BENCHMARKING ACTIVE TRANSPORTATION IN CANADIAN CITIES

Kevin Behan and Nancy Smith Lea
Clean Air Partnership, 75 Elizabeth Street, Toronto, Ontario, M5G 1P4, Canada
nsmithlea@torontocat.ca

Benchmarking is an important exercise in that it allows us to measure where we are against where we can be. In doing so it's possible to identify weaknesses while simultaneously identifying areas of improvement.

The effect of the built environment on motorized transportation is well understood, but considerably less attention has been paid to its impacts on active transportation (Cervero and Duncan, 2003). A key omission has been a credible assessment of the indicators against which planners can assess the benefits of active transportation interventions. The United Nations Commission on Sustainable Development (2001) notes the vital role that indicators can play in assisting planning and decision making through measuring progress towards stated goals, identifying deficient areas and by providing units of measurement through which we can quantify complex social and physical information.

This research first reviewed over 78 active transportation indicators employed in both academic and governmental studies. 39 of these indicators were selected for inclusion in this benchmarking study, comparing the state of active transportation in eight cities; Toronto, Montreal, Calgary, Vancouver, Chicago, New York, Vienna and Berlin. Indicators were grouped in five key areas: Infrastructure, Safety, Travel Behaviour, Demography and Geography. After comparing the eight selected cities using the 39 selected indicators, the report concludes with a focus on Toronto, Ontario, comparing active transportation in Toronto with neighbouring municipalities. The indicators were used to provide a snapshot of two time periods – 2007 and 2010.

Among the study's findings were that cities with more kilometres of bicycle facilities also have a higher AT mode share and in cities with high mode shares, the percentage of cyclists and pedestrians injured and killed is lower than in cities with low mode shares, thus confirming the "safety in numbers" theory. It was found that the two cities with the lowest active transportation mode shares (Chicago and Calgary) are also the two cities with the highest private automobile shares. Additionally, cities in jurisdictions with low gas taxes tend to have low active transportation levels and higher private automobile mode shares. Another key finding was that cities with shorter commuting distances are more likely to have higher rates of active transportation. Vancouver, with the highest AT share in the North American study cities, has the lowest median commuting distance of 5 km.

Regarding gender, in North America, pedestrian trips are more likely to be made by women, while cycling mode share is predominantly male. Where weather is often thought to influence active transportation, our study showed that Vienna and Berlin, with the two highest levels of active transportation of all study cities, have the lowest annual sunshine. Regarding Toronto-specific findings, it was observed that Toronto's automobile mode share of 56% is dramatically lower than the lowest of its Greater Toronto Area neighbours, at 81%, and that the highest increases between 2001 and 2006 in both walking and cycling by age group, was in the 55-64 age cohort.

Kevin Behan

Kevin Behan, Director of Research at Clean Air Partnership, has post-graduate qualifications in Spatial Analysis, GIS, Business Studies and Software Development. With research experience at the Centre for Spatial Analysis and Institute for Transportation and Logistics at McMaster University, Kevin's current interests include active transportation and urban heat island research.

Nancy Smith Lea

Nancy Smith Lea, Director of the Toronto Coalition for Active Transportation at Clean Air Partnership, has decades of research and project management experience. She has been actively involved in working toward improving conditions for active transportation since 1993 and published several articles on barriers and incentives to cycling and walking.

Benchmarking Active Transportation in Canadian Cities

Kevin Behan and Nancy Smith Lea
Clean Air Partnership, 75 Elizabeth Street, Toronto, Ontario, M5G 1P4, Canada
nsmithlea@torontocat.ca

Introduction

In the process of benchmarking active transportation (AT), the selection of accurate and robust indicators is considered imperative. Canby (2003) recommends the development of a set of performance and accountability outcomes/indicators to be used to take inventory of the availability and condition of AT infrastructure. Leslie (2006) reinforces this point with specific reference to pedestrian infrastructure, stating; “In order for local governments to progressively make their communities more walkable, it is important that they use appropriate tools to evaluate and monitor the walkability status of their local area” (Leslie et al, 2006).

While many AT indicators are common to both walking and cycling, since each mode has its own distinctive characteristics and infrastructure some indicators are specific to only one or the other mode. Pedestrian trips by their nature are quite different to cycling trips, with shorter trip times and distances, often as part of a multimodal trip chain involving transit or private vehicles, and thus have a unique indicator set. This study uses indicators mutual to both modes as well as those unique to each.

Indicator Categories

Infrastructure

As is the case for motorized transportation, the provision of adequate infrastructure is essential for AT in order to move people safely and efficiently. Basset et al (2008) note that extensive, safe, and convenient facilities for walking and cycling are omnipresent in cities with high levels of AT. Similarly, Cervero and Duncan (2003) found that the absence of bicycle/pedestrian friendly designs at either the origin or the destination had an extremely strong statistical relationship with mode choice, where the automobile was almost universal in such circumstances. The main infrastructure attributes included by Alliance for Biking & Walking (formerly Thunderhead Alliance) (2007, 2010) in their comprehensive benchmarking studies of AT in American cities were “miles of existing and planned facilities including sidewalks, on-street striped bike lanes, multi-use paths, and signed bike routes” and the number of existing bicycle racks and spaces per rack.

Well-developed public transit systems with bike parking facilities are standard features within cities with high levels of AT (Basset et al, 2008). The International Technology Scanning Program (2009) observe that “close integration of bicycling and walking considerations with public transit (including intercity rail) make longer intermodal commutes by bike practical as well as safer and more convenient”. The Team recommends several integration strategies, including a variety of bike parking solutions at stations, covered outdoor parking, secured indoor parking, policies that permit bikes on trains and buses, even during peak times, and bike rental or sharing programs located in or very near train or bus stations.

Safety

There are two principle safety concerns for pedestrians and cyclists. The first set of concerns is related to personal safety that could be jeopardized by crime. The second arise as a result of traffic safety, primarily due to the fact that non-motorized and motorized modes often share the same road space.

Traffic safety is a more pressing concern for both pedestrians and cyclists than for motor vehicle occupants. Pucher and Dijkstra (2003) found that in the United States pedestrians and cyclists suffer two-three times more accidents that car drivers (per 100 million trips). Guaranteeing the safety of cyclists is a necessary prerequisite for promoting cycling as a daily mode of transport (Dekoster and Schollaert, 1999). The Canadian Go for Green/Environics survey (1998) found that 53% of respondents felt traffic safety was a barrier to AT, especially to cycling.

Travel Behaviour

Indicators of travel behaviour can include AT mode shares and rates of car ownership. The Alliance for Biking & Walking (2007, 2010) found that "cities with the highest levels of bicycling and walking have the lowest car ownership rates." Average trip distance/time is also a useful indicator. Many empirical studies have proven the negative relationship between distance and AT mode choices (Cervero and Duncan, 2003). Cost of car use is also a factor. Pucher et al (1999) observe that the cost, speed, and convenience of alternative modes have a crucial impact on modal choice.

Demography

There are a number of demographic indicators of AT. In the United States context, cycling is inversely correlated with income (Pucher et al, 1999). This has not been proven in the case of Canadian cities (City of Toronto, 2010). Population density is clearly a factor that affects levels of AT, as is the overall population size of an urban area (Pucher et al., 1999). Gender is a potentially useful indicator of AT, since numerous research studies have found that women are less likely to bicycle than men (Plaut, 2005, Dill & Voros, 2007).

Geography and Weather

Cervero and Duncan (2003) examined the effect of slope gradient and numerous researchers have examined the effects of temperature and rainfall (Cervero and Duncan (2003), Alliance for Biking & Walking (2010), Thunderhead Alliance (2007), Dill and Carr (2003), Pucher et al (1999), Pucher and Buehler, 2005, Stonor et al 2002). Cervero and Duncan (2003) also researched the role of land use, finding that AT flourished where mixed land use and a balance of residences, jobs and retail opportunities are available at the point of origin.

Methods

Based on our extensive literature review, we chose indicators that previous studies had noted as relevant based on their findings. We compiled an initial list of 167 indicators, of which 78 were unique. After several iterations of refinement, a total of 39 indicators were used in this research [see Table 1]. In deciding on appropriate indicators, we employed those methodologies used by other researchers, notably Curran (2005) and Alliance for Biking & Walking (2007, 2010). For indicator evaluation, we employed the principles proposed by Wood (2005). Indicators that were both relevant and available were included in our final list of indicators.

Limitations

Four limitations were observed. First, access to reliable AT data is limited and inconsistent. Second, different agencies often combine walking and cycling data at the reporting stage, and sometime even at the data collection stage. Third, despite repeated attempts, we were unable to get the survey completed in Calgary, Vienna and New York. Finally, to ensure harmonization of data and consistency in data sources, it was necessary to examine cities based on their political boundaries only.

Table 1 Indicators included in this research

Indicator Type	Specific Indicator	Metric
Infrastructure	1. Total length of on-street cycling facilities	km
	2. On-Street Cycling Facilities (separated)	km
	3. On-Street Cycling Facilities (not separated)	km
	4. Signed bicycle routes	km
	5. Multiuse paths	km
	6. Policies regarding inclusion of bicycle lanes	yes/no
	7. Shared lane markings	yes/no
	8. Bike boulevards	yes/no
	9. Woonerf/living streets	yes/no
	10. Colored bicycle lanes	yes/no
	11. Bicycle traffic lights	yes/no
	12. Covered Bicycle Parking Facilities	capacity
	13. Uncovered Bicycle Parking Facilities	capacity
	14. Pedestrianized Zones	km
	15. Pedestrian Sidewalks	km
	16. Bicycles permitted on Streetcars?	Yes/no
	17. Bicycles permitted on Subways?	Yes/no
	18. Bicycles permitted on Buses?	Yes/no
	19. Bicycles permitted on Commuter Rail?	Yes/no
	20. Bikes permitted on these modes at all time	Yes/no
Safety	21. AT Injuries	%
	22. AT Fatalities	%
	23. Violent Crime Rates	Crimes/1,000 people
Travel Behaviour	24. Cycling Mode Share (Work Trips)	%
	25. Walking Mode Share (Work Trips)	%
	26. Combined AT mode share (Work Trips)	%
	27. Other Mode Shares (Work Trips)	%
	28. Median Commuting Distance	Km
	29. % work trips <5km in length	%
	30. Level of taxation on new vehicles	%
	31. Level of taxation on petrol	%
Demography	32. Population (total)	#
	33. Population Density	Persons/km^2
	34. Gender	%m/f
Geography	35. Annual precipitation	Mm/year
	36. Hours of Sunshine per year	Hours/year
	37. Mean Summer Temperature	°c
	38. Mean Winter Temperature	°c
	39. Mean Annual Temperature	°c

Data Collection

We employed a two-pronged approach to data collection. The first was through literature sources and examining recent government documentation regarding the quantification of our selected indicators. For Canadian cities, much of the information was available through the 2006 census, including data on mode shares, populations, gender etc. For American cities, Berlin and Vienna, census data was also used to obtain this information, as well as information from State Departments of Transportation. Information regarding safety, crime and injury statistics was obtained from relevant municipal police departments. Meteorological data was obtained from the Weather Network while data regarding taxation policies were obtained from a variety of sources.

Data that was not obtained through literature reviews was gathered using an online survey sent to selected persons employed by municipal governments in our study cities. The survey was developed in consultation with staff from the City of Toronto's Cycling Infrastructures and Programs Unit of the Transportation Services Division to ensure relevance and applicability.

Study Cities

The eight cities that selected for this research were:

1. Toronto, Ontario, Canada
2. Montreal, Quebec, Canada
3. Calgary, Alberta, Canada
4. Vancouver, British Columbia, Canada
5. Chicago, Illinois, USA
6. New York, New York, USA
7. Vienna, Austria
8. Berlin, Germany

Several criteria were applied to determine what cities would be included in this study, including comparable standard of living, similar latitude, similar population and similar population density.

Results and Discussion: A Comparative Analysis of AT in Canadian and World Cities

1. Infrastructure

1.1 Total Length of Bicycle Facilities

Figure 1 displays the total length of bicycle facilities in our study cities (km) plotted against mode share (%). As shown, there seems to be a pattern emerging – those cities with more kilometres of bicycle facilities also tend to have a higher AT mode share. It should be noted that when estimating the total length of facilities, the City of Berlin counts only one side of the street, while Toronto, Montreal, Vancouver and Chicago count both sides. This could result in a slight discrepancy in estimating total facility lengths.

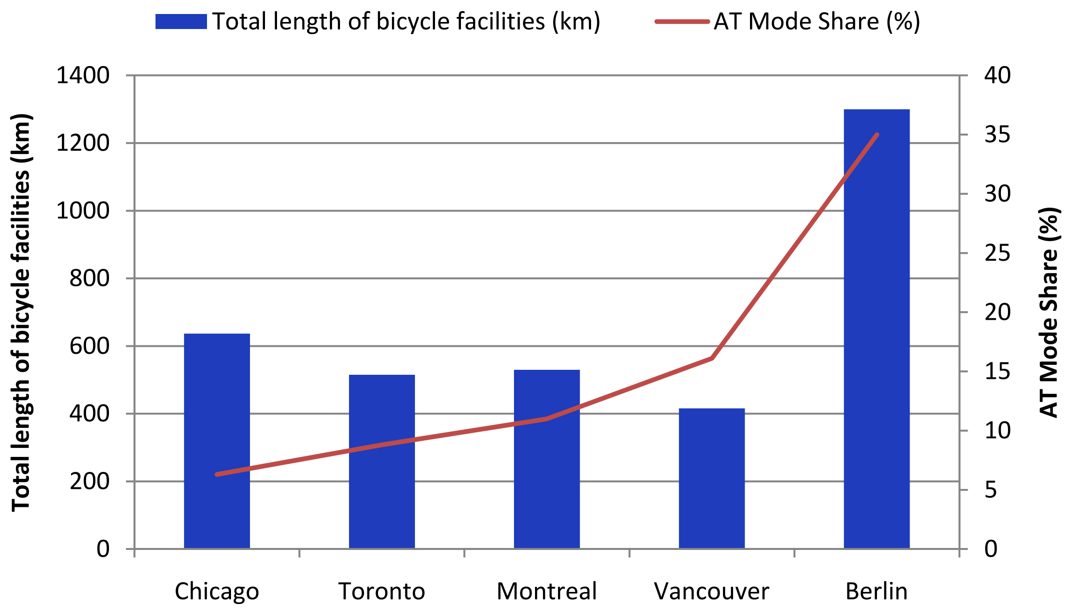

Figure 1 Total length of bicycle facilities by study city, 2010

1.2 Bicycle Facility Types

Figure 2 depicts the level of on-street bicycle lanes separated from motorized traffic against mode share. Figure 3 shows the total length of multi-use paths in our study cities. A complete breakdown of all facility types can also be seen in Figure 3.

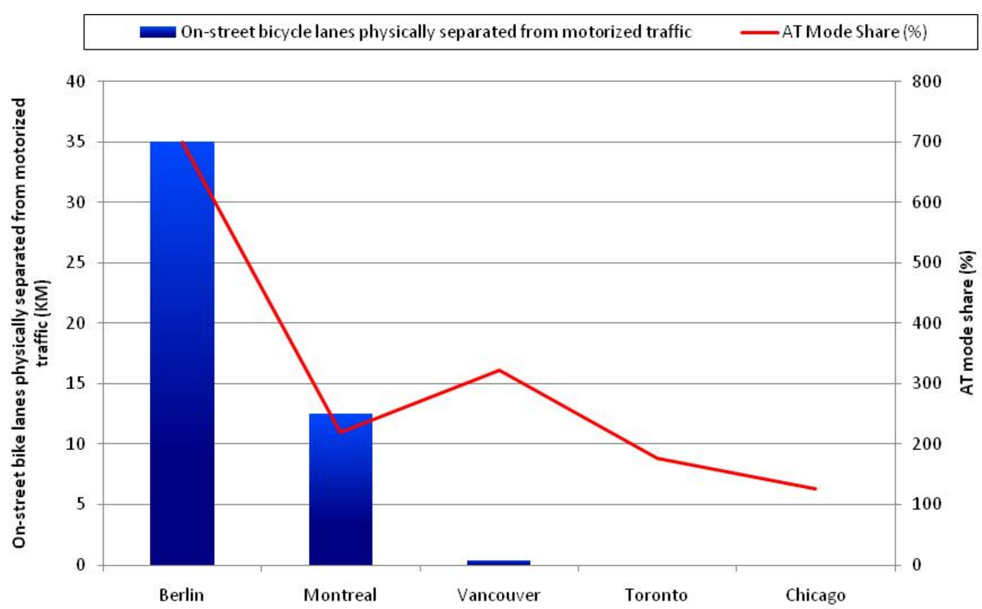

Figure 2 Total length of on-street bicycle lanes physically separated from motorized traffic by mode share and study city

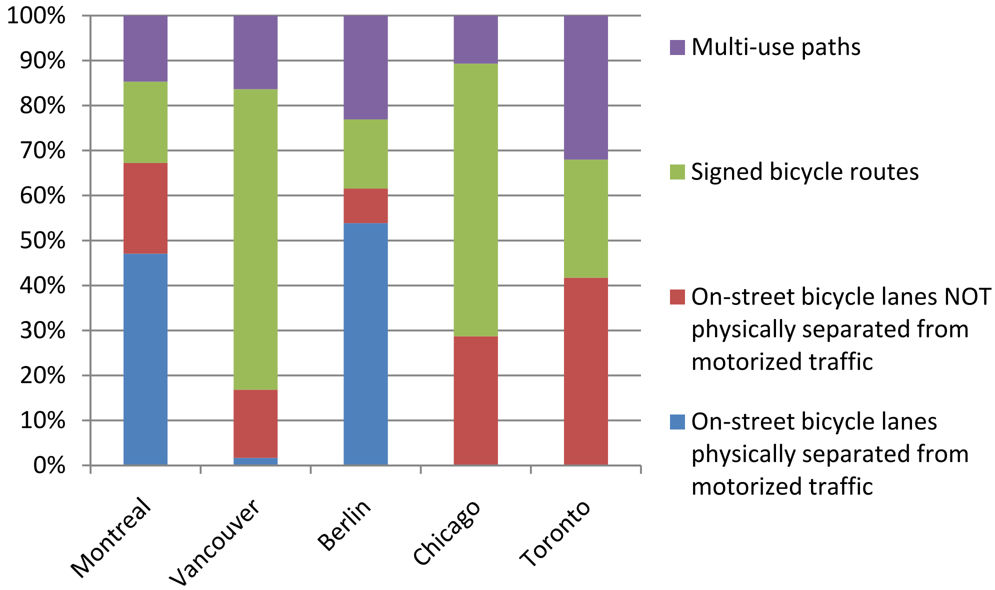

Figure 3 Bicycle facility types by study city, 2010

1.3 Policies Regarding the Street Conditions that warrant Bike Lanes

Of all the cities asked if they have policies outlining street conditions that warrant bike lanes, only Berlin responded affirmatively. A second part to this question asked what characteristics influenced this decision. For Berlin the decision is influenced by the posted speed limit and the traffic volume. Of the two the most important condition warranting bike lanes is if traffic volume exceeds 10,000 cars per day.

1.4 Innovative Bicycle Facilities

When examining innovative bicycle facilities in our study cities, we found a mixture of responses. The innovative facilities we looked at included shared lane markings, bicycle boulevards, woonerf/living streets, coloured bicycle lanes and bicycle traffic lights. The results are presented in Table 2 below.

Table 2 Innovative bicycle facilities by study city, 2010

Facility Type	Montreal	Vancouver	Berlin	Chicago	Toronto
Shared Lane Markings	Yes	Yes	Yes	Yes	Yes
Bicycle Boulevards	Yes	Yes	No	No	No
Woonerf / Living Streets	No	No	Yes	No	No
Coloured Bicycle Lanes	No	No	Yes	Yes	No
Bicycle Traffic Lights	Yes	Yes	Yes	No	Yes

1.5 Bike Parking

All cities were asked to estimate the levels of public bicycle parking. The cities of Vancouver and Berlin were unable to answer as they do not keep an inventory of bike parking spots. Results for the cities of Montreal, Chicago and Toronto are presented in Figure 4.

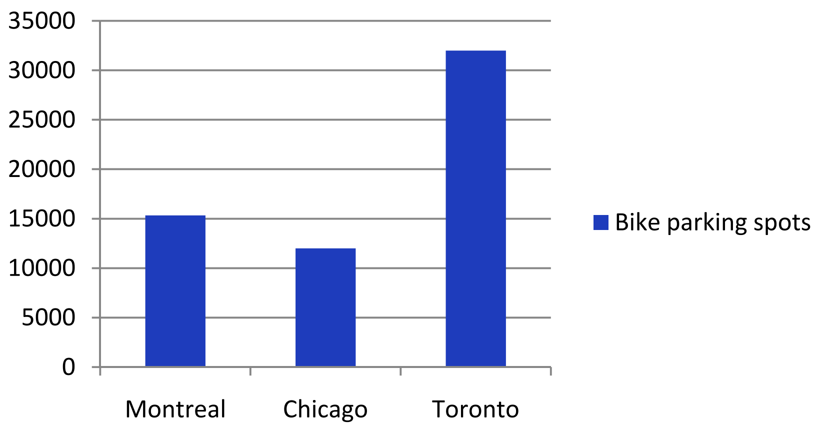

Figure 4 Bicycle parking spaces by study city, 2010

1.6 Transit Integration

We endeavoured to ascertain the level of transit integration with AT in our study cities. Table 3 shows which cities allow bicycles on subways, streetcars, buses and commuter rail. An additional survey question asked if bikes were allowed on these transit modes during rush hours (see Table 4.)

Table 3 Are bicycles allowed on these transit vehicles? (2010)

Transit Type	**Montreal**	**Vancouver**	**Berlin**	**Chicago**	**Toronto**
Subway	Yes	N/A	Yes	Yes	Yes
Streetcar/Tram	N/A	N/A	Yes	N/A	Yes
Bus	No	Yes	No	Yes	Yes
Commuter Rail	Yes	Yes	Yes	Yes	Yes

Table 4 Integration of bikes on transit during rush hours, 2010

Transit Type	Montreal	Vancouver	Berlin	Chicago	Toronto
Subway	No	N/A	Yes	No	No
Streetcar/Tram	N/A	N/A	Yes	N/A	No
Bus	No	Yes	No	Yes	No
Commuter Rail	No	Yes	Yes	No	No

2. Safety

We examined the relationship between AT mode shares and accidents involving motor vehicles and pedestrians and cyclists. **Our findings show that in cities with high mode shares, the percentage of cyclists and pedestrians injured and killed is lower than in cities with low mode shares.** These findings reinforce the 'safety in numbers' theory. Figure 5 illustrates the percentage of pedestrians and cyclists injured, while figure 6 presents fatality data.

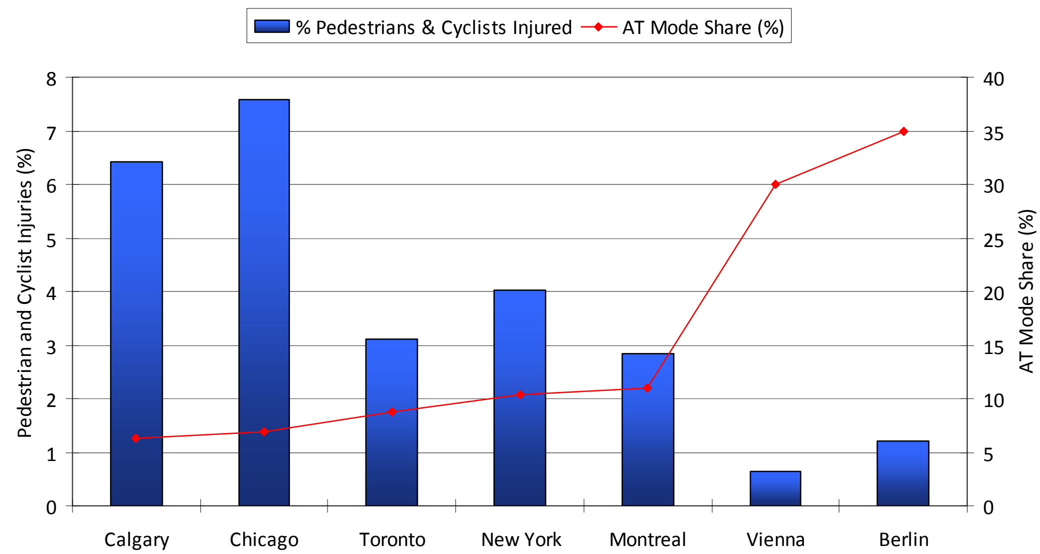

Figure 5   % of AT users Injured by study city, 2007

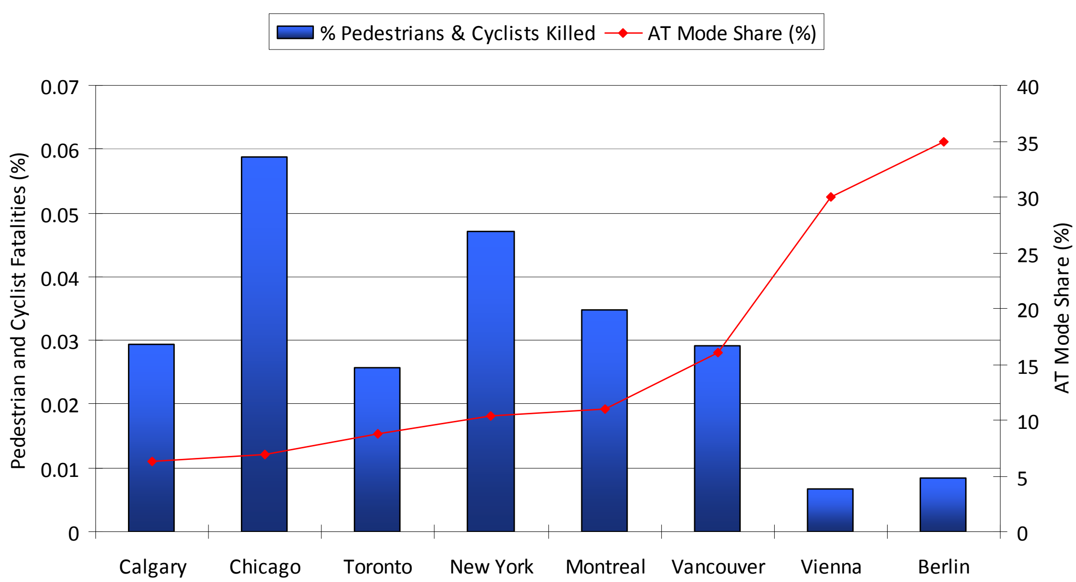

Figure 6   % of AT user fatalities by study city, 2007

To explore personal safety concerns, we examined violent crime rates in our study cities and did not find a relationship between violent crime and AT (see Figure 7).

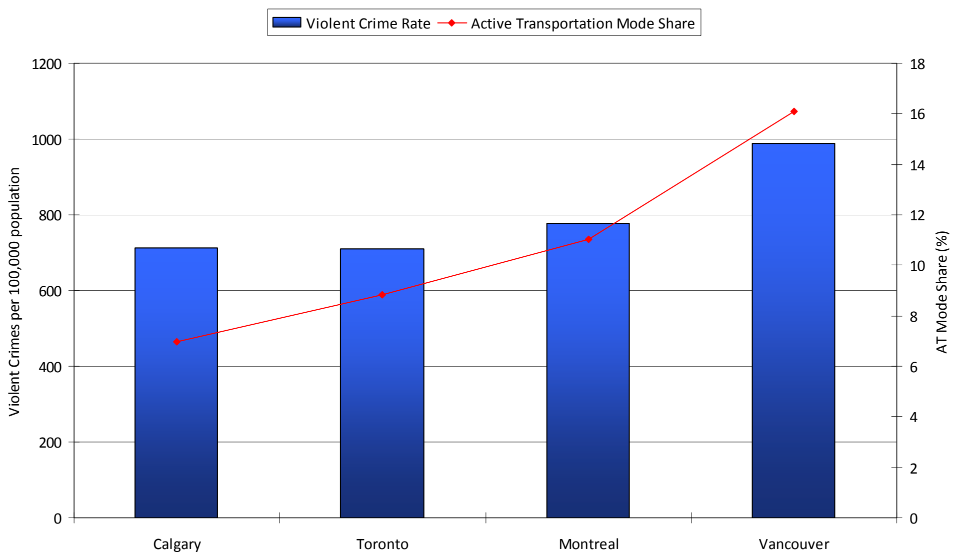

Figure 7   Violent crime and AT rates in Canadian cities, 2007

3. Travel Behaviour

Figure 8 presents the overall AT mode share (data for pedestrians and cyclists combined) in our study cities. In all cities, this is the mode share for work trips only. **Vancouver has the highest AT mode share of any of the North American cities in this study at 16.1%.**

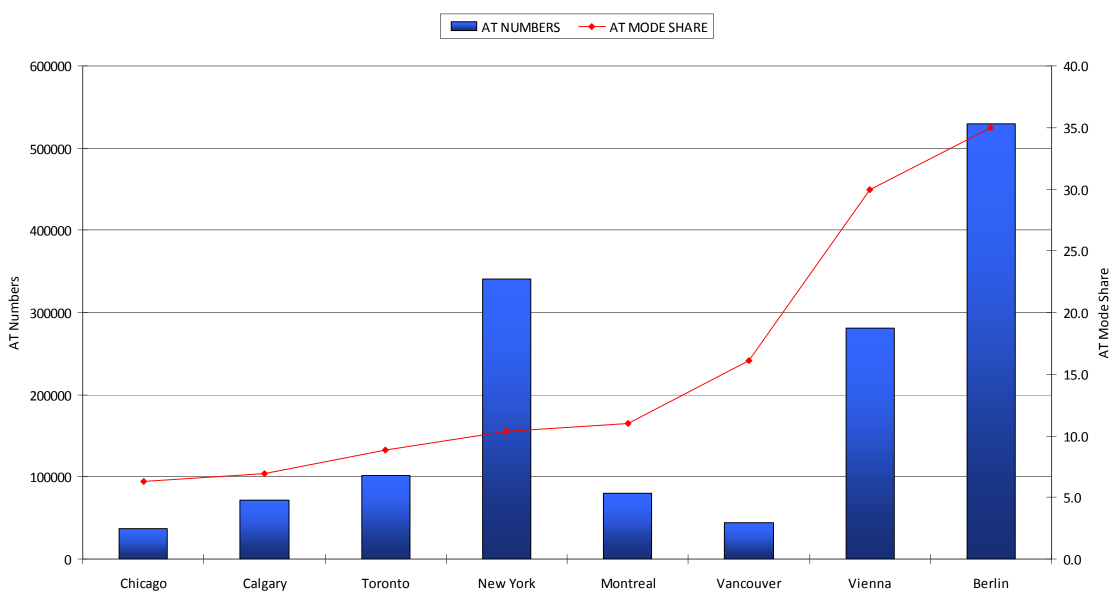

Figure 8   AT raw numbers and mode share by study city, 2007

Figures 9 and 10 examine the cycling and pedestrian mode shares separately. This data was only available for Canadian cities.

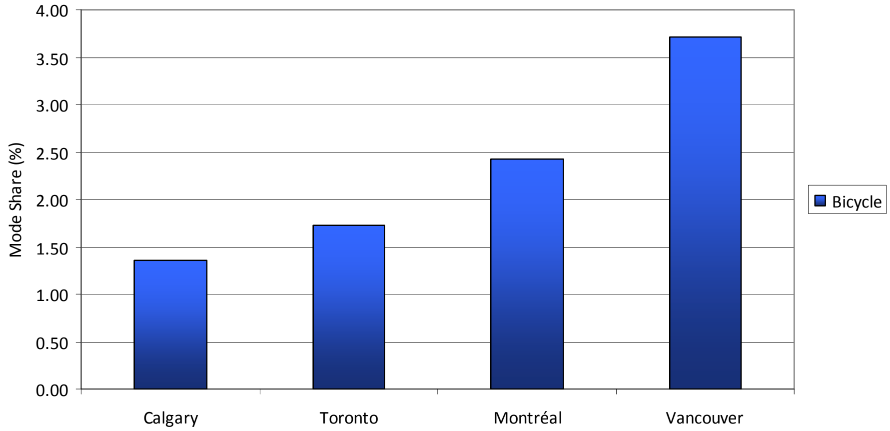

Figure 9 Cycling mode shares in Canadian cities, 2007

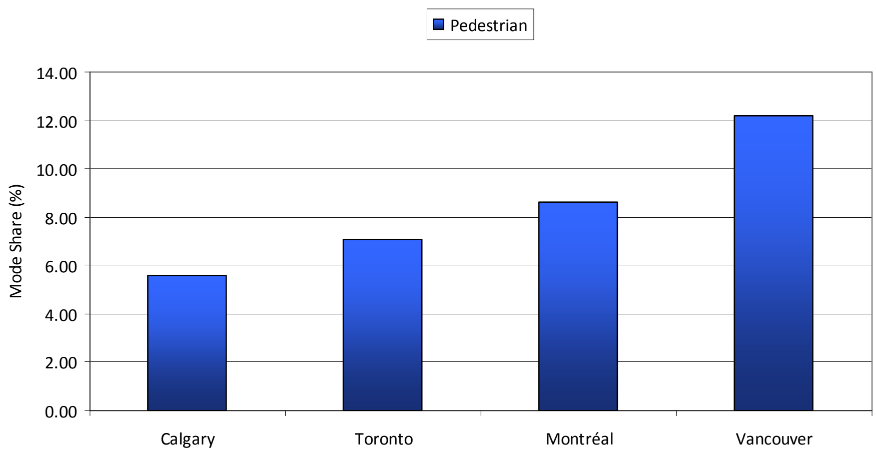

Figure 10 Pedestrian mode shares in Canadian cities, 2007

Figure 11 presents a complete modal breakdown for all study cities. It is noteworthy that the two cities with the lowest AT shares (Chicago and Calgary) are also the two cities with the highest private automobile shares. New York has the lowest private automobile share of any city we studied (32.1%). Vienna and Berlin show the most equal distribution across modes.

Figure 11 Complete modal breakdown for all study cities, 2007

Figure 12 examines gasoline taxation and the relative AT mode shares in our study cities. Cities with low gas taxes tend to have low AT levels. Figure 13 presents the converse to this, where we model taxation on gasoline against private automobile mode shares. We can see that those cities with lower taxation levels have higher private automobile mode shares. Cities with shorter commuting distances are more likely to have higher rates of AT. In our study, information about commuting distances was available only for the Canadian cities and is depicted in Figure 14, where we analyzed median commuting distance. We followed this analysis with an examination of the percentage of work trips within a 5 km commuting radius. This information is presented in Figure 15.

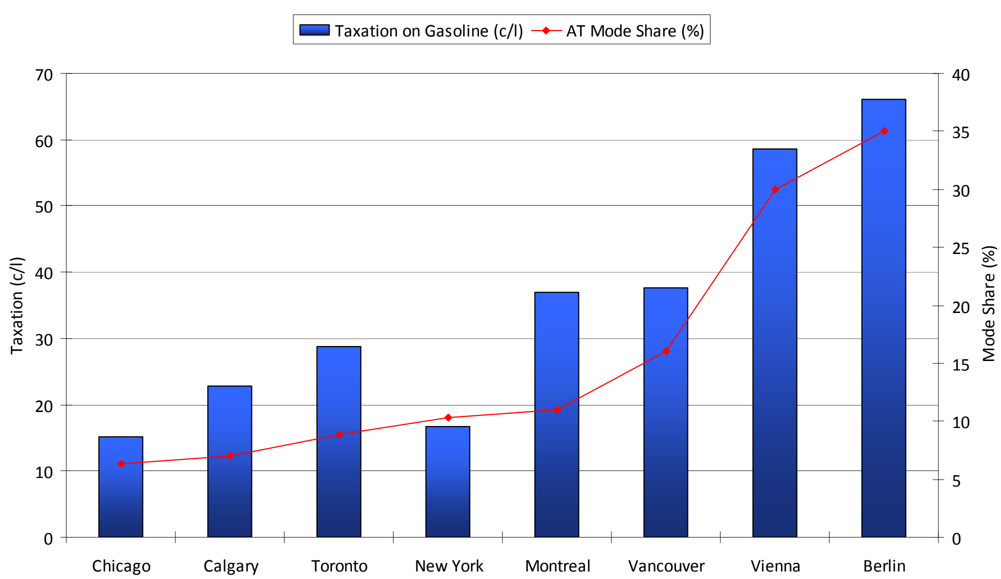

Figure 12 AT mode shares and taxation on gasoline, 2007

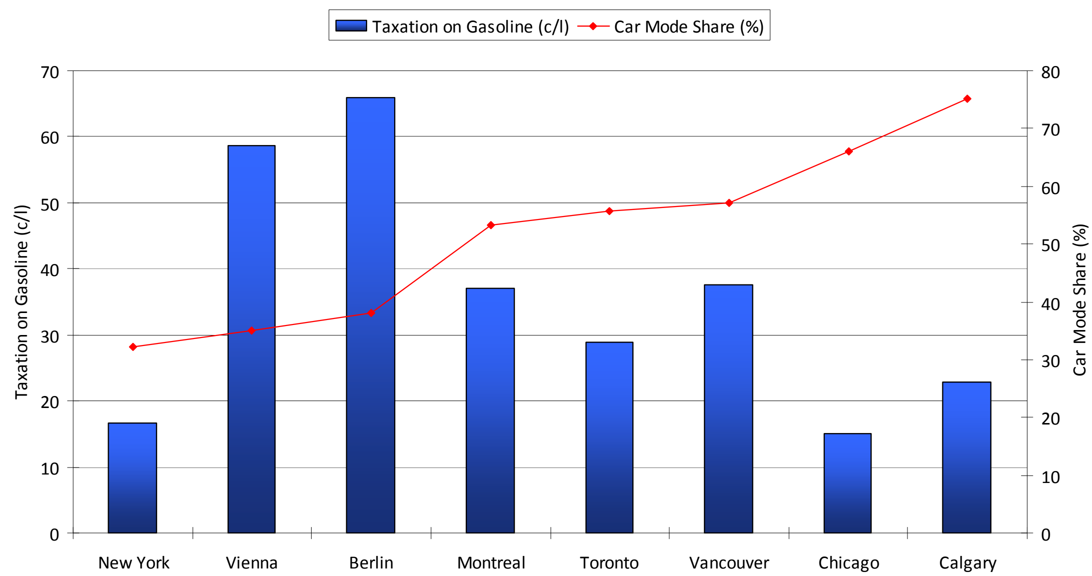

Figure 13 Private automobile mode shares and taxation on gasoline, 2007

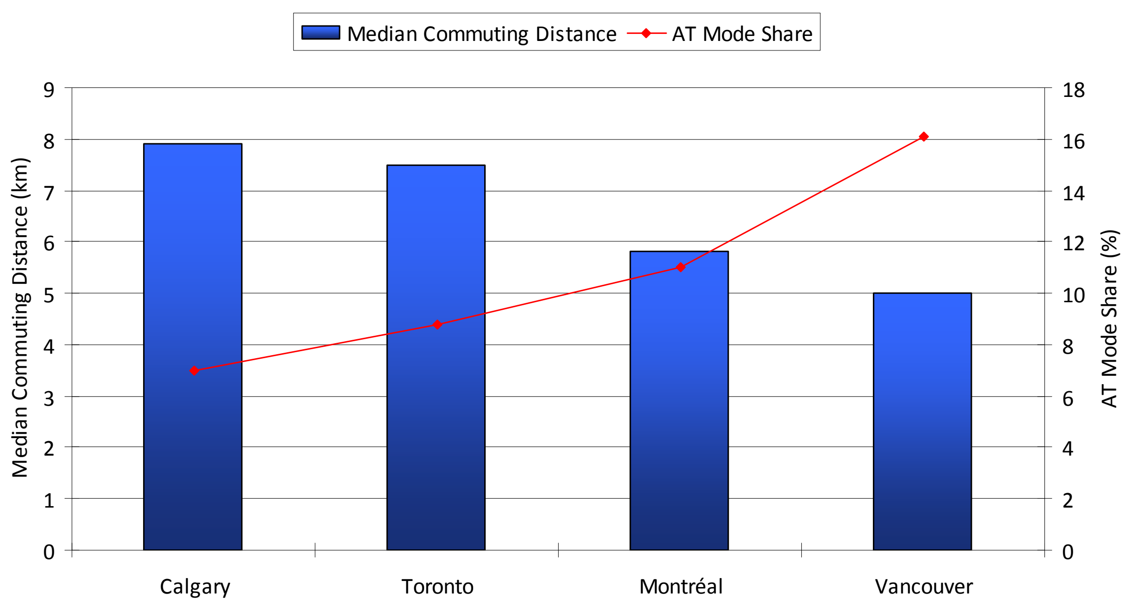

Figure 14 Median commuting distance in Canadian cities, 2007

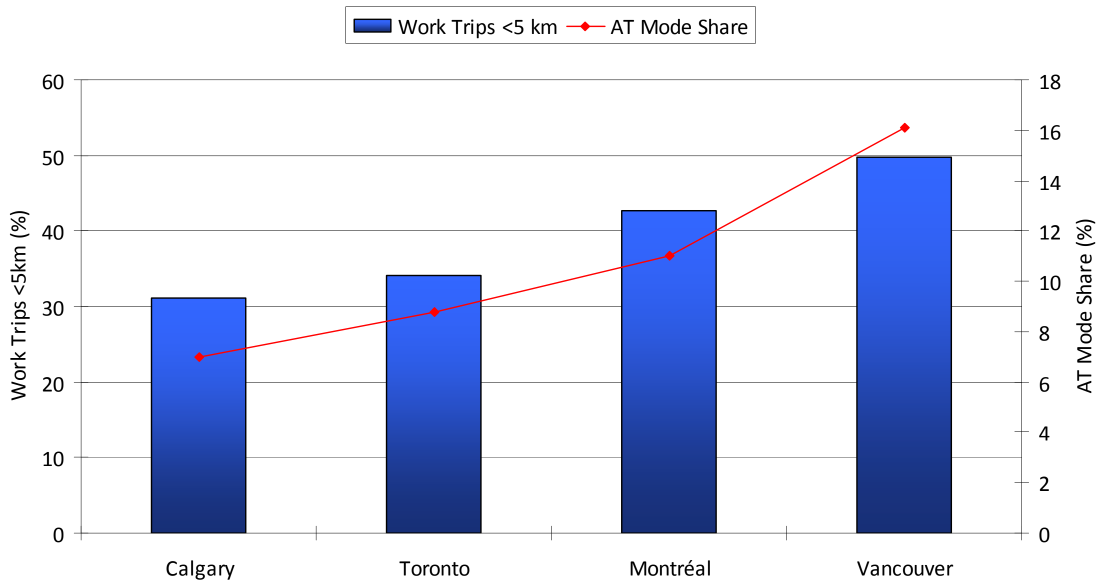

Figure 15 Percentage of work trips less than 5 km in length in Canadian cities, 2007

4. Demographics

4.1 Population and Population Density

Figure 16 shows the total population in our study cities plotted against their AT rate. As is evident from this graph, there was no clear relationship between overall population and AT rates. Figure 17 presents AT mode plotted against population density. The results are very similar to those of absolute population numbers and follow no distinct trend. Interestingly, if we only focus on Canadian cities, there is a clear trend between population density and AT rates (see Figure 18). However, given the results from our international cities around this metric, we would hesitate to draw firm conclusions around this outcome. Building on our analyses around population density, we examined the mode shares of transit and private automobile. These results were considerably more conclusive. Figure 19 plots population density against the mode share for public transit and reveals a more linear relationship, where **as density grows, so does the mode share for public transit**. The converse to this is presented in figure 20 where we plot private automobile mode shares against population density. Here, we see Calgary has, by far, the highest car mode share where New York has the lowest.

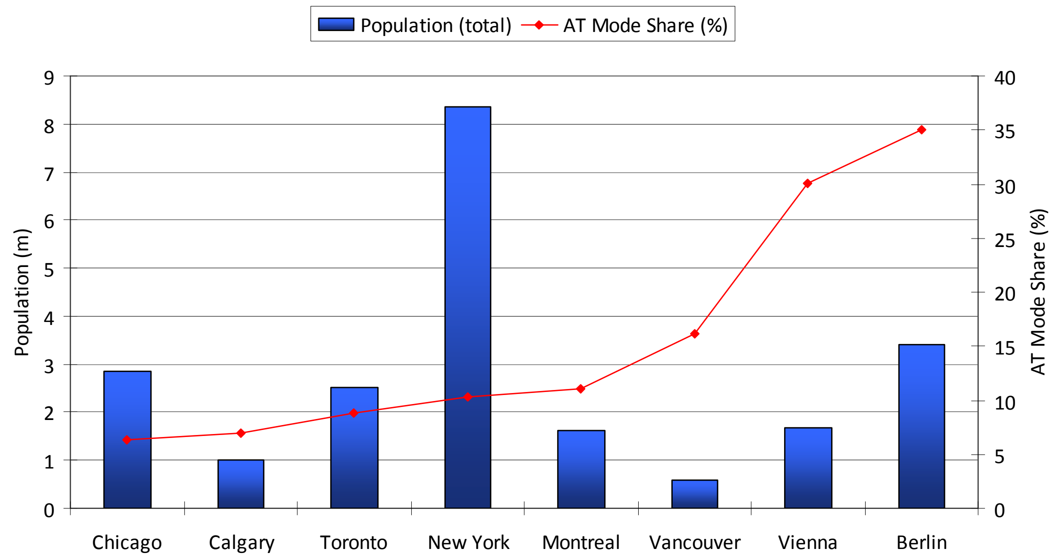

Figure 16 AT mode share by total population, 2007

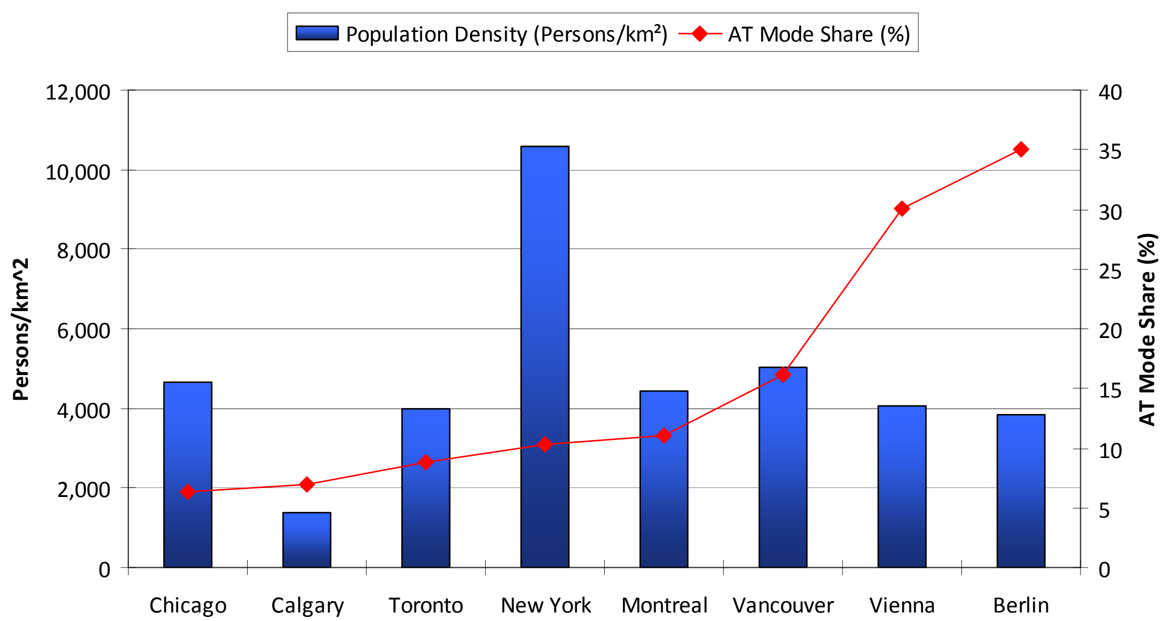

Figure 17 AT mode share by population density, 2007

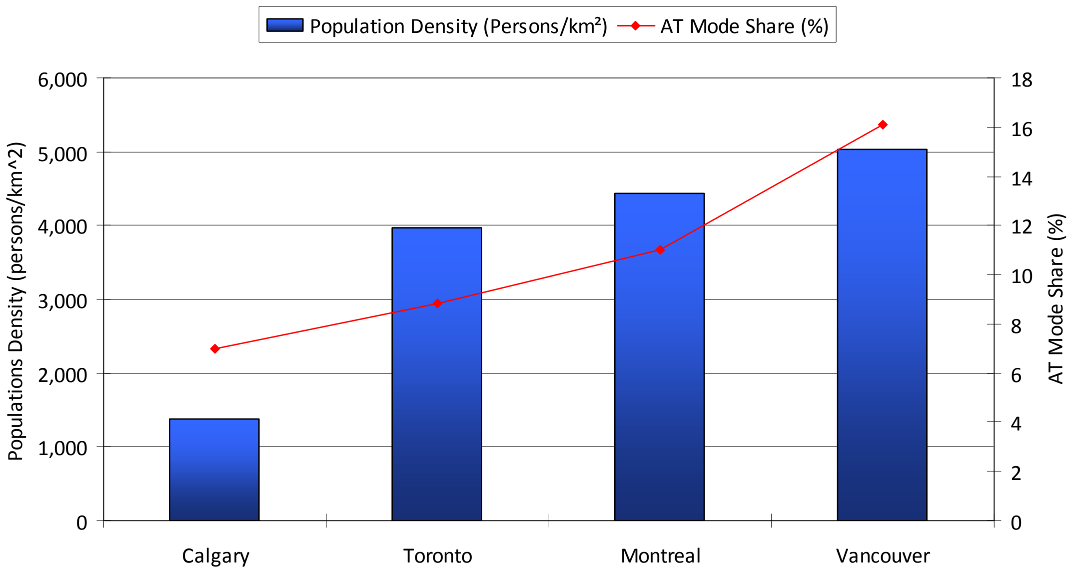

Figure 18 AT mode share by population density (Canadian cities only), 2007

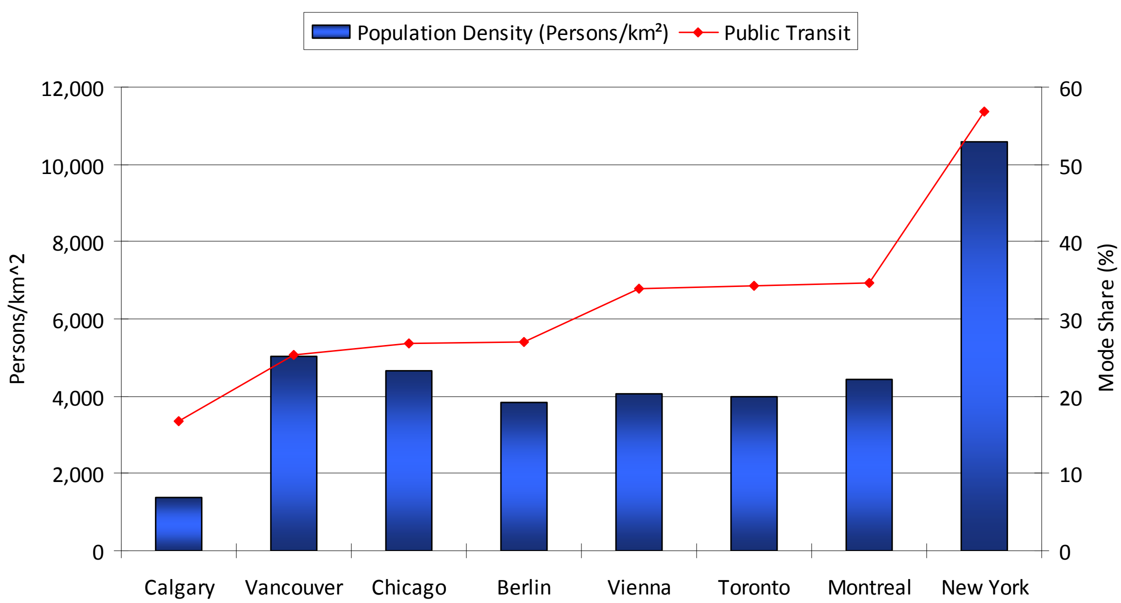

Figure 19 Transit mode share by population density, 2007

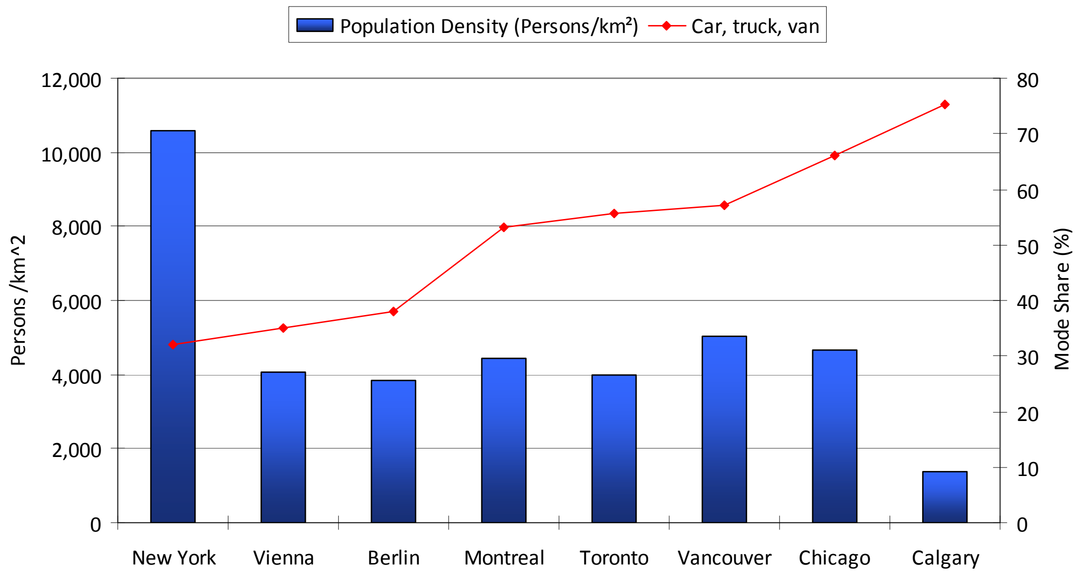

Figure 20 Private automobile mode share by population density, 2007

4.2 Gender

When we examine gender and AT modes combined, we see that overall, the female to male split hovers around 50:50. This is evident in Figure 21. However, on closer examination, when we separate AT into walking and cycling, we see that there are great disparities between the sexes. As displayed in Figure 22, where we look at pedestrian trips, in all cities the majority of pedestrian trips are made by females. **Although not extremely large in magnitude, for pedestrian trips there is a clear trend where females dominate this mode. As is evident in Figure 23, cycling as a mode choice is male dominated.**

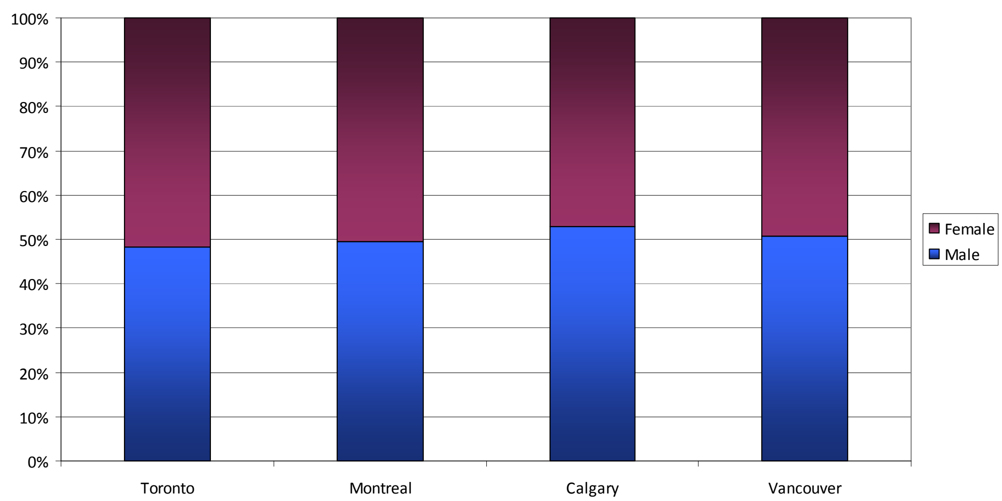

Figure 21 AT modes combined by gender (Canadian cities only), 2007

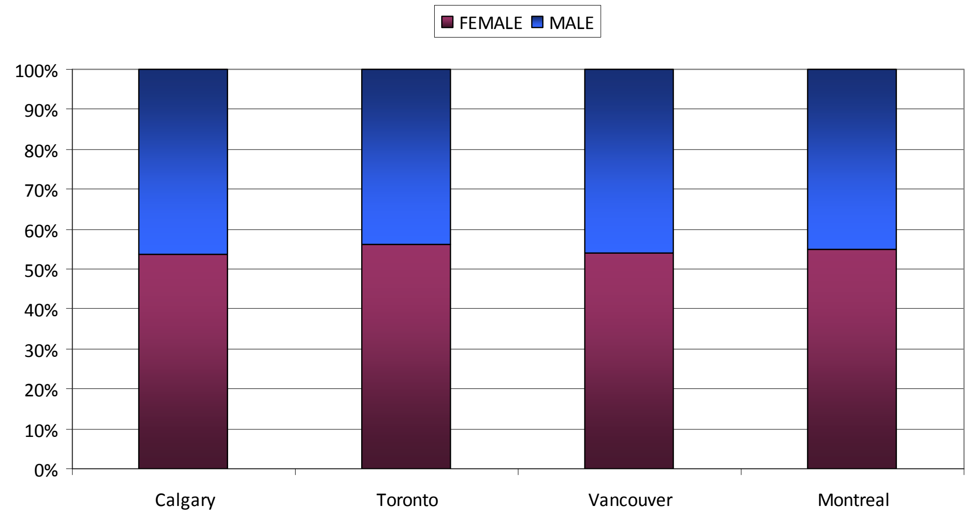

Figure 22 Walk to work by gender in Canadian cities, 2007

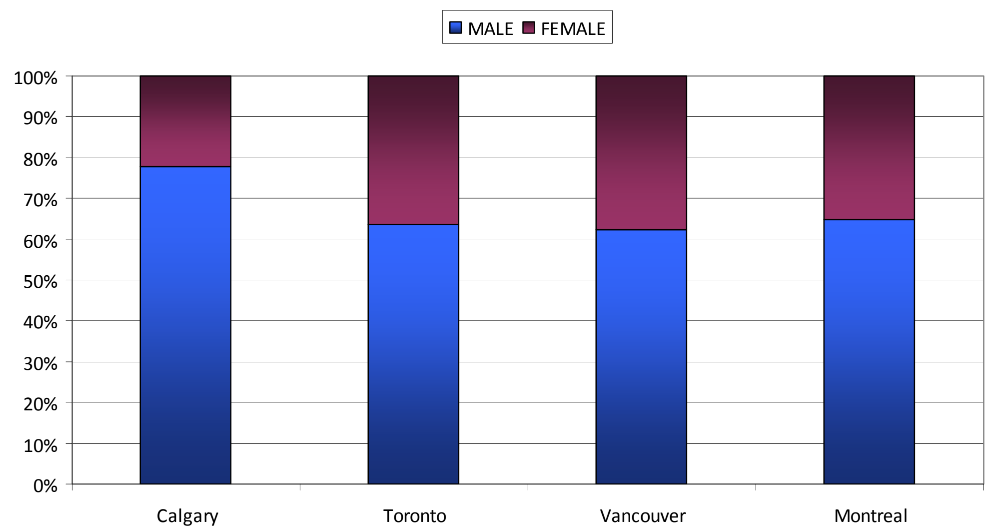

Figure 23 Cycle to work by gender in Canadian cities, 2007

5. Geography and Weather

Our *a priori* expectations around meteorological indicators were that there would be no significant correlations. This proved to be the case. When we examine annual precipitation (Figure 24) we see no meaningful results. An examination of annual hours of sunshine reveals similar results, where **Vienna and Berlin, with the two highest levels of AT of all study cities, have the lowest annual sunshine** (Figure 25). Average summer temperatures also proved inconclusive, although it should be noted that the range in summer temperature between all cities was only 6°c (Figure 26). Winter temperatures, obviously of a different magnitude, also presented a similar variance, but still no discernable trends exist in the data (see Figure 27). Combining summer and winter temperatures and examining the mean annual temperature proved similarly inconclusive for all study cities (see Figure 28). All of our analyses around meteorology and AT proved our expectation that the effect is, at best, minimal.

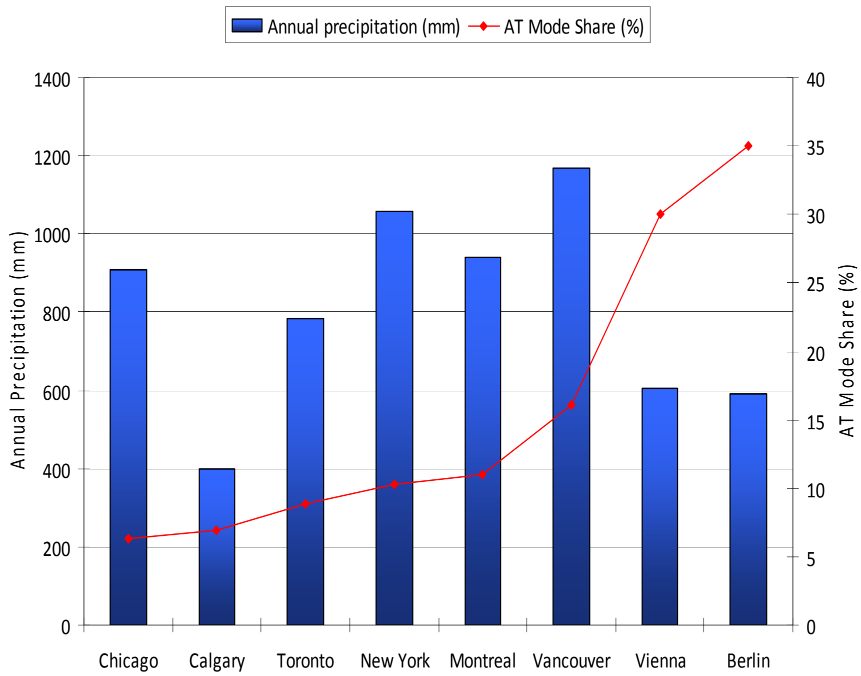

Figure 24 Annual precipitation by study city, 2007

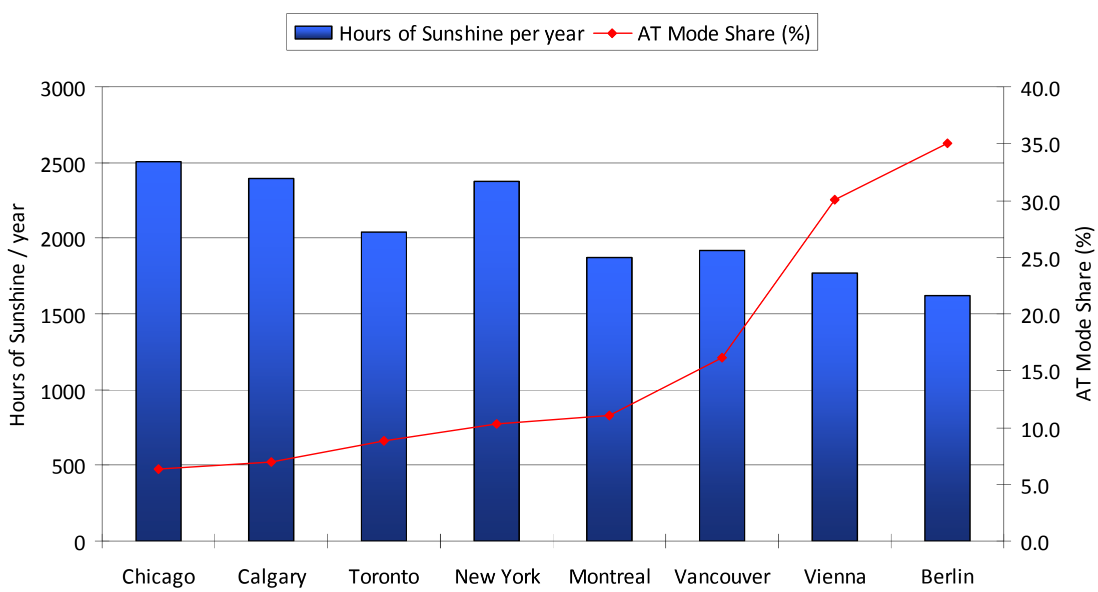

Figure 25 Annual hours of sunshine by study city, 2007

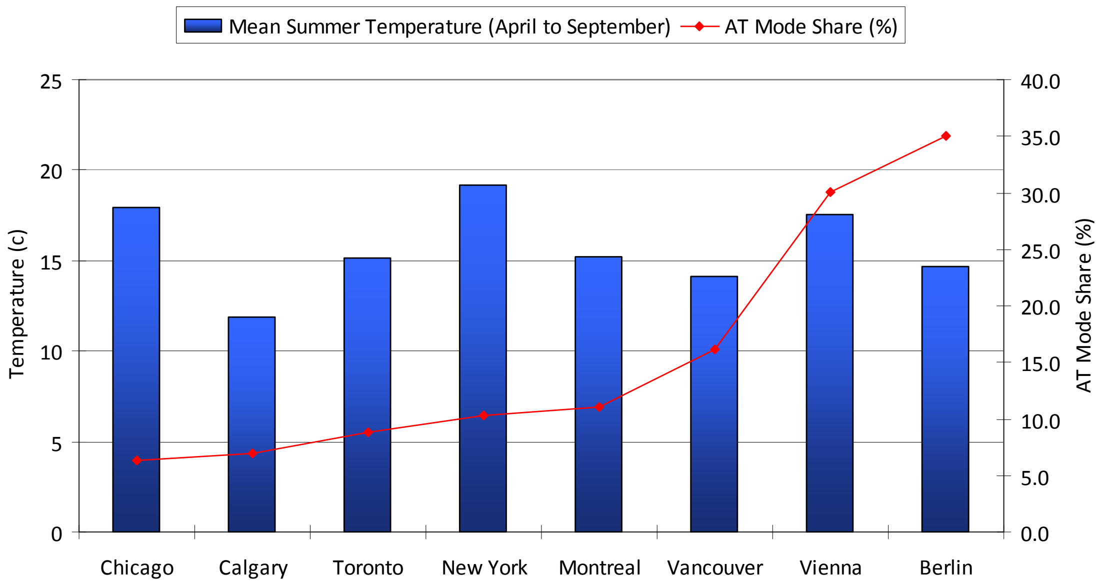

Figure 26 Mean summer temperature by study city, 2007

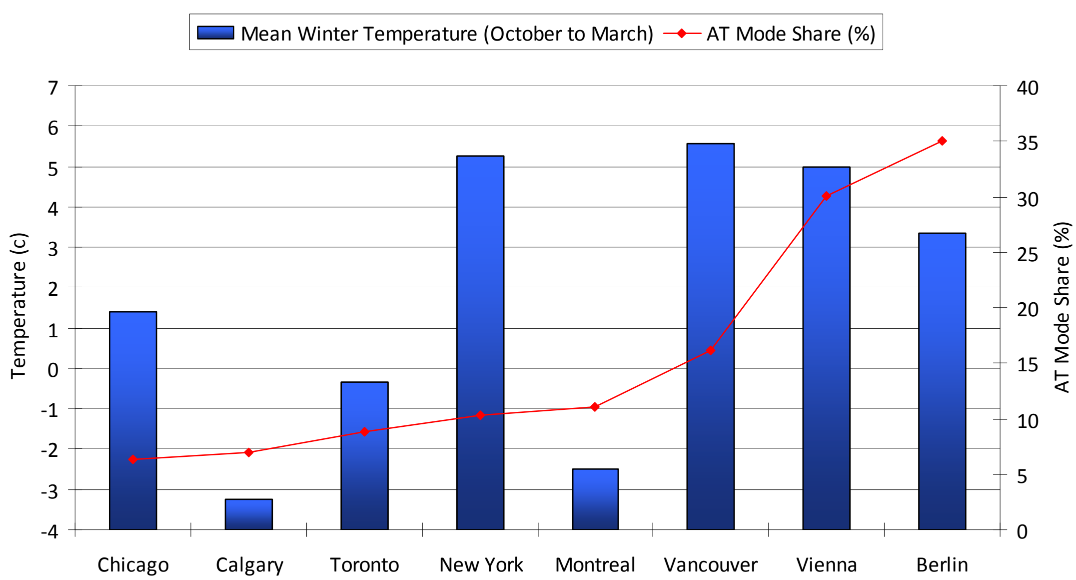

Figure 27 Mean winter temperature by study city, 2007

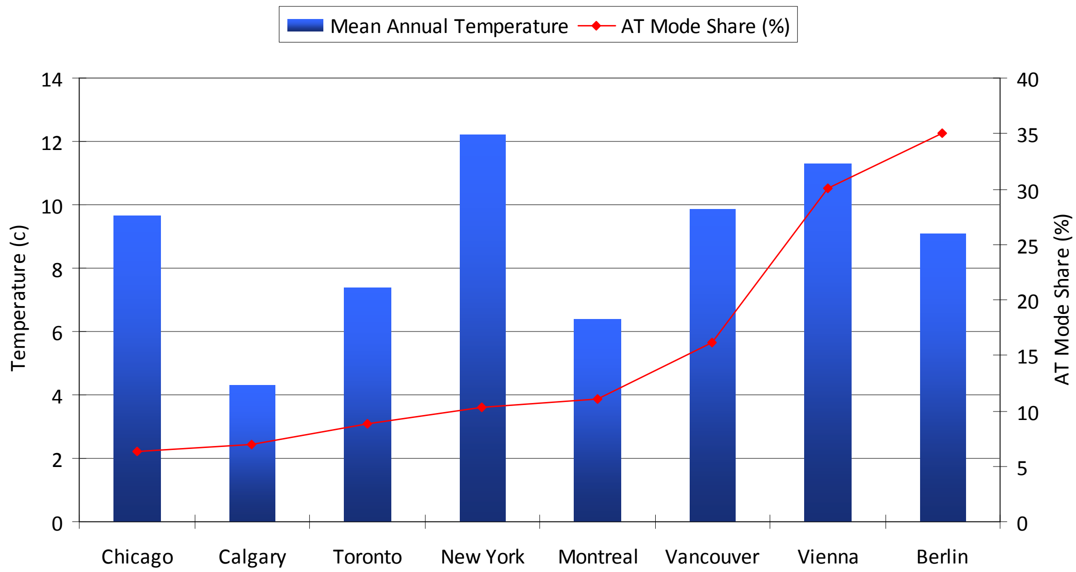

Figure 28 Mean annual temperature by study city, 2007

Current Status of AT in Toronto

Comparing Toronto against Neighbouring Municipalities

When comparing Toronto to its surrounding municipalities, we see the unique position the city occupies relative to its neighbours across all aspects of transportation. **Toronto's automobile mode share of 55.8% is dramatically lower than the lowest of its neighbours, at 80.6%** (see Figure 29). When we compare among public transit mode shares, **Toronto's transit mode share is 34.4%, over double the second highest, Mississauga, at 15.8%** (see Figure 30). Similarly, Toronto's AT mode shares are impressive when compared against other GTA municipalities (see Figure 31). This statement should be qualified by noting the extremely low levels of AT in the surrounding areas.

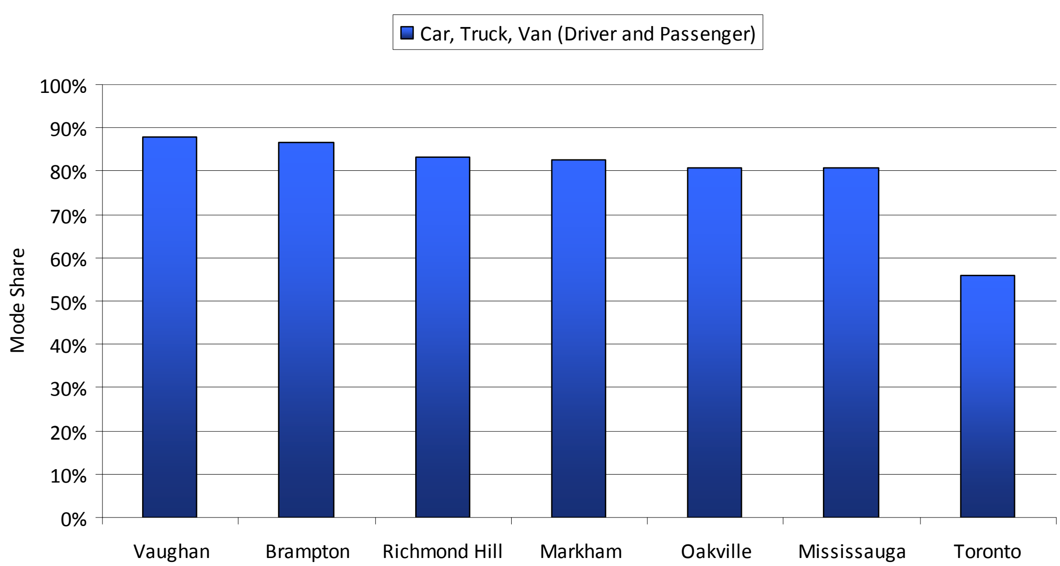

Figure 29 Mode to work by private automobile – GTA municipalities, 2007

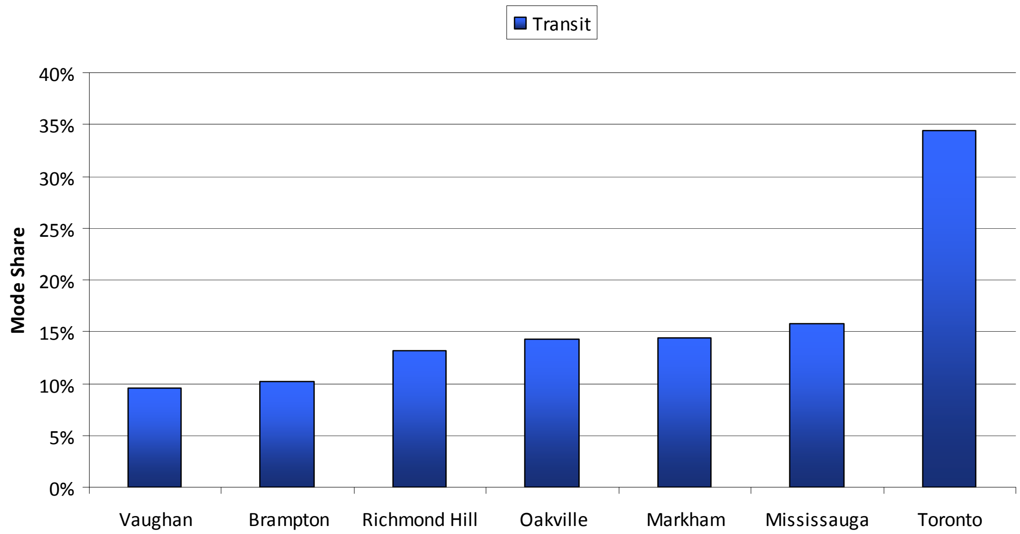

Figure 30 Mode to work by transit – GTA municipalities, 2007

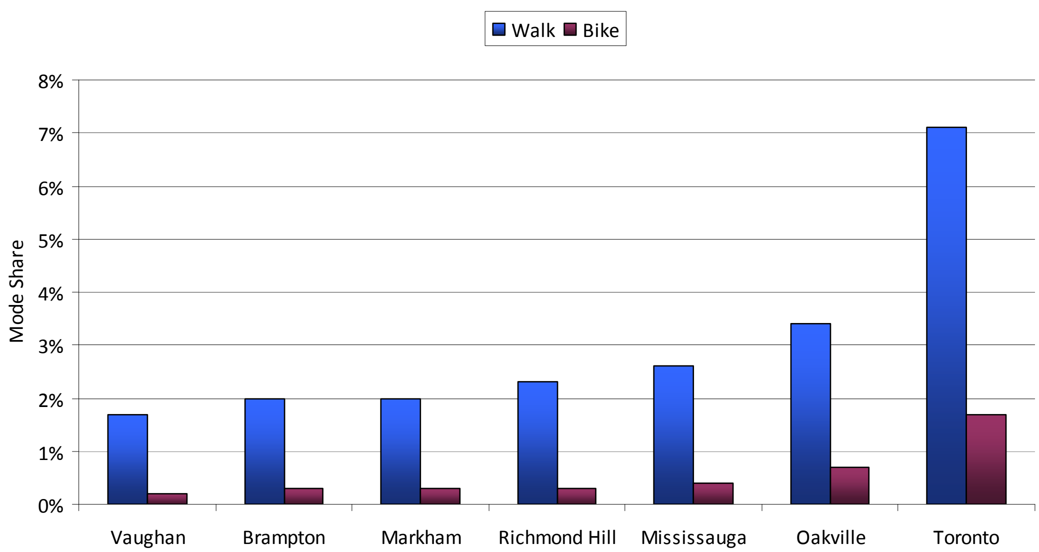

Figure 31 Mode to work using AT – GTA municipalities, 2007

Changes in the Transportation Choices of Torontonian's, 2001-2006

This section examines the changes between 2001 and 2006 in the transportation choices of Torontonians. The highest rate of change for any mode was with cyclists, where we see an increase of 32.6% (see Figure 32). Increases in the pedestrian mode of 11.4% are also positive and encouraging.

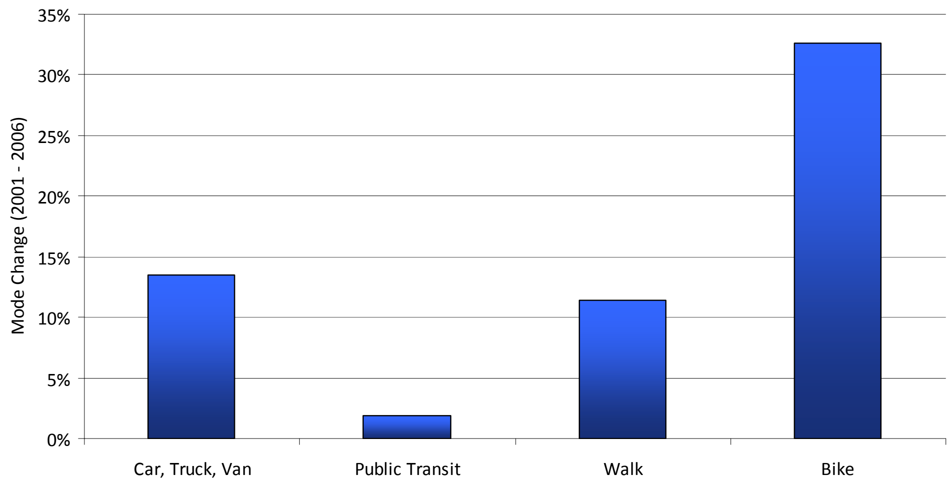

Figure 32 Change in mode to work, Toronto, 2001 – 2006

Interestingly, when we examine changes in AT between the sexes in Toronto between 2001 and 2006, we see greater increases for males walking to work compared to females, and greater increases for females cycling to work against males (see Figure 33).

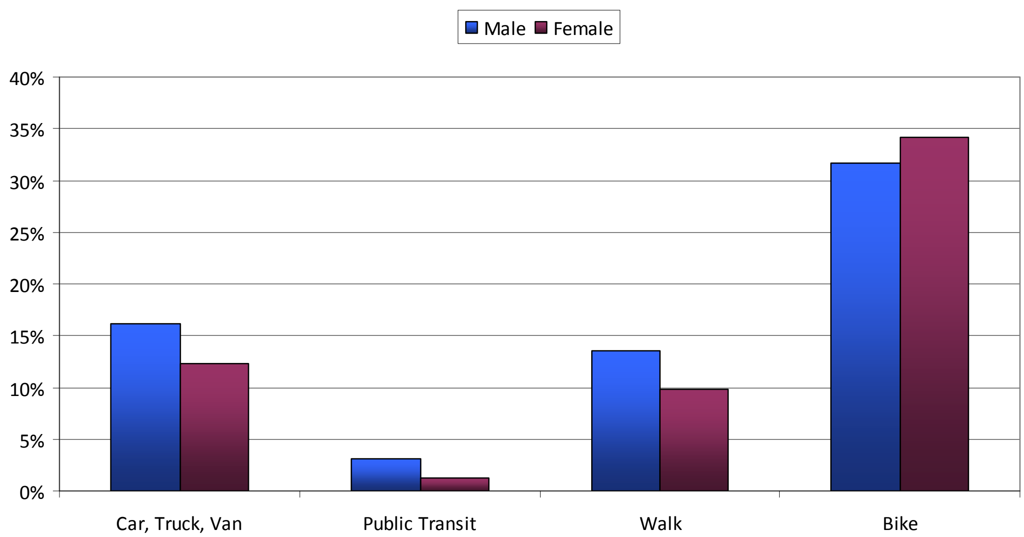

Figure 33 Change in mode to work, Toronto, 2001 – 2006 by sex

By examining the change in AT modes by age category, we discovered an interesting trend. As Toronto's population ages, we see cohorts turning to cycling and walking in impressive numbers. As Figure 34 displays, the highest increases in both walking and cycling were in the 55-64 age category.

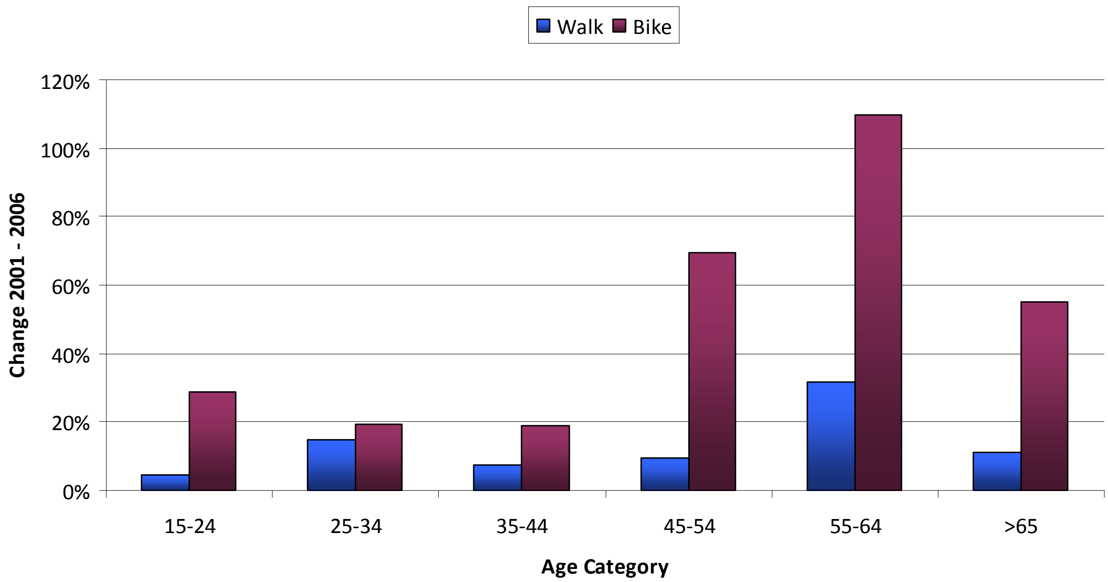

Figure 34 Changes in AT modes, 2001 -2006, by age category

Conclusion

Benchmarking is an important exercise in that it allows us to measure where we are against where we can be. In doing so it's possible to identify weaknesses while simultaneously identifying areas of improvement. Benchmarking provides an opportunity to see what other cities are doing and identify best practices as well as areas to avoid. Despite the small sample size and study limitations, these findings largely mirror those found in larger benchmarking studies. As in previous studies, we found that those cities with more kilometres of bicycle facilities also tend to have higher cycling mode shares. Cities with greater transit integration, where bicycles are permitted on transit vehicles during rush hours, also have higher AT mode shares. Our findings show that in cities with high mode shares, the percentage of cyclists and pedestrians injured and killed is lower than in cities with low mode shares, reflecting the 'strength in numbers theory'.

As was the case in previous research, our study found that weather is not as great a deterrent to AT as is generally conceived. Vancouver, the wettest of our Canadian study cities had the highest AT mode shares of any Canadian city. Vienna and Berlin, with the two highest levels of AT of all study cities, have the lowest annual sunshine.

Commuting distance was also found to influence AT rates, where we found that cities with shorter commuting distances are more likely to have higher rates of AT. Vancouver, with the highest AT mode share of any Canadian city, has the lowest median commuting distance at 5 km. Local policies also have an effect, where we found that those cities with lower fuel taxation levels have higher private automobile mode shares. As is the case in most cities with relatively low AT rates, we found that for all Canadian cities, walking tends to be dominated by females where cycling has a higher number of males.

The final focus in our research looked at the City of Toronto specifically and compared Toronto with neighbouring municipalities. Toronto's automobile mode share of 55.8% is dramatically lower than the lowest of its neighbours, at 80.6%. Toronto's transit mode share (34.4%) is the highest in the region, where the next highest is 15.8%. Toronto has made investments in AT over the past decade, and although AT mode shares are still quite low, they are improving. There was a 32.6% increase in utilitarian cyclists in Toronto between 2001 and 2006, where there was only a 13.5% increase in the number of people travelling to work by private automobile. In the same period, we witnessed greater increases in the number of female cyclists, where parity between the sexes can be seen as an important step in creating a healthy state of AT. Interestingly, when we examined the age structure of cyclists and pedestrians in Toronto, the highest increases in both walking and cycling were in the 55-64 age category.

Toronto's investment in AT is relatively low when compared to those European cities with very high AT mode shares. Still, we have witnessed improvements in mode shares and levels of infrastructure. With continuing improvement and increased investment in the future, we have the potential to create a vibrant, liveable, moving city, with greater levels of AT, cleaner air and healthier citizens.

References

Alliance for Biking & Walking (2010) *Bicycling and Walking in the US: Benchmarking Report, 2010* (Washington, DC: Alliance for Biking & Walking).

Bassett Jr., D.R., Pucher, J., Buehler, R., Thompson, D.L., Crouter, S.E. (2008) Walking, cycling, and obesity rates in Europe, North America and Australia. *Journal of Physical Activity and Health* Volume 5, Issue 6, November 2008, Pages 795-814

Canby (2003) Creating Successful Communities – Making it Happen! Institute of Transportation Engineers. *ITE Journal*; Jul 2003; 73, 7; ABI/INFORM Global pg. 26

Cervero R, Duncan M. Walking, bicycling, and urban landscapes: evidence from the San Francisco Bay Area. Am J Public Health. 2003;93:1478–83.

City of Toronto (2010) Cycling Study Tracking Report (1999 and 2009). Toronto, Canada: City of Toronto. Accessible at: http://www.toronto.ca/cycling/reports/pdf/cycling_study_1999_and_2009.pdf

Curran, A (2006) Taking the pulse of active transportation: Measuring the built environment for healthy communities 2006 *Plan Canada* 46 (2), pp. 32-34

Dekoster, J. and Schollaert, U. (1999) *Cycling: the way ahead for towns and cities.* European Communities, Belgium.

Dill J. and Carr T. (2003) Bicycle commuting and facilities in major U.S. cities: if you build them, commuters will use them. Transp Res Rec. 2003;1828:116–23.

Dill, J. and Voros, K. (2007) Factors affecting bicycling demand: initial survey findings from the Portland,

Federal Highway Administration International Scanning Team (2009) International Scan Summary Report on Pedestrian and Bicyclist Safety and Mobility. Available at: http://drusilla.hsrc.unc.edu/cms/downloads/Pedestrian%20Bicycle%20Scan%20Summary%20Report.pdf Accessed August 6, 2009.

Go for Green/Environics (1998) 1998 National Survey on Active Transportation Summary Report. Ottawa, Ontario, Go for Green.

Leslie ,E., Butterworth, I., Edwards, M. (2006) *Measuring the walkability of local communities using Geographic Information Systems data.* Paper presented at Walk21-VII, "The Next Steps", The 7th International Conference on Walking and Liveable Communities, October 23-25 2006, Melbourne, Australia www.walk21.com.

Plaut P.O. (2005) Non-motorized commuting in the U.S. Transportation Research D – Transport and Environment;10:347–56.

Pucher, J., Komanoff, C., and Schimek, P. (1999) Bicycling renaissance in North America? Recent trends and alternative policies to promote bicycling, *Transportation Research A,* 33(7/8), pp. 625–654.

Pucher, J. and Dijkstra, L. (2003) Promoting Safe Walking and Cycling to Improve Public Healtti: Lessons From The Netherlands and Germany. *American Journal of Public Health* September 2003. Vol 93, No, 9

Pucher, J. and Buehler, R. (2005) Cycling Trends and Policies in Canadian Cities. *World Transport Policy and Practice*, 2005, volume 11, issue 1

Statistics Canada (2007) *Where Canadians Work and How They Get There* (Ottawa: Statistics Canada).

Stonor et al (2002) Towards a walkability index. Presentation to the 3rd Walk 21 Conference, 9th - 10th May, Donostia-San Sebastian, Spain (2002)

Thunderhead Alliance (2007) *Bicycling and Walking in the US: Benchmarking Report, 2007* (Prescott, AZ: Thunderhead Alliance).

Wood, M. E. (2005). *On the path to community well-being: Indicators for active recreation*. Masters Project. School of Planning, Dalhousie University. Available online at http://sp.architectureandplanning.dal.ca/spubs0506/Wood.pdf