

Transportation Sustainability in Mid-sized Canadian Cities: a case study of Kamloops, British Columbia

Erin Toop, P.Eng.

MASc Candidate at the University of Toronto

735 Markham Street, Toronto, ON, M6G 2M2

Work supervised by Professor Eric J. Miller

ITE District 7

ABSTRACT

This paper weaves together two subjects that rarely arise within transportation planning research – mid-sized cities and qualitative research methods – and forms part of a broader University of Toronto research project, which is investigating the culture around transportation in mid-size Canadian cities. Given that a large percentage of Canadians currently live within mid-sized cities and that this segment of the population is expected to grow into the future, it is extremely important to understand the current issues around transportation sustainability in these communities. Though they are not well understood by travel behaviour researchers, qualitative research methods offer an opportunity to explore the context of travel behaviour beyond the level of detail that is offered by quantitative methods. Using a combination of research methods, it is possible to drill down from higher-level issues that surface in large quantitative datasets to investigate the reasons behind particular behaviour at increasing levels of detail. Thus, this paper suggests a process for combining qualitative and quantitative methods for use in mid-sized cities, and demonstrates the first stages of its application in a case study of Kamloops, British Columbia. The preliminary results indicate that, although the automobile is the dominant travel mode in the city, significant potential exists for increasing non-motorized travel.

INTRODUCTION

Transportation planning issues in mid-sized cities are unique. These cities often suffer from low-density and homogenous land use patterns, insignificant central business districts, and inherently, auto-centric travel behaviour. Within the literature and particularly within Canada, there is some debate over the definition of a mid-sized city. However, for the purposes of this discussion, mid-sized cities are defined using the Transportation Research Board's population range of 50,000 to 250,000 residents (TRB, 2012). Based on this definition, there are currently 79 mid-sized municipalities in Canada, which aggregately, are home to over 8.2 million people (Statistics Canada, 2012). Given that 25% of the Canadian population lives within mid-sized municipalities and this population is expected to grow into the future (Foot, 1998), more effort must be made to understand why the culture of these cities has allowed

unsustainable development and behaviour to persist, and how these challenges may be dealt with in the coming decades.

Sustainability issues in mid-sized cities affect a number of measures – social, environmental and economic – and transportation plays a role in each. Socially, there is the concern that certain demographic groups (low-income, mentally or physically impaired, or the elderly, for example) may suffer from social exclusion or reduced quality of life due to having limited accessibility to the automobile as a travel mode. Environmental issues surround the resource consumption that is inherent to current automobile dependent cultures and low-density and isolated land use patterns. Finally, economic issues arise from the inefficiencies, especially at the municipal level, in supporting sprawling development with linear infrastructure, and providing transit services to areas that are primarily low-density and suburban. Efficient transportation systems are essential to attracting people and industries to urban areas, and as such, transportation plays an integral role in the overall sustainability of communities.

These sustainability issues represent the impetus for the Midsize Cities Project, which is currently underway at the University of Toronto. The goal of this research project is to better understand the culture around transportation in mid-sized cities, and ultimately, to suggest opportunities for mid-sized cities to affect more sustainable travel behaviour. Because understanding culture does not lend itself well to typical quantitative data analysis, this project is designed to employ both quantitative and qualitative research methods through case studies of travel behaviour in specific municipalities. The City of Kamloops in south-central British Columbia was chosen as the first case study due to enthusiasm and interest expressed by the city's administration and their willingness to make their most recent Household Travel Survey (HTS) data available to the researchers.

The remainder of this paper is used to describe the process of the Midsize Cities Project and to show proof of the concept through highlights from the first phases of the Kamloops case study. The subsequent sections are outlined as follows. First, qualitative research methods are briefly discussed as they relate to the transportation planning field. Next, the data collection process for the Midsize Cities Project is outlined in its generic form. Lastly, the completed stages of the City of Kamloops case study, including the qualitative survey, are presented. The case study consists of a profile of the city, a discussion of future growth, a description and analysis of both the HTS data and qualitative survey data.

QUALITATIVE RESEARCH METHODS

Though the application of qualitative research in the field of transportation planning is not new, it is infrequent and rarely the first choice for travel behaviour researchers whose training often emphasizes quantitative data collection and modelling methods. Where quantitative research is typically applied to understand “who”, “what” and “when” questions, qualitative research is used to understand “why” and “how” (Clifton, 2011). In general, the goal of qualitative research is to provide context to information that is quantifiable (Clifton, 2001). Through supplementing quantitative

datasets with qualitative information, researchers are better equipped to understand the factors that motivate behaviour (Clifton and Handy, 2001).

Qualitative research takes on a number of forms, but most common are surveys, focus groups and interviews. Each of these qualitative research methods has strengths and weaknesses, which are summarized below.

Although most surveys are not qualitative in nature, they may be used to gather information about attitudes and perceptions, which have been shown to be significant indicators of travel behaviour. Surveys are common in travel behaviour research and are relatively easy to employ with statistical validity. However, it is difficult to gain substantial depth and insight from responses to survey questions, especially close-ended questions. (Clifton and Handy, 2001)

Inherently, focus groups restrict sample sizes considerably, which removes any statistical significance from the data collected and does not allow for broad generalizations. Typically, focus groups are capped at a dozen participants and provide an environment for idea exchange both between participants and between participants and the researcher. Though focus groups allow for exploring issues at depth, it takes considerable skill and practice to effectively facilitate focus groups, as the group dynamic may affect the outcome of the results. (Clifton and Handy, 2001)

Personal interviews eliminate some of the complications that arise with focus groups by allowing for a confidential and intimate environment in which to discuss issues. Interviews are often flexible and provide opportunities for the researcher and respondent to clarify or elaborate about questions and responses. Unfortunately, implementing interviews is very a labour-intensive process and researchers must always be cautious of interview bias. (Clifton and Handy, 2001)

Given resource constraints and the researchers' lack of experience in facilitating focus groups, the focus group method was eliminated as a candidate for the Midsize Cities Project. As a result, the project employs the following two qualitative methods: surveys and personal interviews.

MIDSIZE CITIES DATA COLLECTION

The case study research process developed for the Midsize Cities Project uses a strategic three-stage combination of quantitative and qualitative methods: a preliminary analysis of quantitative HTS data provided by the municipality, a qualitative survey, and follow-up personal interviews. Following the initial analysis of an existing set of HTS or trip diary data, the subsequent data collection stages are designed to close the gap between broad research questions that arise from HTS data and the intricacies of respondent's travel behaviour and decision-making.

In developing the case study process, the researchers set a goal of conducting 40 personal interviews. This number allows for the possibility of acquiring a statistically significant dataset and provides ample opportunity to achieve a representative sample of a municipal population across a number of demographic categories. However, various complications arose with respect to recruiting interview participants and defining key research questions; and as such, a qualitative survey was added to the process to act as a recruiting tool for the interviews, and to ask

respondents some key questions about issues that were identified in the analysis of the HTS data.

Given the end goal of conducting 40 interviews and estimates of 20% response rates for both interviews and the survey, a sample frame of 1,000 residents was defined for the qualitative survey. Survey participants were recruited via mail using a sample frame of addresses, which includes first names and last names. A reminder letter was mailed to delinquents two weeks following the initial recruitment mail out in order to increase the response rate. The personally addressed letters contained a link to the Midsize Cities Project website, where the online qualitative survey was hosted and accessed using a four-digit identification number provided in the recruitment letter. The identification number is used by the researchers to follow-up with those survey respondents who express consent to participating in a personal interview.

Following the analysis of the survey data, a representative sample of interview participants is selected from those who provide consent in the survey. The representative sample is determined according to the citywide demographic distributions recorded in the HTS data and collected during the qualitative survey. Approximately hour-long semi-scripted interviews are then conducted with the selected candidates to further explore their responses to the qualitative survey and to add context to the behaviour observed in the HTS data. To ensure consistency, all interviews are conducted by the same researcher. Interviews are recorded on an audio recording device and later transcribed to text for analysis.

Using this combination of research methods, it is possible to drill down from higher-level issues that surface in large quantitative datasets to explore the reasons behind certain behaviour and choices at increasing levels of detail. Tangible examples of the clarity achieved through this method are shown in the following case study.

CITY OF KAMLOOPS CASE STUDY

The City of Kamloops case study is currently in the stage between the qualitative survey and follow-up interviews. Though the personal interview data is unavailable at this point in time, a substantial amount of analysis has been completed using the city's HTS data and the recently completed qualitative survey. Highlights of the work completed to date are described in the following sections, along with background information about the city.

Kamloops Profile

The City of Kamloops, shown in Figure 1, is a mid-sized city located in the Thompson-Nicola region of British Columbia and a stand-alone community, which acts as a transportation hub within its region. With a 2011 population of approximately 86,000 residents, the city is ranked 59th nationally in population size (Statistics Canada, 2012).



Figure 1 - City of Kamloops Location (ArcGIS, 2012)

The economy in Kamloops is based largely on the mining and forestry sectors, though in a past study of industrial diversity, Kamloops was ranked one of the most industrial diverse cities in its size range with an index of 58.6% (Beckstead and Brown, 2003). As a point of comparison, the same study found Vancouver's industrial diversity to be significantly higher at 87.8% (Beckstead and Brown, 2003). In 2011, the major employers in Kamloops were: the Interior Health Authority, the School District, Thompson Rivers University, Highland Valley Copper Mine, the City of Kamloops, and Domtar – a pulp and paper company (Venture Kamloops, 2011).

Weather in Kamloops varies significantly throughout the year with average highs of 28 Celsius in the summer months and average lows of -8C in the winter months (Environment Canada, 2012). In Canada, the city is ranked the second driest based on annual amounts of precipitation (Environment Canada, 2012).

BC Transit provides transit service in the City of Kamloops, where there is currently an estimated transit mode share of 3.8% (BC Transit, 2012). As of 2007, the overall active transport mode share in Kamloops was 8.2%, which is impressive considering the city's hilly topography and significant seasonal temperature variation. The automobile mode share in the city accounts for 86%, with 70% of trips made as the auto driver and the remaining 16% made as auto passengers (Synovate, 2008).

A normative land use assessment of the city indicates that it is primarily low-density and outside of the downtown area, does not exhibit a healthy mixture of land uses. Many of the city's neighbourhoods are strictly residential, and 7 out of every 10 households live in a single-family dwelling unit (Synovate, 2008).

Projected Population Growth

In a 2009 report, the city projects a growth rate of 1.25% per year, which by 2039, will yield 120,000 residents and an overall population increase of 47%. Based on this projection, it is expected that over the next two and a half decades, there will be a significant increase in the median age of Kamloops residents. As shown in Figure 2, the number of residents over the age of 65 is expected to grow by 156% (Urban Systems, 2009).

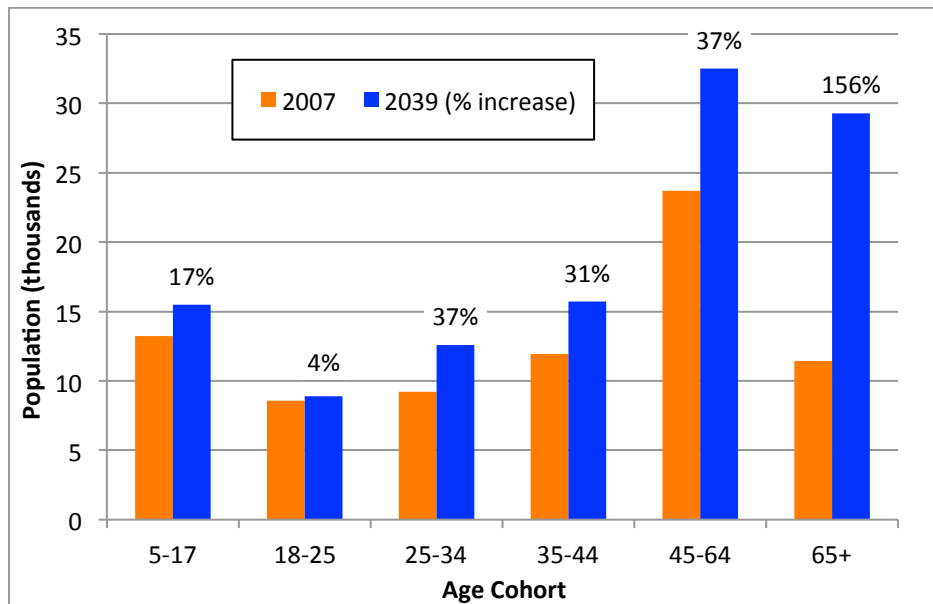


Figure 2 - City of Kamloops Projected Population Growth (Urban Systems, 2009)

These population growth estimates are consistent with the Canadian literature, which indicates that in the future, there will be significant out-migration of baby boomers from larger metropolitan cities toward medium and small cities in search of a quieter pace of life. This trend will be further amplified by younger residents of mid-sized cities simultaneously out-migrating to larger cities in search of opportunities (Hodge, 2008; Foot, 1998).

Household Travel Survey Analysis

The City of Kamloops completed its first household travel survey in 2007 using a 3% sample of the city's 33,456 households. There are a total of 1,060 household responses in the dataset, which include socioeconomic characteristics of the households, details about all individuals within the households and trip diary information for each individual over the age of five. The trip diary data are weighted by household size in order to replicate the city's 2007 population of 82,000 residents (Synovate, 2008). The information that is of specific importance to this discussion is the age of the respondents, person trip rates, trip distances, travel modes and trip purposes.

Highlights from the analysis of the city's HTS data and 2039 growth projections is summarized in the following figures by trip purpose (Figure 3), travel mode (Figure 4) and trip distance (Figure 5) (Toop et al, 2013). Due to the absence of longitudinal

behaviour information, this analysis is based on the assumption that travel behaviour amongst age groups will remain consistent between 2007 and 2039. For each travel characteristic, an analysis of variance was completed, which indicates that there is indeed a statistically significant difference (at a level of 5%) in both the trip rates by mode and purpose and the average trip distances across the different age cohorts.

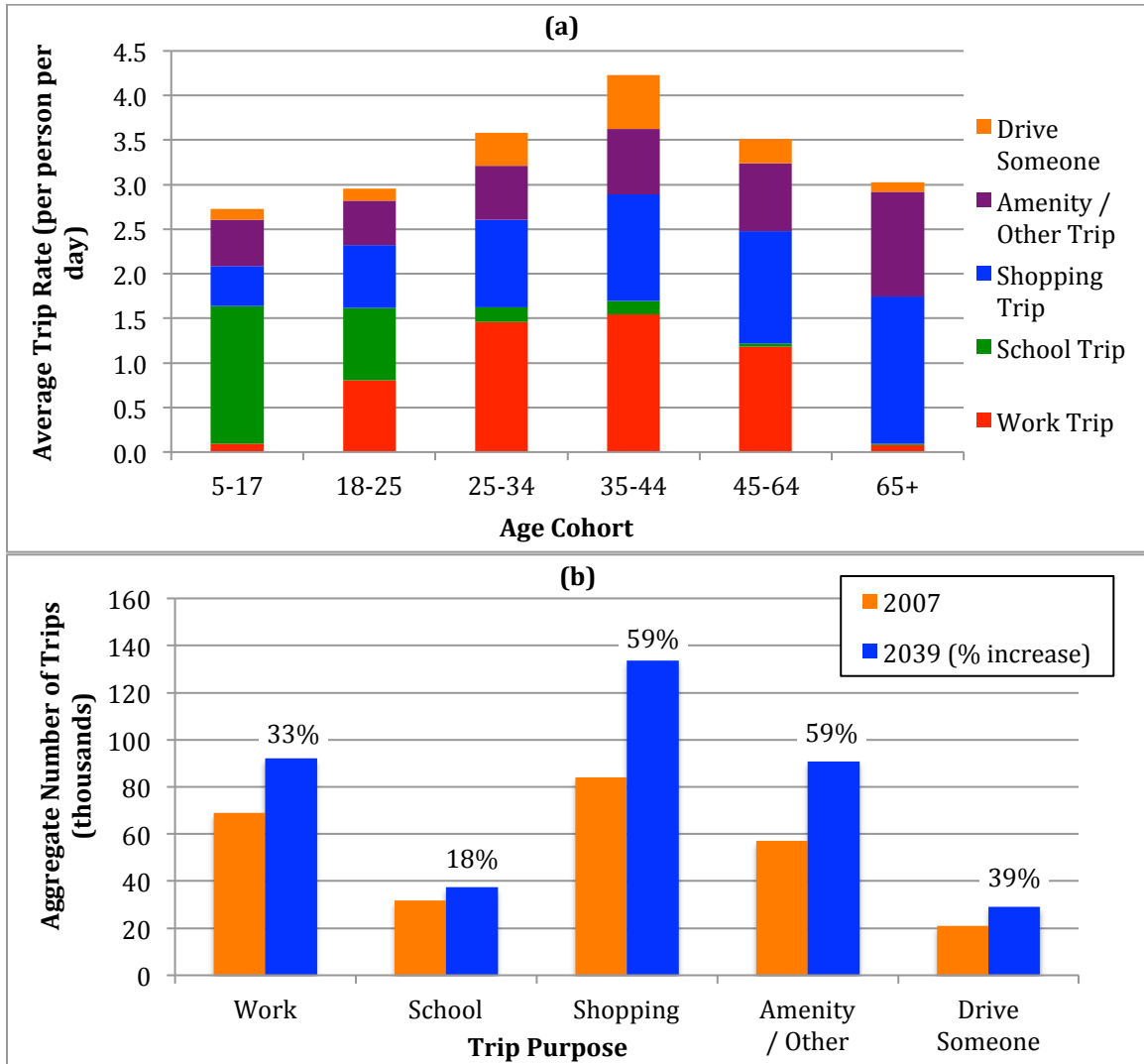


Figure 3 - Trip Purpose Analysis: (a) Trip rate breakdown, (b) Aggregate effect of population growth (Toop et al, 2013)

Results of the trip purpose analysis show that the aging demographics will have a significant effect on the distribution of trip purposes in the future. In the 2007 data, work trips and shopping trips make up the majority of the travel; however, assuming consistent longitudinal travel behaviour, the sharp increase in the seniors age group results in a significant increase in amenity related trips. According to the data, by 2039, a large majority of the trips made in Kamloops will be for shopping,

work and amenities. Notably, school travel will increase only marginally due to the low growth rates of the school-aged cohorts.

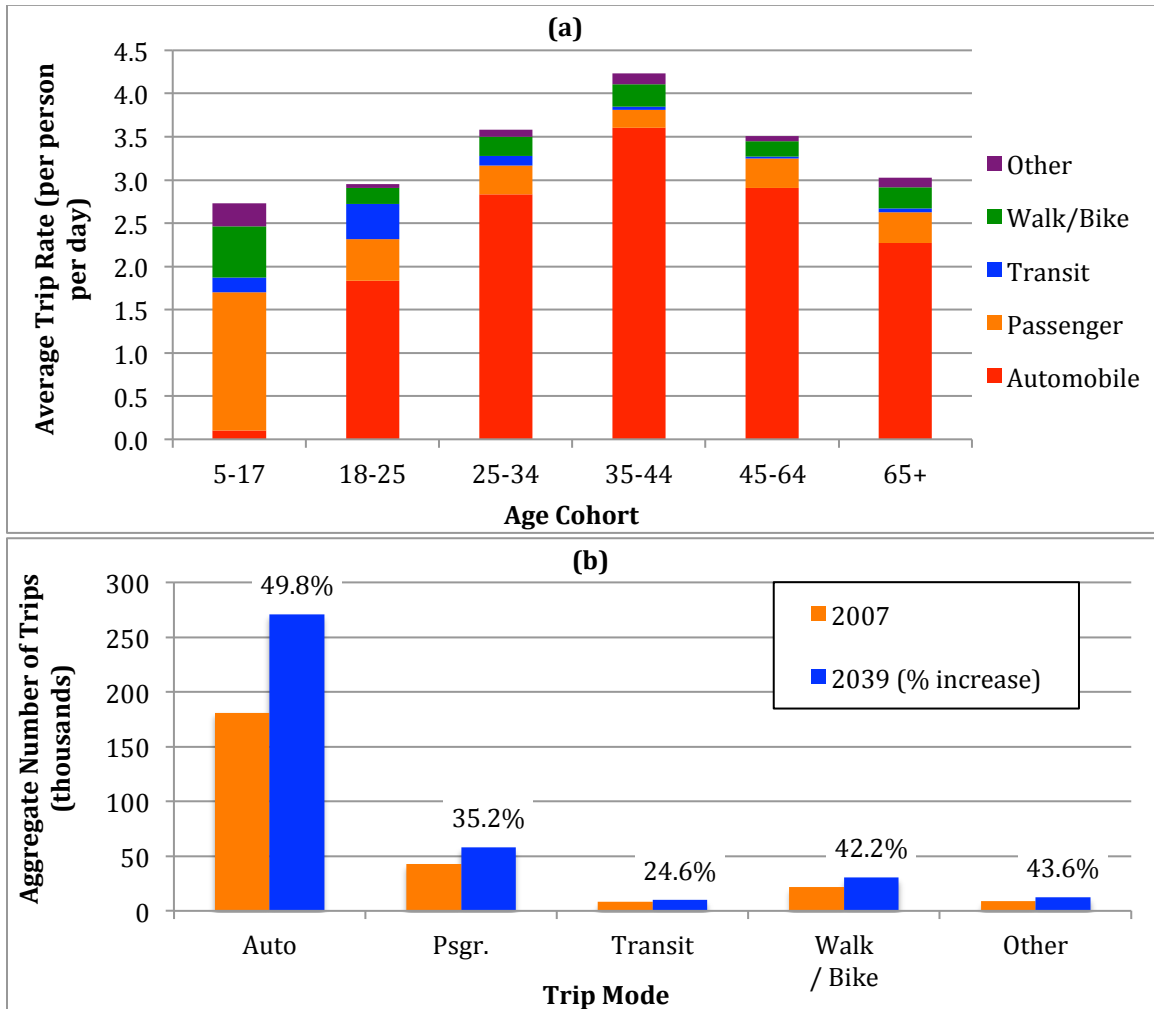


Figure 4 - Travel Mode Analysis: (a) Trip rate breakdown, (b) Aggregate effect of population growth (Toop et al, 2013)

As documented previously, the travel behaviour in Kamloops is extremely automobile oriented. Given the auto-dependent behaviour of current seniors, the future projections indicate a substantial increase of 50% in auto driver trips, which outpaces the overall population growth of 47%. Transit trips are shown to grow at half the rate of the population, whereas the increase in non-motorized travel is shown to lag only slightly behind the population growth.

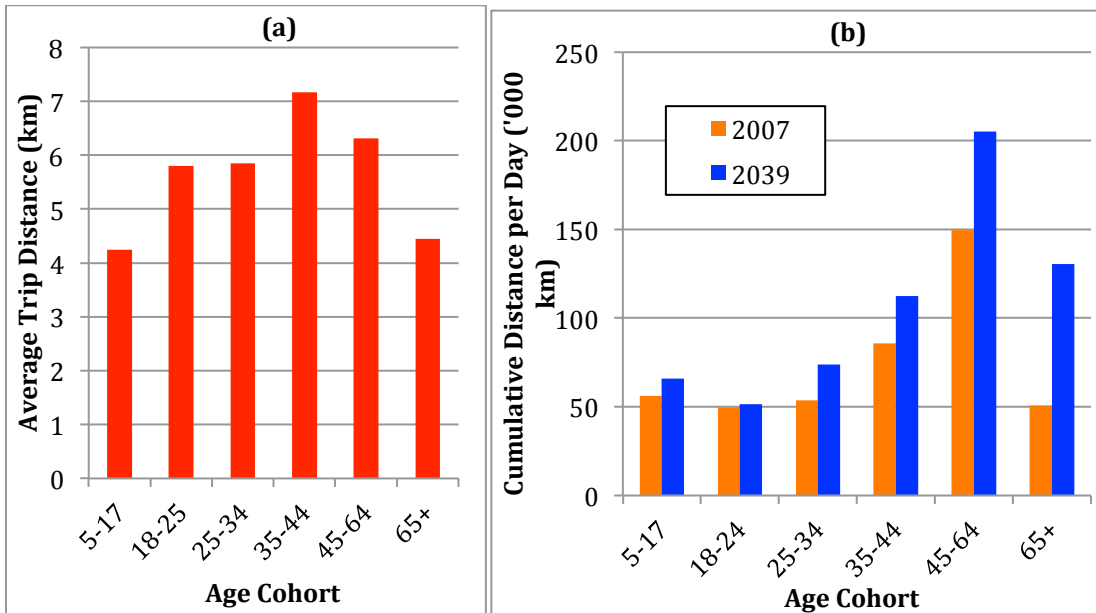


Figure 5 - Travel Distance Analysis: (a) Average distance breakdown, (b) Aggregate effect of population growth (Toop et al, 2013)

Finally, the travel distance analysis shows that, due to the aging population's shorter trips, the overall distance travelled in Kamloops will increase more slowly than the population.

Combining the results from each of the three figures indicates that while automobile use is shown to increase drastically and the existing transit markets grow more slowly than the population, non-motorized modes will preserve most of their traction. With seniors making fewer and shorter trips, and maintaining a relatively modest use of non-motorized modes, there could be an opportunity for the city to elevate the status of active transportation.

This is not to say that the city should abandon transit, it is merely presenting a hypothesis that non-motorized travel could create more sustainability gains for the city due to its relatively cost-efficiency compared to transit capital and operations. Given that transit is most effective when demand is concentrated in well-defined corridors and sustained over time, the city could potentially use mid-term active transportation and strategic land use investments to build up future transit markets (Toop et al, 2013).

Though the above illustrates some of Kamloops' probable transportation issues and suggests potential solutions, the understanding of residents' behaviour is limited to quantifiable information. A true understanding of this behaviour requires a deeper understanding of the mechanisms behind the behaviour, which is why more qualitative assessment is required. In the next section, the qualitative survey is used to test the hypothesis that, within Kamloops, significant markets for active transportation do exist.

Qualitative Survey Analysis

Based on the HTS data analysis, a qualitative survey was conducted in the City of Kamloops in the fall of 2012. The survey attempted to gather information about respondents' thresholds for walking and cycling to test the hypothesis that active transportation may be the lower hanging fruit of transportation sustainability improvements. Questions about support for local neighbourhood transportation improvements and neighbourhood-scale amenities were also included to gauge respondents' reactions to more mixed-use neighbourhoods and local transportation improvements; however, analysis of these results is left for future work.

The survey response rate was approximately 22%, yielding a total of 223 responses from the 1,000-person sample frame. Notably, over 57% of the survey respondents consented to being contacted for the follow-up interview phase, which is almost three times greater than the assumed response rate.

The following highlights from the survey analysis include respondents' stated thresholds for walking and cycling for both work trips and shopping trips. Unfortunately, due to a lack of responses from post-secondary students, the data from the "travel to school portion" of the survey is not available for analysis.

Figure 6, below, shows the results of responses to the questions: what is the maximum distance that you would be willing to [walk/cycle] to work in the [summer, spring or fall, winter]?

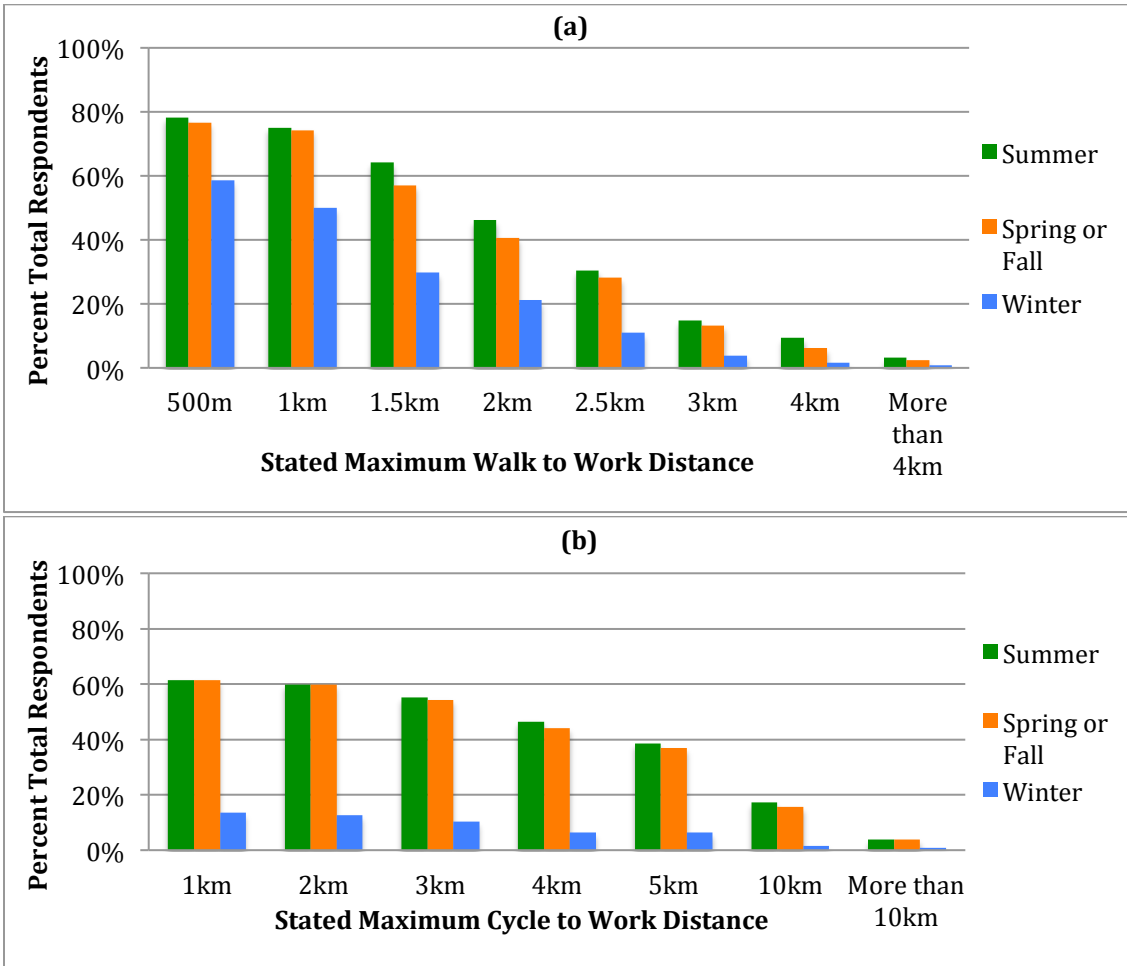


Figure 6 - Travel to Work Analysis: (a) Stated Walk to Work Thresholds, (b) Stated Cycle to Work Thresholds

The results shown in Figure 6 indicate that there is only a marginal difference between preference for active travel in the summer and spring or fall; however, there is a significant drop in propensity for walking and cycling to work in the winter. Where there is an approximate 20% decrease in preference for walking to work in the winter compared to walking to work in the summer, spring or fall, there is an approximate 50% decrease in preference for cycling to work in the winter compared to cycling to work in the summer, spring or fall. The major takeaway from the above figure is the stated distance thresholds for each mode and the potential walk and cycle to work markets. Based on the above graphs, the city could maximize its walk to work mode share by encouraging more employment and residential land uses within 1km of each other. Similarly, the city could maximize its cycle mode share by encouraging employment and residential land uses within 2km to 3km of each other.

Figure 7, below, shows the responses to the questions: what is the maximum distance you would be willing to [walk/cycle] for grocery shopping? This question was

not broken down seasonally based on the assumption that carrying groceries would be more prohibitive to walking or cycling than the weather would be.

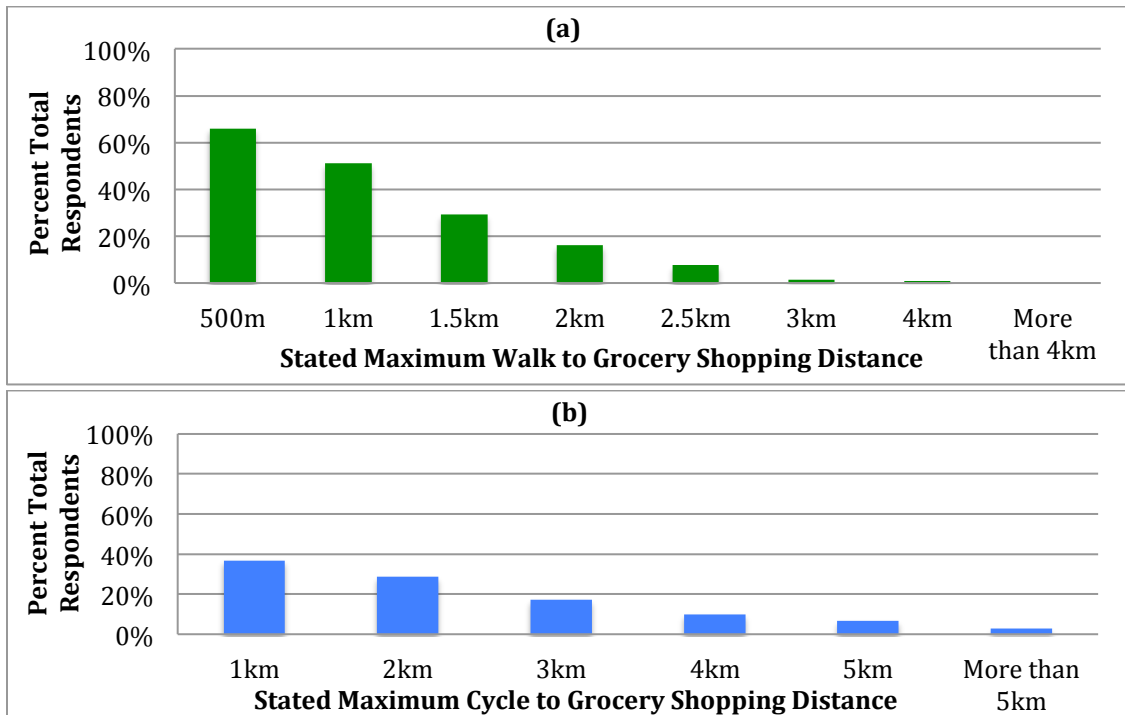


Figure 7 - Travel to Grocery Shopping Analysis: (a) Stated Walk to Grocery Shopping Thresholds, (b) Stated Cycle to Grocery Shopping Thresholds

As shown in the figure, there is an approximate linear relationship between distance and propensity for both walking and cycling to buy groceries. Roughly 50% of survey respondents would be willing to walk up to 1km to buy groceries, whereas less than 40% of respondents would be willing to cycle to buy groceries at all.

Seasonal variation was captured through the question: if there was a grocery store within [1km/2km] of your home, how often would you [walk/cycle] there to buy groceries in the [summer, spring or fall, winter]? Notably, only 30% of respondents indicated that they would never walk 1km to the grocery store in the summer, spring or fall, and 50% of respondents would never walk 1km to the grocery store in the winter. This leaves a potential 50-70% market, depending on the season, for walking 1km to buy groceries. In response to the cycling question, roughly 60% said they would never cycle 2km to the grocery store in the summer, spring or fall, and over 80% said they would never cycle 2km to the grocery store in the winter, which indicates a much smaller market, 20-40% depending on the season, for cycling to buy groceries.

In general, propensity for using active modes for grocery shopping trips reduces more drastically with distance than propensity for walking and cycling for work trips. These findings stress the importance of providing grocery stores and other amenities within residential neighbourhoods or within short distances of dwelling clusters.

The next step in this survey data analysis is to assess the differences in stated preferences between the age cohorts described in the HTS data. Due to the page limitations of this paper, however, this is left as future work.

CONCLUSIONS AND NEXT STEPS

The primary goal of this paper is to outline sustainability issues in mid-sized cities, and a process for understanding travel behaviour using both quantitative and qualitative research methods. Though this process may have broader applications, it is developed specifically to understand issues around sustainable travel behaviour in mid-sized cities for the ongoing Midsize Cities Project. Proof of the concept is demonstrated through a case study of Kamloops, BC, in which the survey data collection process is complete, and interview participants have been successfully recruited.

Although Kamloops currently has a number of sustainability issues around auto-centric travel behaviour, the preliminary results of the case study show that significant potential exists for elevating the use of non-motorized travel modes in the city. Perceptions gathered from the qualitative survey indicate the markets for walking and cycling on work and shopping trips. These perceptions will be explored further in personal interviews, which will delve deeper into understanding the current barriers to walking, cycling, and the mechanisms that would support non-motorized mode use.

The decision to focus on issues around non-motorized travel in Kamloops came out of the results of the HTS analysis and a review of the literature. However, it is expected that in future case studies the context will be different, and it is important that this qualitative research process does not become entrenched in a given theme, but left open to exploring the unique characteristics of each city. Part of the power of qualitative research is its flexibility, and it is crucial that researchers remain open to discovering issues that arise throughout the process.

Next steps in the Midsize Cities Project, beyond completion of the Kamloops interviews, include a second case study of a municipality within the Greater Toronto Area. This case study will be used to substantiate the research process and to account for a different perspective from a mid-sized city that forms part of a larger region. Results from both case studies will be reported and compared as part of a MASc thesis in the fall of 2013.

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