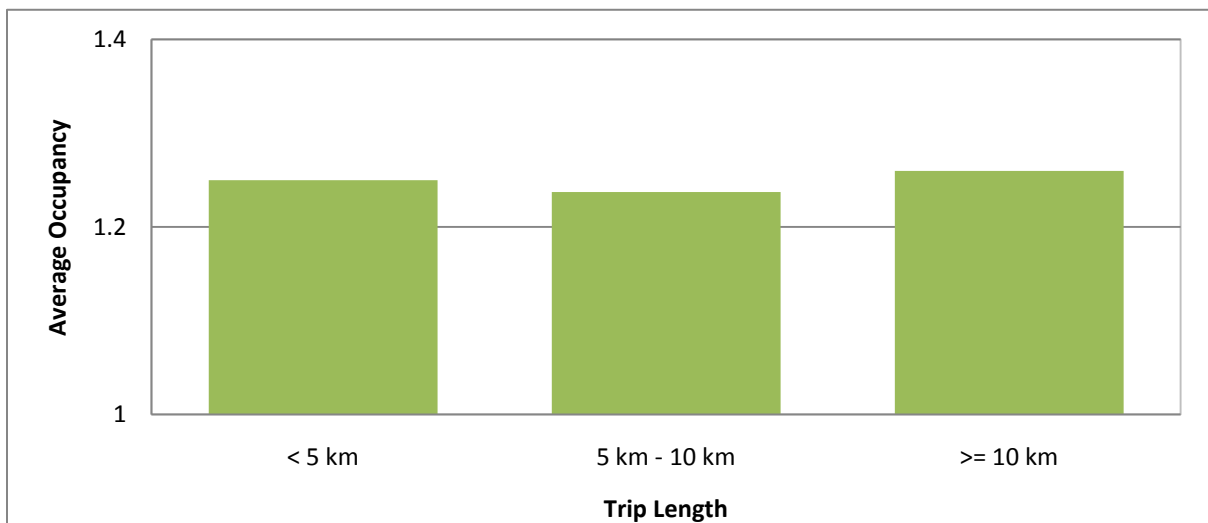


**Exhibit 4-27: Ridesharing patterns by household size (Ontario), 2005**



**Exhibit 4-28: Ridesharing patterns by household size (Québec), 2005**

Average auto occupancy remains at approximately 1.2 people per vehicle regardless of the length of the trip, as shown in Exhibit 4-29.

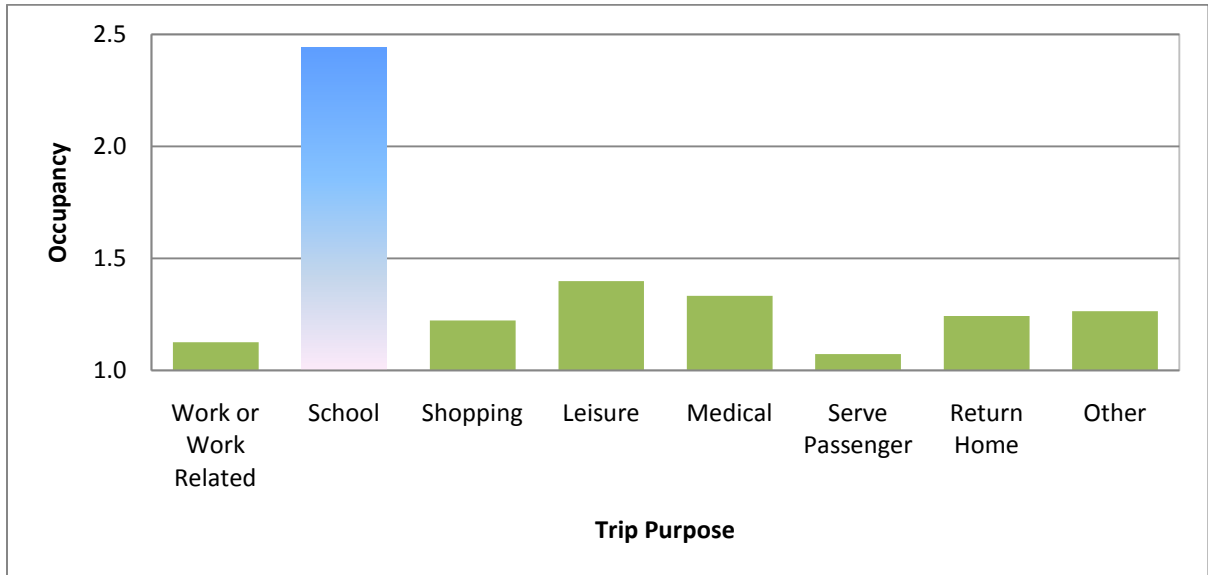


**Exhibit 4-29: NCR ridesharing patterns by trip length, 2005**

Exhibit 4-30 shows that school trips appear to have a substantially higher vehicle occupancy than any other purpose—whereas the others all vary between 1 and 1.5 people per vehicle, trips to school average almost 2.5 people per vehicle.

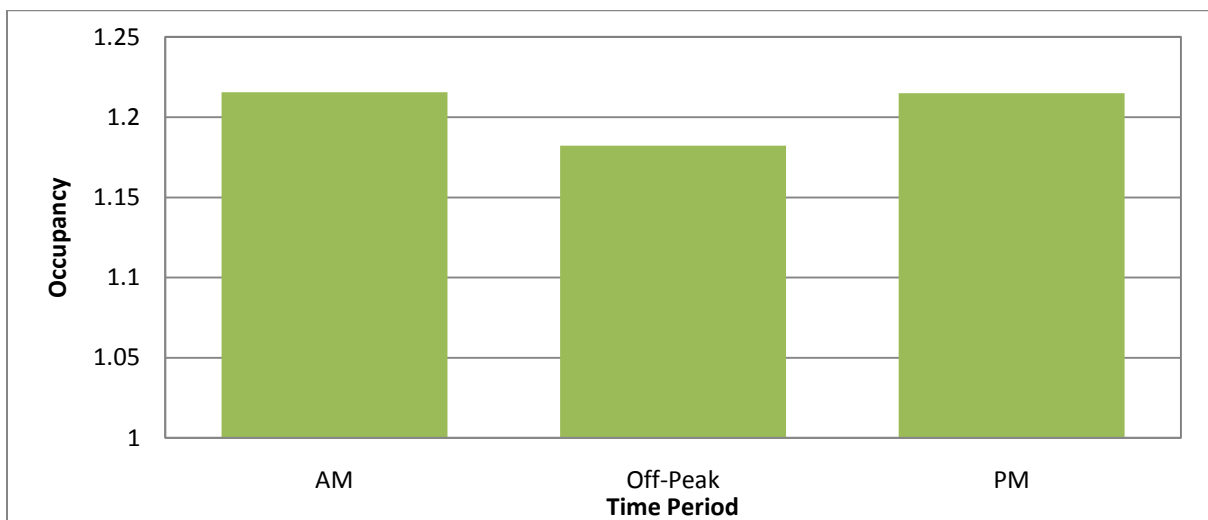
It is important to note, however, that occupancy in this case is an approximation representing travellers per driver for a given purpose, and in the event of the drivers taking passengers to their destination (e.g. school) while not attending it themselves,

drivers will count in the “serve passenger” category. This means that vehicle occupancy will actually be lower than indicated, because it represents the number of total trips to school divided by the number of drivers making a school trip.. Nonetheless, the occupancy numbers by purpose can still be compared to other years to determine a trend.



**Exhibit 4-30: NCR ridesharing patterns by trip purpose, 2005**

Exhibit 4-31 compares ridesharing between the AM and PM peak periods. There does not appear to be any discernible difference between auto occupancy rates in these two peak periods, but there is a drop of 0.04 people per vehicle in the off-peak, which is in accordance with the pattern noted in Table 3-4.



**Exhibit 4-31: NCR ridesharing patterns by time period, 2005**



## 4.5 Conclusion

Overall, the dominant mode share is auto drive for all time periods and most purposes, for an overall peak-period average of 53%, with transit at 18%, auto passenger at 11%, and non-motorized travel at 9% (school buses and minor modes make up the rest, and the auto share is higher in the off-peak). Transit is the largest share for school trips at 30%, while two-thirds of trips to work are made by driving, and around one-sixth by transit.

AM peak transit mode share increases proportionally to the density of population and jobs of the destination, and non-motorized mode share increases proportionally to the density of population and jobs of the origin.

For the region as a whole, workers usually have access to a car (and over 90% have licences) as the number of vehicles in a household increases along with the number of workers. A gender divergence is noted in the auto drive-auto passenger duality with men more likely to be drivers and women almost twice as likely to be passengers, but in other modes there is near-balance.

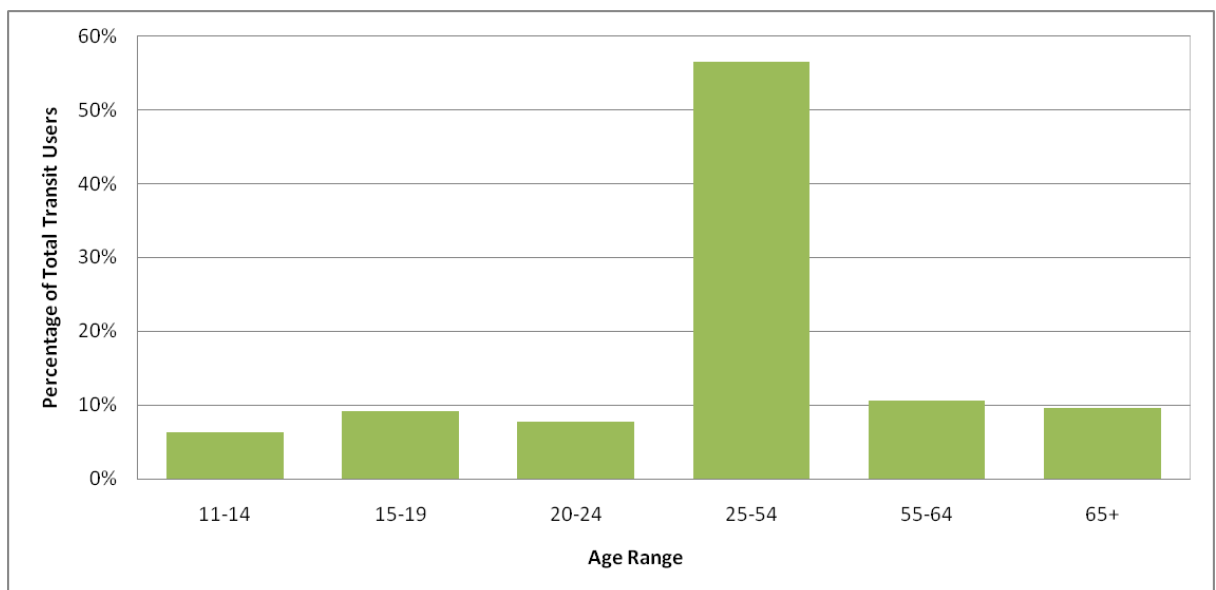
Ridesharing increases gradually (in terms of auto occupancy) as the ratio of household occupants to vehicles increases in multi-occupant households. However, district density does not have an appreciable impact other than in the high-density urban centres, where auto occupancy is markedly lower.

## 5. Public Transit

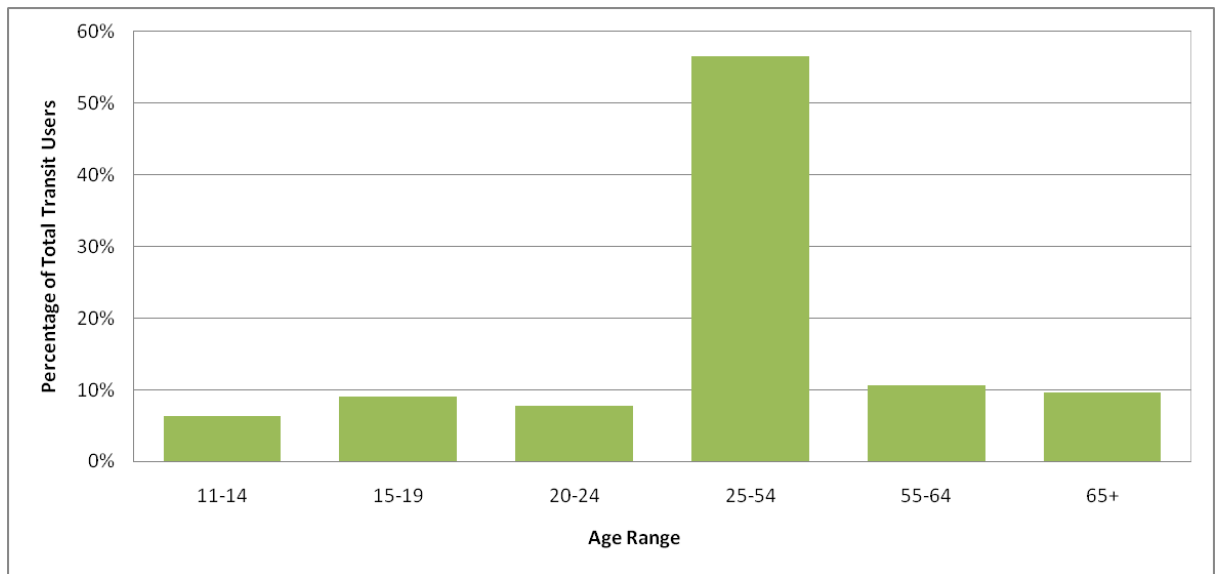
This section focuses more closely on the specifics of transit users; their age range, gender balance, household characteristics and why they use transit, in order to develop an understanding of the motivating factors behind transit use in the NCR.

### 5.1 Demographic characteristics of transit users

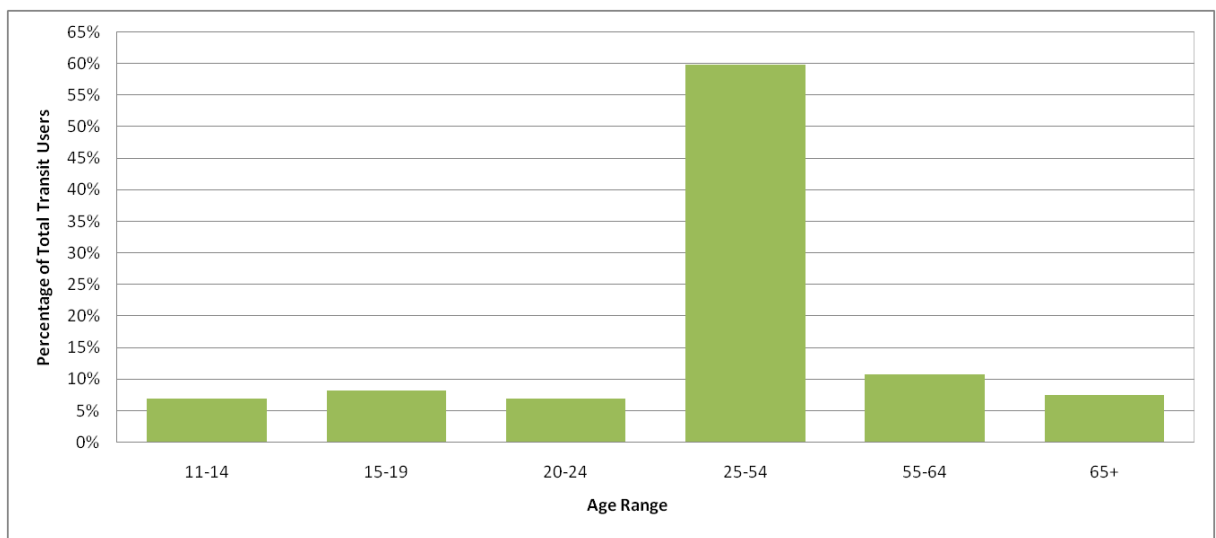
Over half of transit users are in the 25-54 age group, as evidenced by Exhibit 5-1 to Exhibit 5-3, below. This fits with the 47% of the population that are in this age range, although lower age ranges (15 to 24) use transit disproportionately as this group is only 14% of the population, while higher age ranges (55+) use transit less than their 21% share of the overall population would indicate.



**Exhibit 5-1: NCR transit user distribution by age group, 2005**

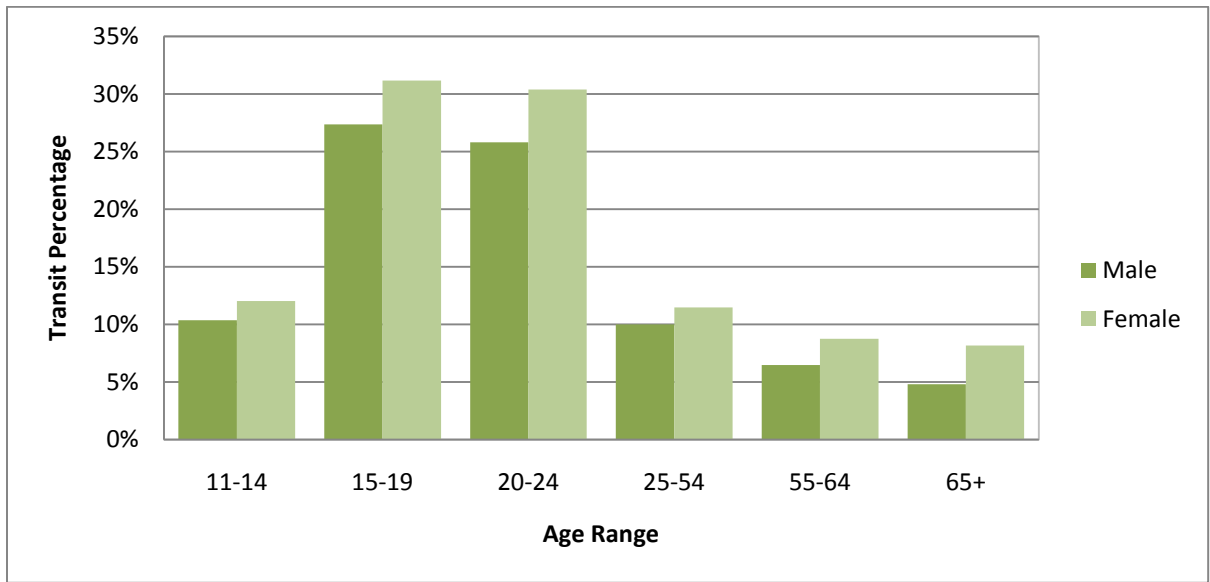


**Exhibit 5-2: Ontario transit user distribution by age group, 2005**

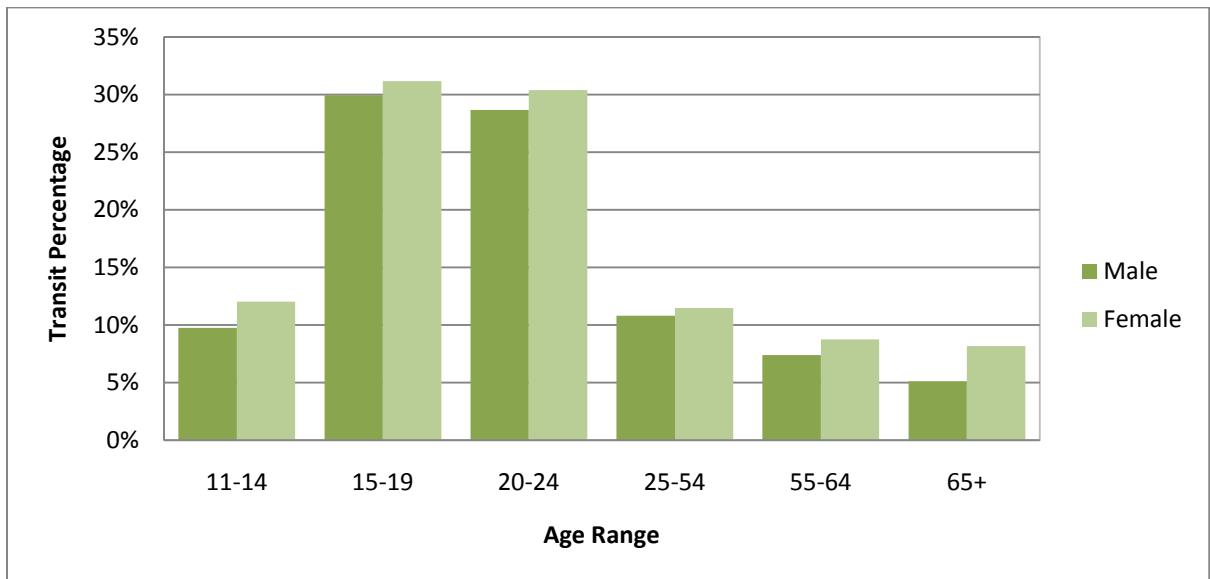


**Exhibit 5-3: Québec transit user distribution by age group, 2005**

From Exhibit 5-4 to Exhibit 5-6, we can see that the female mode share for transit exceeds the male mode share for all age groups. This is not very significant in Ontario (about 1%) but is more noticeable in Québec, especially between the ages of 15 and 24 where the gap is nearly 5%.



**Exhibit 5-4: NCR transit mode share by gender, 2005**



**Exhibit 5-5: Ontario transit mode share by gender, 2005**

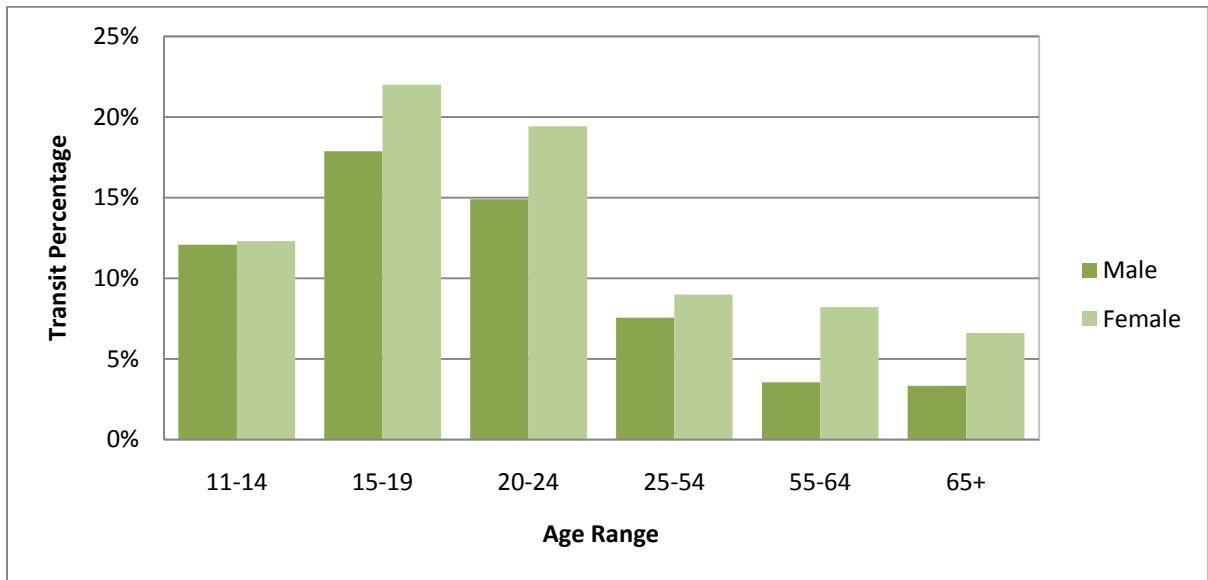


Exhibit 5-6: Québec transit mode share by gender, 2005

## 5.2 Household characteristics of transit users

As seen in Exhibit 5-7, transit use fluctuates based on the number of workers in the household, with a slight increase with one worker and then a drop (although the overall mode share percentage change is very slight) with more workers.

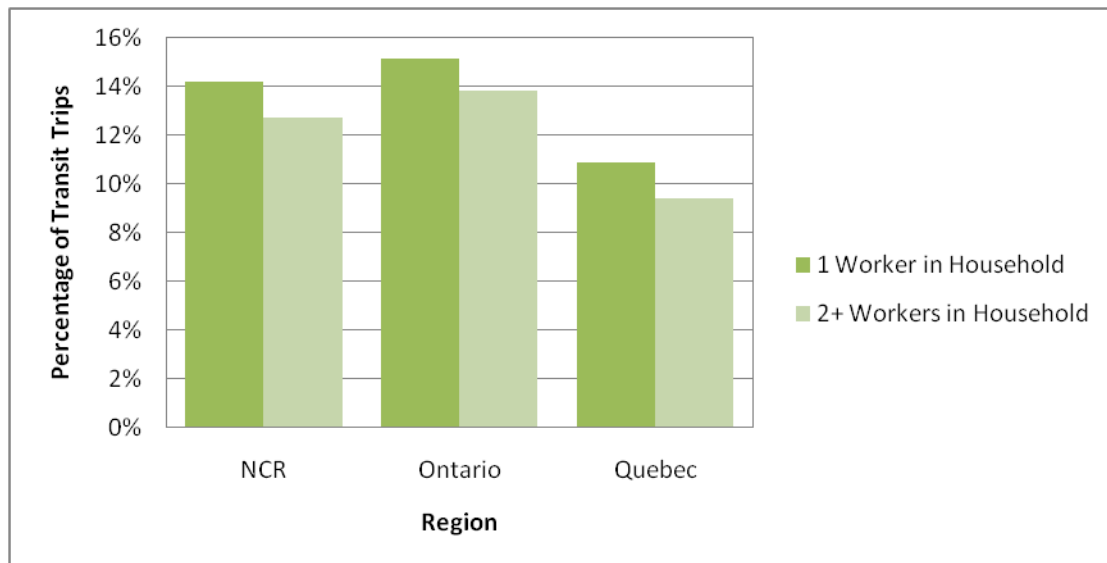
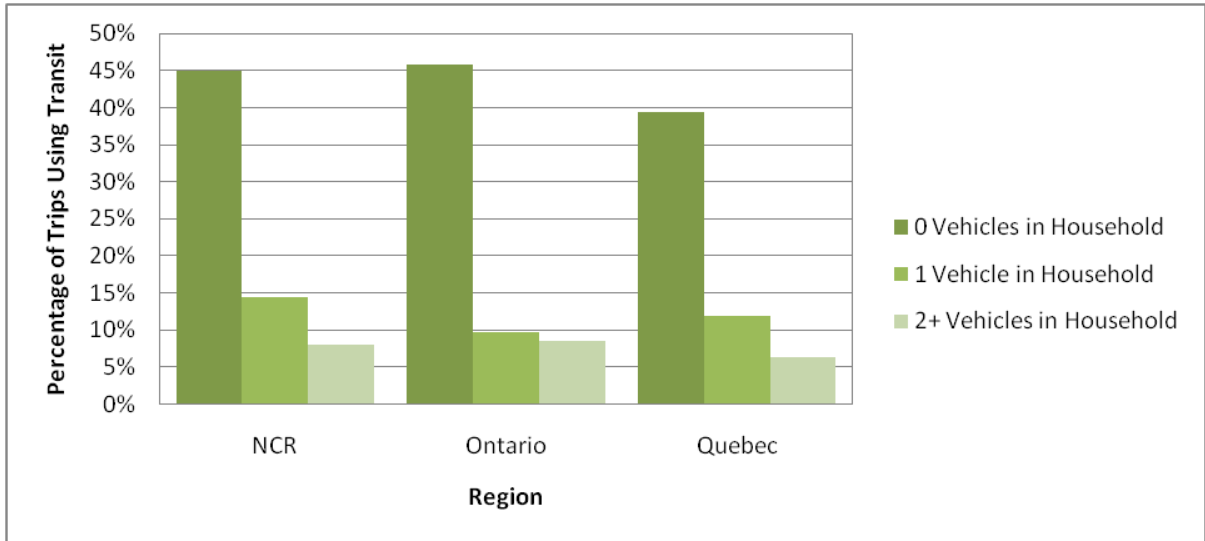


Exhibit 5-7: Transit mode share by household number of workers, 2005

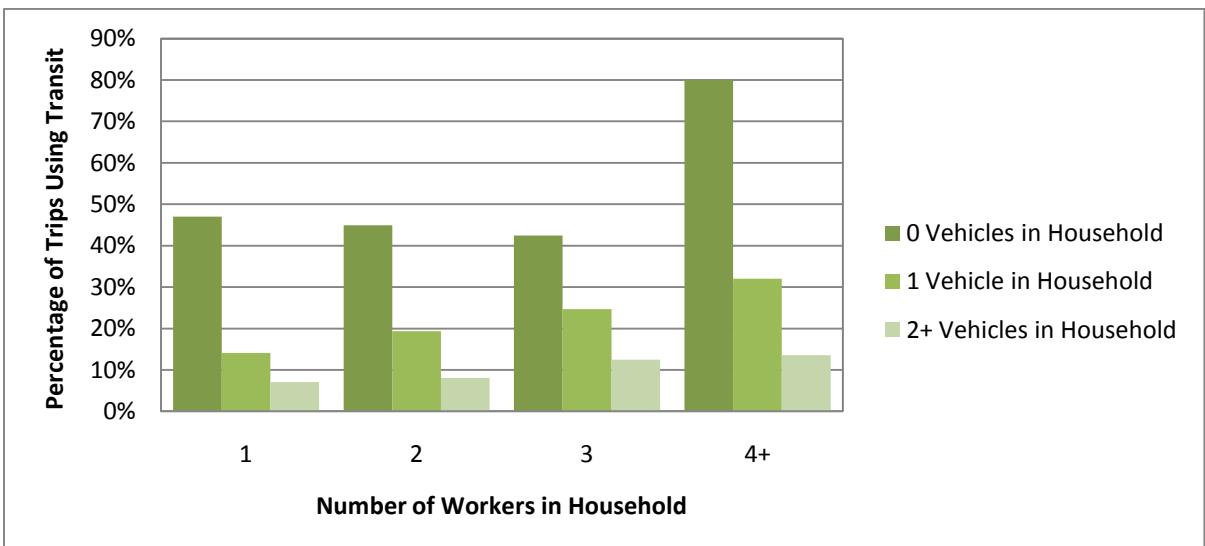
Evidently, living in a no-vehicle household makes it much more likely that a person will take transit, as the mode share increases, shown in Exhibit 5-8, from 10 to 15% in a one-

car household to 45% in a no-car household. This indicates that, to a large extent, transit use is governed by auto-ownership decisions.



**Exhibit 5-8: Transit mode share by household number of vehicles, 2005**

Exhibit 5-9 shows a similar pattern for each number of workers per household for each region, with a decrease in transit mode share with the corresponding increase in number of household vehicles. There appears to be a substantial jump for 0 vehicles per household between 3 workers and more than 3 workers, but we should note that this applies to a very low sample size, remembering from Exhibit 4-4 that vehicle sufficiency per worker remains above 1 even with an increasing number of workers per household.



**Exhibit 5-9: Transit mode share by worker/vehicle sufficiency (NCR), 2005**



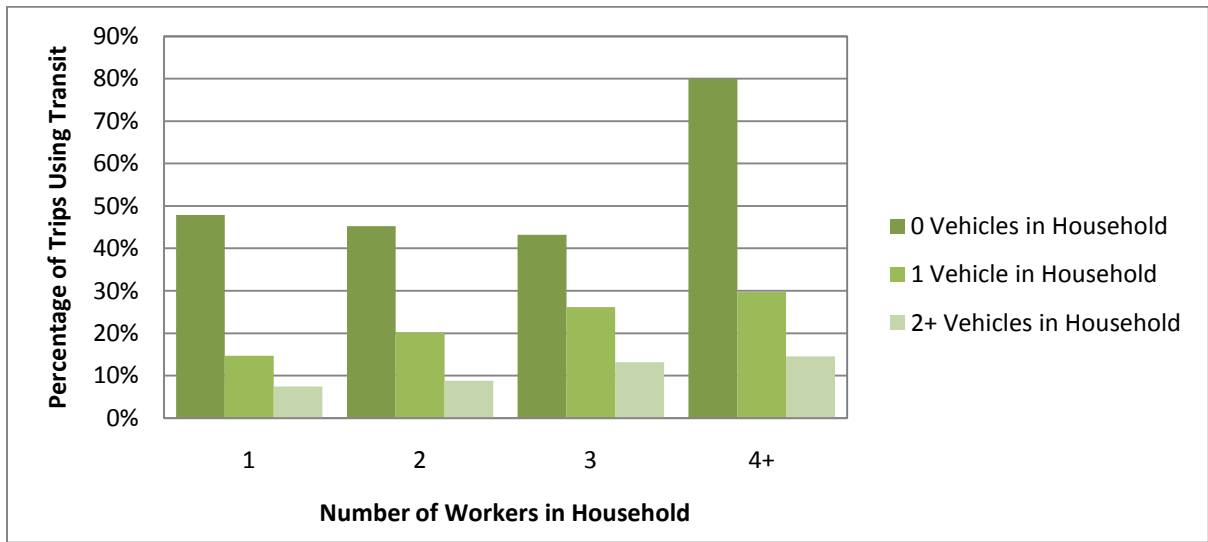


Exhibit 5-10: Transit mode share by worker/vehicle sufficiency (Ontario), 2005

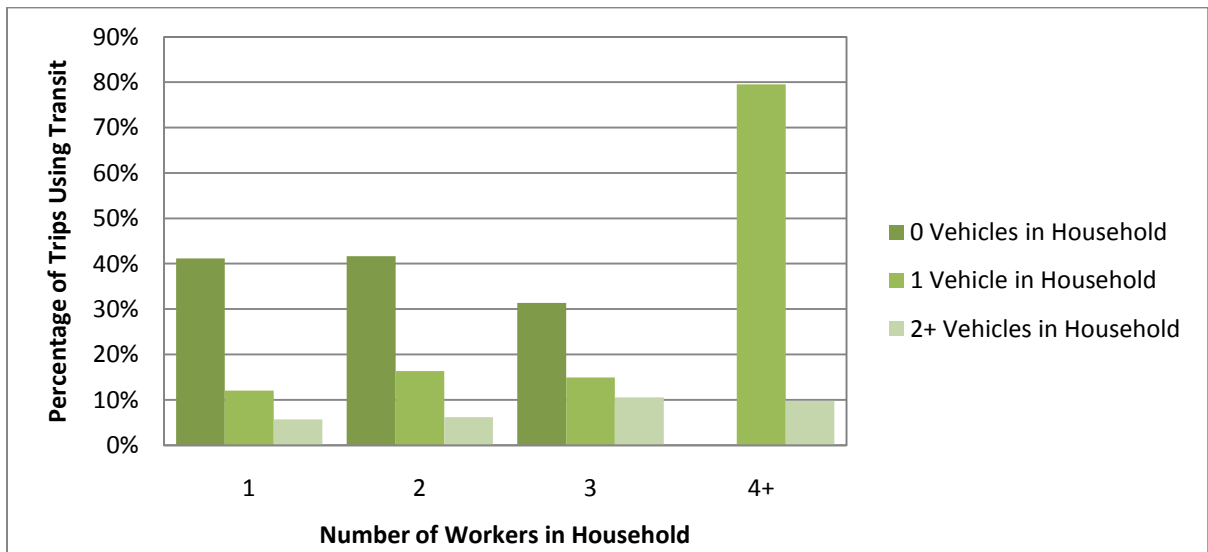
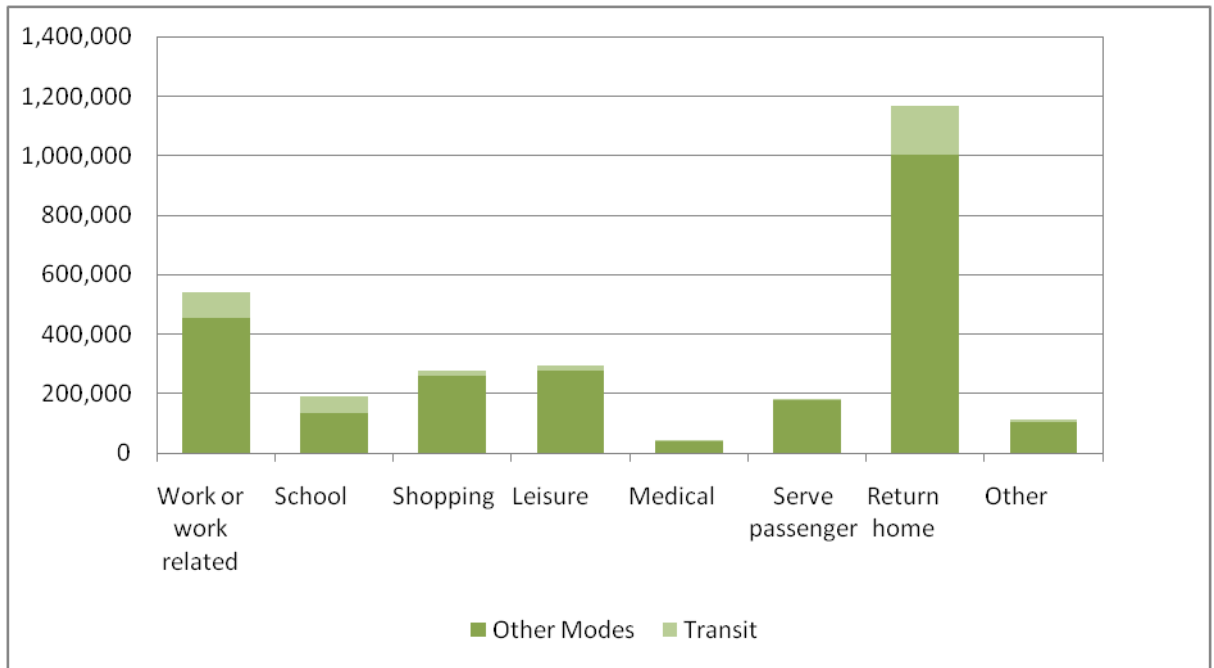


Exhibit 5-11: Transit mode share by worker/vehicle sufficiency (Québec), 2005

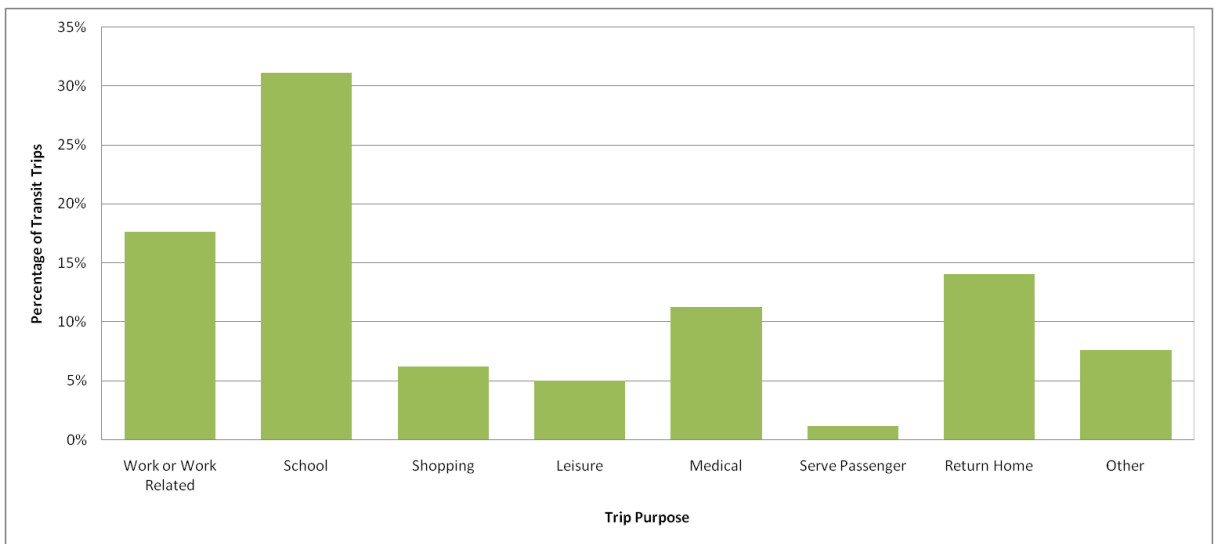
### 5.3 Transit trip purposes

Exhibit 5-12, below, shows for each major trip purpose the proportion of trips that are carried out by transit (the lighter-coloured portion of the column). For some purposes, such as shopping, the transit share is almost undetectable, whereas for others, such as work, school and return home, there is a significant transit portion.



**Exhibit 5-12: NCR transit composition of total trips by purpose, 2005**

Exhibit 5-13, below, focuses in on the areas that were shaded for transit in the chart above, indicating what actual percentage of each purpose corresponds to transit trips.

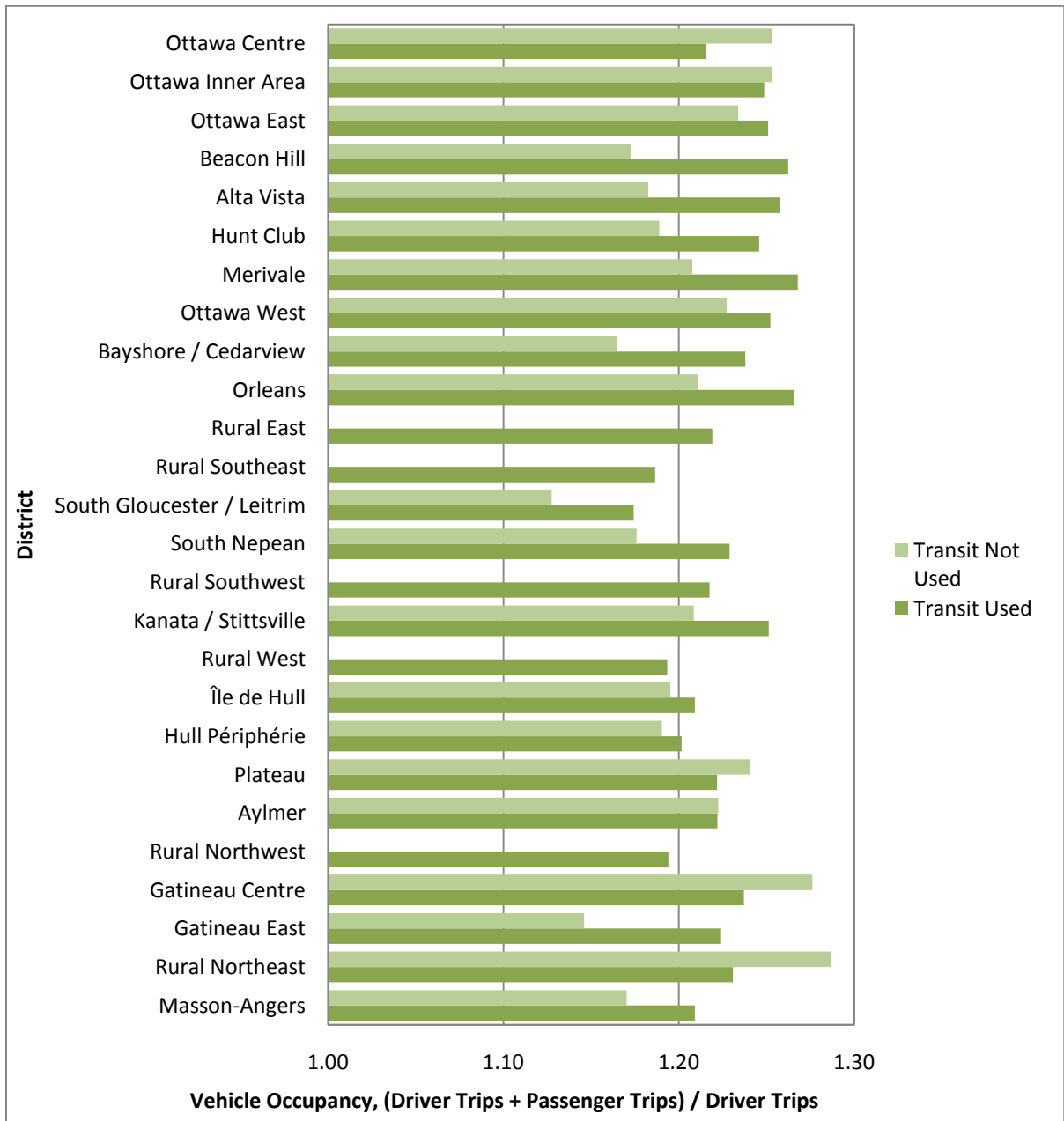


**Exhibit 5-13: NCR transit mode share by trip purpose, 2005**

## ***5.4 Transit-auto occupancy comparison***

There are some traffic zones from which the survey records that no one took transit in 2005. These can be compared with zones from which people did take transit, to see if the auto occupancy rate is affected (that is, if people are travelling as auto passengers instead of by transit). In order to do this, each district is divided into zones with transit usage, and zones without transit usage, and the average auto occupancies are compared, as shown in Exhibit 5-14. Owing to the large zones within the Rural districts, there is at least one transit trip in each of the Rural districts, resulting in some vacant spaces on the chart.

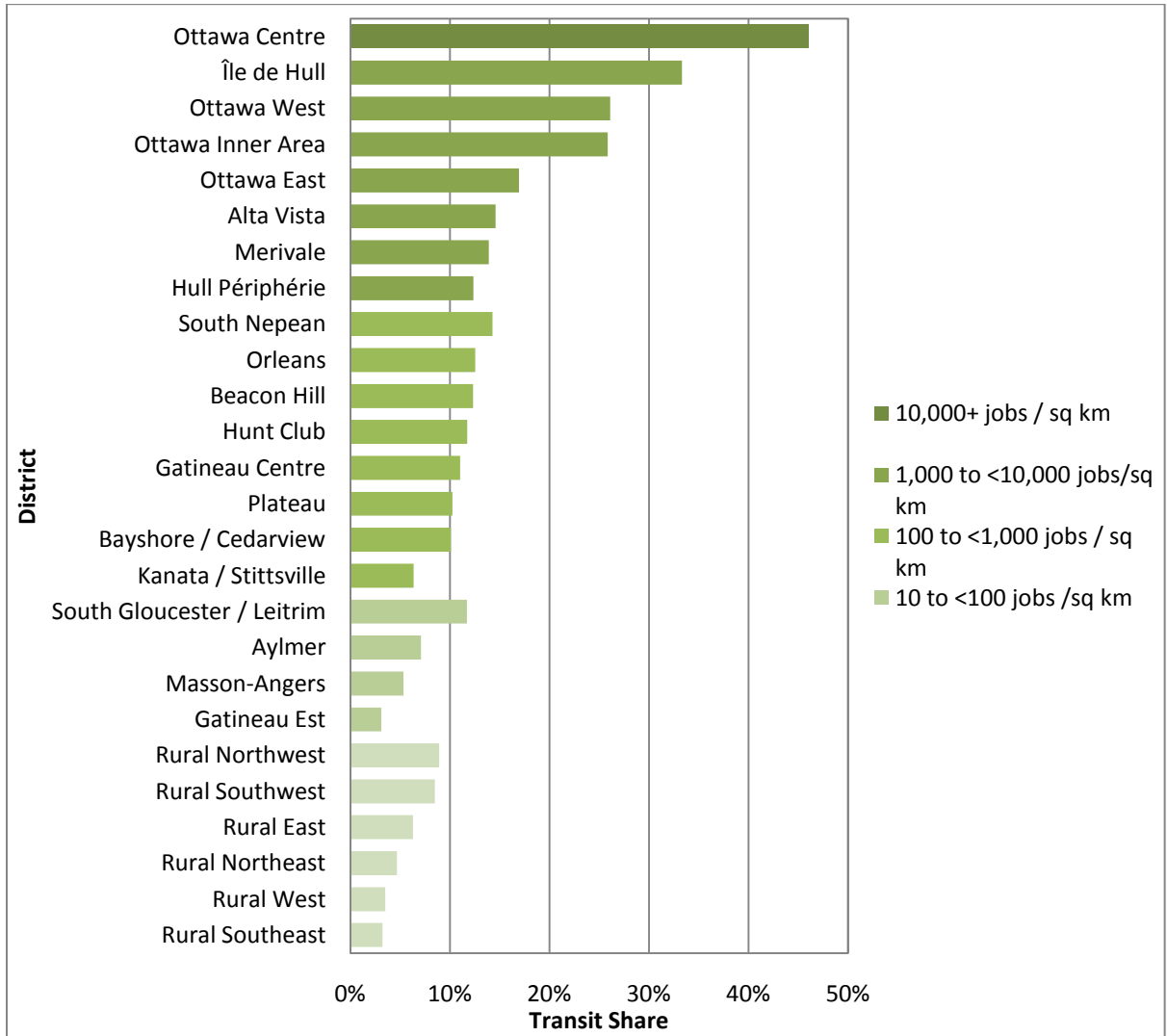
Here, we see that in general, there is no identifiable pattern of increase or decrease in average occupancy when people choose not to use transit. Overall there is a slightly higher occupancy in zones where there is transit usage (1.24 as opposed to 1.21) but there are districts on both sides of the increase/decrease split. As was noted before with Exhibit 4-25, Exhibit 4-29 and Exhibit 4-31, ridesharing is not seen to be substantially affected except by household characteristics.



**Exhibit 5-14: Vehicle occupancy by transit usage, 2005**

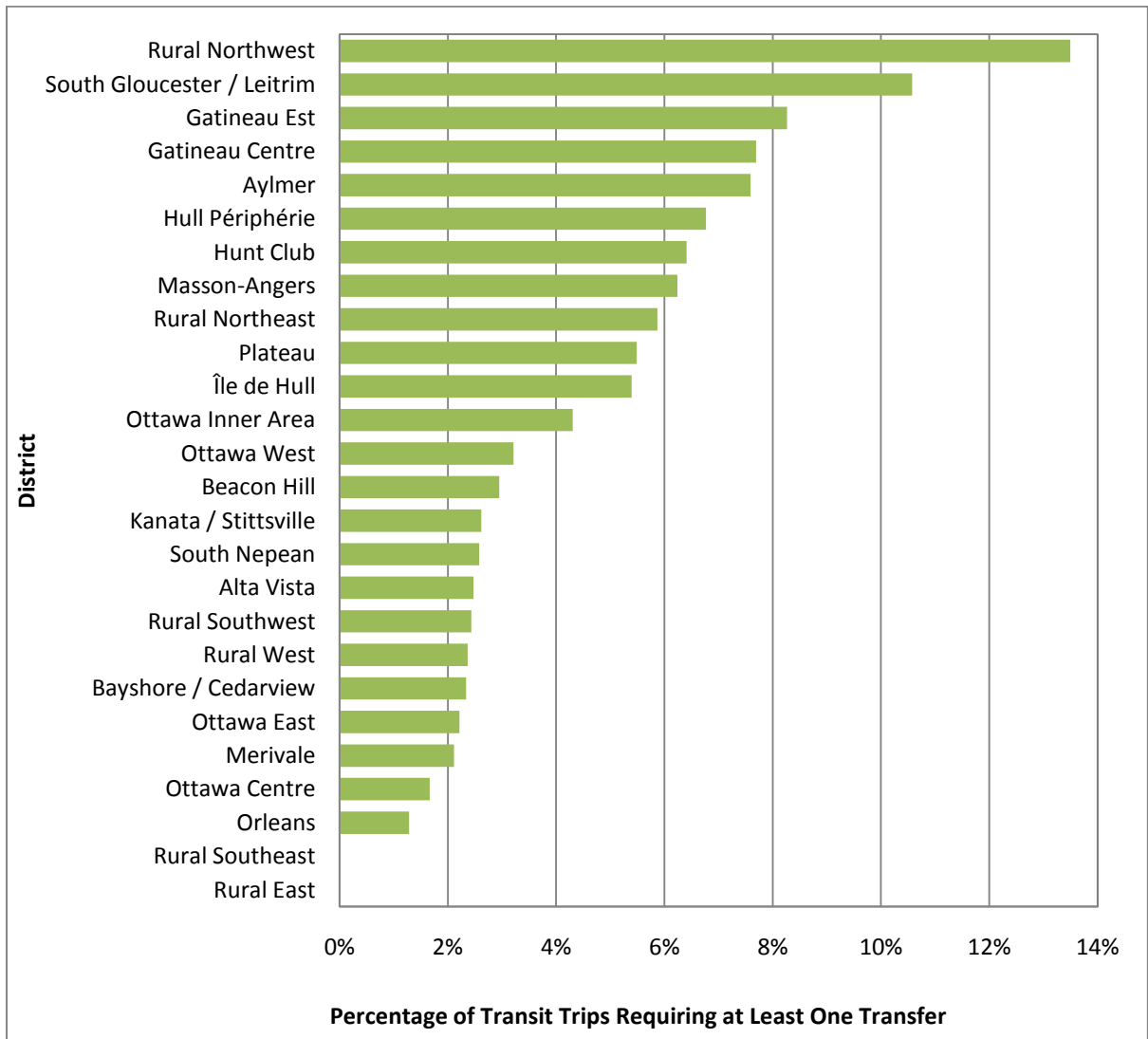
The next chart, Exhibit 5-15, compares the employment density of each district with the transit mode share of trips made by people who work in the district (in the AM peak period). (This is not the same as Exhibit 4-25, which covers all purposes.) There is evidently a close correlation between the two—Ottawa Centre is much denser in employment terms than any other district and the transit mode share, at almost 45%, is much higher than for any of the other districts. Meanwhile, the rural areas with an

employment density below 100 jobs per square kilometre have correspondingly low transit mode shares of around 2-3%.



**Exhibit 5-15: Transit mode share by employment density and work district, 2005**

The following chart, Exhibit 5-16, illustrates what percentage of transit trips require at least one transfer of mode, such as between transit agencies or on or off the O-Train. In general, there are a higher percentage of transfers made by transit users from Québec than from Ontario, with most of the Québec districts at or near the top of the list.



**Exhibit 5-16: Percentage of transit users who transfer by residence district, 2005**

### 5.5 Conclusion

From the survey results presented in this section, we can see that school trips, with a 30% mode share, are most likely to use transit, with work trips at 16% and others at or below 10%. The proportion of users is higher in lower age categories, average in the main working age group, and lower in older age groups, which is consistent with the mode shares by purpose (i.e., people going to school are usually under 25). There is a higher female than male transit mode share, although the difference is not significant in Ontario it is almost 5% different in Québec.

In general, transit mode share follows the same pattern as employment density—little used in rural areas, and very important in central Ottawa. It also depends considerably on

the availability of vehicles in the traveller's household—across the NCR a traveller is three times as likely to use transit if there is no household vehicle available as if there is one or more. That being said, in the no household vehicle case more than half of trips are still not made by transit, though a large proportion of the no-vehicle households are in dense urban areas and walking or cycling can be chosen.

It remains difficult to discern a pattern between the use of transit and vehicle occupancy, though this may be due to difficulty with defining availability and convenience of transit within the limits of the zone system (with some zones quite large, especially in rural areas, and some having few survey responses).



## 6. Conclusions

From the survey we can identify the following major demographic and trip-making characteristics within the National Capital Region:

### 6.1 *Demographic patterns*

While jobs are largely concentrated in a few districts, the places of residence of the labour force are much more broadly distributed (central Ottawa, Merivale and Alta Vista have nearly half of the jobs in the NCR but only one-fifth of the population). The jobs per worker distribution changes very dramatically, with the ratio of jobs to worker more than 100 times greater in central Ottawa than in the rural districts in Québec. This indicates the need for extensive inter-district commutes.

Concerning household characteristics, it is hard to identify district-level trends. The number of workers (and people) per household gradually increases as we move away from the urban cores, with the most common household size in both Ontario and Québec being a two-person, one-vehicle arrangement.

### 6.2 *Transit, ridesharing and non-motorized mode share*

Transit usage is tied to area density, household auto ownership and trip purpose (and, by extension, age insofar as purpose is linked to age) and, at 16% overall, compares reasonably with other large Canadian municipalities. However, the work/nonwork split does not make a significant change in transit share, as the high school share balances the low discretionary share. Non-motorized travel, however, has a substantially higher mode share for non-work than for work purposes (12% compared with 9%). Looking at the AM peak, and so considering the bulk of trips to be home-to-work or home-to-school, the non-motorized mode share is related to the density of the area where the trip starts (notably starting in central Ottawa, where it is comparable to the auto share and considerably ahead of the transit share), while transit mode share is better related to the density of the area where the trip ends.

When it comes to ridesharing, vehicle occupancy remains relatively constant (in the 1.2-1.4 range) regardless of trip length, time period, trip purpose (other than to school) or household size, though it does increase to 1.7 in households with a high ratio (>4) of people to vehicles. There is a slightly higher transit mode share deriving from one-worker households than zero or more-than-one-worker households, perhaps because transit is more popular for commuting than discretionary trips, but when there is more than one worker in a household the household is less likely to be in a central area well-served by transit. Transit mode share is, as expected, much higher in no-vehicle households, by a factor of 3 or 4.

### **6.3 Gender balance**

The labour force is relatively evenly distributed between male and female, with around a 55/45% split across the NCR. Men are more likely to be auto drivers, with women correspondingly more likely to be passengers, but the overall auto mode share is similar. Women are also marginally more likely to use transit (more so in Quebec—in Ottawa the numbers are nearly equal).

### **6.4 Trip distribution patterns**

We see from the major trip flow diagrams that virtually all NCR districts have large numbers of AM peak trips to central Ottawa, while virtually all Québec districts (plus Orléans) have large numbers of AM peak trips to urban Hull/Gatineau. There are also significant linkages between the suburban districts outside the greenbelt and the rural and inner-suburban districts nearby.

### **6.5 Time of day variation**

The daily profile in general features the two expected peaks between 6:00 and 9:00 AM, and 3:00 and 6:00 PM, but other details were also noted such as the asymmetry of the auto profile (the PM spike is 10% higher than the AM spike), the earlier transit PM spike compared to the auto one, and the effective three-spike profile for non-motorized trips, with a (much smaller) third midday spike also present for auto trips.

### **6.6 Impact of urban density**

Urban density follows the same pattern as overall number of jobs, decreasing substantially with increasing distance from downtown Ottawa. There is a corresponding effect on trip lengths, with the average trip by the resident of a rural district more than twice as long as one made by a downtown resident (when looking just at trips to work, the rural resident must travel on average four times as far). However, this does not appear to translate into a consistently greater percentage of people working at home in rural areas compared to urban ones. The auto-occupancy rate also does not appear to be any higher in rural areas than in suburban and urban ones, despite the greater length of trips that have to be made.