HALIFAX REGIONAL MUNICIPALITY TRAVEL ACTIVITY STUDY

Submitted to:
Halifax Regional Municipality
Regional Transportation
Planning & Development

Submission: January 2019

Revised Submission: November 2021

Ahsan Habib, PhD
Dalhousie Transportation Collaboratory
Associate Professor, School of Planning, and
Department of Civil and Resource Engineering (cross)
Dalhousie University, Sexton House, Room E205
5410 Spring Garden Road, B3H 4R2, Halifax, NS, Canada

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1. Introduction

This report presents an overview of the design, conduct and results of the 2018 Nova Scotia Travel Activity (NovaTRAC) Halifax survey. The NovaTRAC surveys were initiated in 2015 by the Dalhousie Transportation Collaboratory (DalTRAC) in partnership with the Province of Nova Scotia. The current project, the Halifax Travel Activity Study funded by Halifax Regional Municipality (HRM), began in 2017 with the goal of gathering information on how HRM residents travel in order to better understand and improve the region's transportation systems.

Although HRM has taken significant steps in recent years to promote sustainable transportation and integrated mobility planning, the region has a significant gap in travel data collection, visualization and analysis. While most major cities in Canada undertake travel surveys regularly, none have been conducted in the Halifax area since the mid-1980s. DalTRAC has initiated a comprehensive approach to fill the gap. To do this, our lab has procured essential data collection infrastructure with the funding support of the Canada Foundation for Innovation, Nova Scotia Research Innovation Trust, HRM and Dalhousie University.

The 2018 NovaTRAC Halifax survey is the first randomly sampled travel survey in HRM with a large sample size. Approximately 12,000 households were contacted, of which 2,333 completed the survey. The first phase of the survey, a cellular phone-based sample, invited about 2,000 households. The second phase utilized a land phone-based sampling approach in which 10,000 survey invitation packages were distributed by mail. The survey asked respondents to provide information about their household and each person who lived there. In addition, each household member was asked to record their travel activities for a 24-hour period of a typical weekday. Respondents could complete the survey online through a novel Computer Assisted Web Interviewing (CAWI) survey tool developed by DalTRAC, or by mail with a supplied return envelope. Follow-up calls were made to each household by a telephone interviewer, providing an opportunity to respond by phone.

This project offered an opportunity to build a partnership between Dalhousie University and HRM to realize a household travel survey for benchmarking travel behavior for use in transportation network modelling. The initiative took advantage of the physical infrastructure and research expertise at DalTRAC. More importantly, it establishes a survey methodology, survey tools and data which will be useful for transportation professionals at the municipal and provincial levels for years to come. Our approach provides long-term value to HRM by developing useful data, survey instruments, infrastructure and capacity in the region for travel behavior data collection and modelling.

1.1. Background

Travel surveys collect data to represent the travel behaviour of an area's population. These surveys capture respondents' movement across time and space, as visualized in Figure 1-1, providing an empirical understanding of a region's travel patterns and promoting better land-use and transportation planning decisions (Inbakaran and Kroen, 2011).

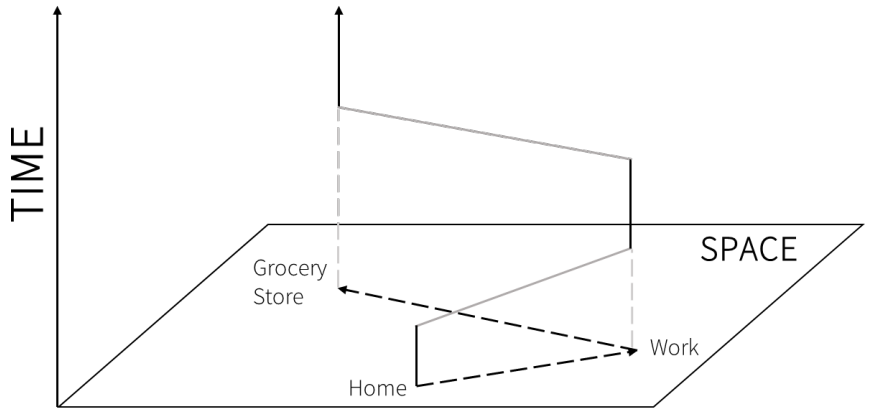

Figure 1-1. Representation of an individual's activities in space and time

Travel behaviour analyses offer insights into choices that households and individuals make daily, such as frequency of trips, mode choice, route choice, and places to visit. This type of information is critical in benchmarking current behaviour and monitoring progress against community sustainability goals (Krizek, 2003). Travel activity data is a prerequisite for developing and monitoring performance measures in mobility choices as identified in the 2014 HRM Regional Planning Strategy.

Many regions in North America conduct travel surveys on a regular basis and use travel demand forecasting models for plan-making and evaluation. For instance, municipalities in the Greater Toronto and Hamilton Area have partnered with the University of Toronto to collect travel behaviour information through the Transportation Tomorrow Survey (TTS) since 1986. The City of Toronto actively develops, maintains and improves transportation network models using TTS data. The State of Oregon and City of Portland have developed innovative initiatives in travel behaviour data collection, visualization and modelling to assist transportation decision-making processes. In the United States, Environmental Protection Agency regulations require coordinated and structured data collection and transport network and impact modelling, even for smaller communities.

In December 2017, HRM released the Integrated Mobility Plan (IMP), providing a regional vision for mobility and directing future investment in transportation demand management, transit, active, sustainable and affordable transportation options, and the road network. During the development of the plan, the IMP team emphasized public engagement and invited residents to share their visions and transportation priorities through online surveys, public workshops and pop-up events. The IMP also

established indicators to measure progress towards achieving the vision and objectives of the plan. It is envisioned that monitoring the performance of indicators over time will help the municipality improve transportation planning initiatives, revise funding priorities and respond to evolving opportunities and challenges. This project directly helps HRM to measure travel behavior indicators outlined in the IMP and Regional Plan. The data collected through this study is also useful for developing travel demand forecasting models for the region, which will provide useful insights for future mobility planning.

1.2. Purpose

The purpose of this study is to collect information on HRM residents' travel choices, i.e. where they go, how they get there and what they do there. This data will provide a benchmark for municipal transportation indicators and allow HRM to track progress in transportation planning and travel outcomes. It will also help municipal planners evaluate future transportation needs as the municipality grows. The data will also be useful to develop multiple components of a transportation network modeling system, including trip generation, trip distribution, mode choices and destination choices.

1.2.1. Technical objectives

The project aimed to:

- Develop and design a travel survey questionnaire based on best practices, relevance to Halifax and pilot testing;
- Obtain permission from Dalhousie's Research Ethics Board to conduct the survey;
- Develop a customized, innovative computer-assisted web interviewing (CAWI) tool which could reduce the cost of the survey;
- Set up a server-client system for secure data collection, processing and analysis;
- Develop and test survey materials, a mailing plan and a communication plan;
- Train surveyors and associated personnel to administer the survey;
- Develop sample design, procurement and management protocols;
- Deploy a computer-assisted telephone interviewing (CATI) system for data retrieval;
- Administer the survey, including CAWI and CATI data collection;
- Develop a survey database, including geocoding and data cleaning and processing;
- Process the data post-survey, including weighting;
- Conduct data analysis, preparation of summary statistics and visualization of survey findings; and
- Document the survey and prepare the survey report.

The report documents how the project team has achieved these objectives.

1.3. Project team

The Halifax Household Travel Activity Study was completed by the Dalhousie Transportation Collaboratory (DalTRAC) of Dalhousie University, led by the principal investigator, Dr. Ahsan Habib. Software development and data analysis was led by DalTRAC research associate Stephen McCarthy. Table 1-1 lists members of the DalTRAC project team and their roles.

Table 1-1. Project team

Name	Role
Dr. Ahsan Habib	Principal Investigator and Project Lead
Stephen McCarthy	Research Associate
Dr. Mahmudur Fatmi	Postdoctoral Research Associate
Nazmul Arefin Khan	PhD Research Assistant
MD Jahedul Alam	PhD Research Assistant
Pauline Laila Bela	MASC Research Assistant
Babatope Olajide	MASC Research Assistant
Sara Campbell	Project Coordinator
Leen Romaneh	Project Coordinator
Mitch Gold	Project Coordinator
Rachel Lynn	Project Coordinator
Katie Walker	Project Coordinator
Alexander Glista	MPlan Research Assistant

Dalhousie University contracted professional market research company MQO Research to conduct computer-assisted telephone interviews. The project team at MQO was led by Cheryl Watts, VP of Customer Insights and Strategy – Research, and included senior data analyst Jonathan Keats and April Molloy, manager of call centre operations.

1.4. Organization of the report

Section 2 outlines DalTRAC's research and preparation for the NovaTRAC Halifax survey, including questionnaire design, development of a web survey interface, and outreach to the public. Section 3 discusses how the survey was conducted, and Section 4 presents statistics on the data collected, including completion rates and sample composition. Section 5 reports on the survey results, providing an overview of travel behaviour for HRM as a whole. Section 6 offers a comparison of the travel behaviour of HRM's regional centre, suburban and rural areas, followed by a conclusion.

2. Survey Preparation and Research

This section outlines the activities DalTRAC undertook to prepare the NovaTRAC Halifax survey, in alignment with the technical objectives of the project. It details the processes of questionnaire design, ethics review, development of a web survey instrument, deployment of the physical infrastructure to conduct the survey, communication with the public and training of survey personnel.

2.1. Questionnaire design

2.1.1. Best practices review

To prepare the survey questionnaire, DalTRAC first gathered information on recent best practices from travel surveys conducted in other regions. A sample list of surveys reviewed are listed in Table 2-1. We determined which aspects of the surveys best suited the needs of HRM, considering the overall survey approach, questions asked, sample design and data analysis.

Table 2-1. Best practice cases

City	Travel Survey	Frequency	Sample Survey
Toronto, ON	Transportation Tomorrow Survey	Every 5 years	2011
Chicago, IL	Regional Household Travel Inventory	-	2007
Montreal, QC	Household Travel Survey	Every 5 years	2013
Portland, OR	Household Activity Survey	Every 5 years	2011
Edmonton, AB	Household Travel Survey	As needed	2015

The NovaTRAC survey takes a place-based activity survey approach, which asks respondents to provide information on each activity they did over the survey period, including where the activity took place and what they did. Activity-based surveys also ask how participants moved between activities, including when they left one activity and arrived at the next one, their mode of travel, and other information about the trip. The sequence of activities can be interpreted as a series of trips for analysis.

Our approach is consistent with other travel surveys conducted across North America. These include Chicago's Travel Tracker Survey 2008 (Bricka, 2007), Toronto's Transportation Tomorrow Survey (TTS Transportation Information Steering Committee, 2014), and Oregon's Household Activity Survey (Oregon Modelling Steering Committee, 2011). The NovaTRAC survey approach, methods and pilot results were presented at the annual meetings of the Transportation Research Board and Transportation Association of Canada, and the survey team received substantial feedback from transportation professionals prior to the launch of the HRM Travel Activity Study in 2017.

2.1.2. Question generation

The study designed a survey questionnaire based on the best practice review, lessons learned from previous DalTRAC surveys and consultation with HRM. The questionnaire was widely tested by DalTRAC staff and Dalhousie students, practicing planners and engineers, and others. The project team met with municipal staff to present the design of the survey and gather feedback.

The questionnaire was designed to collect information about household characteristics, household members' information, their health and attitudes, and their travel behaviour over a 24-hour period. The inclusion of health and attitude information is a special feature of the NovaTRAC survey and will allow for a greater understanding of the social and health-related impacts of travel behaviour in HRM.

The full questionnaire including travel log is included in Appendix A. It asks each household to provide the following information:

- The number of people living in the household,
- How many vehicles are available and the make, model and year of the most used vehicles,
- The home address,
- Details about the home including ownership status and dwelling type, and
- Gross household income.

The questionnaire also asks each member of the household to provide the following:

- Their age, education, level of employment and occupation,
- Whether they have a driver's license and transit pass,
- General information on their health,
- Attitudes and lifestyle preferences, and
- A 24-hour travel activity log.

2.1.3. Travel log

The travel log records the following information about each activity an individual undertook within a 24-hour period, starting at 3:00 am the morning of the travel day:

- The location of each place travelled,
- The departure time from the previous location,
- The arrival time at the new location,
- The mode of transportation used,
- Mode-specific details (e.g. which vehicle used, which bus route taken),
- Who they are travelling with, and
- The activity undertaken at the location.

The travel log included a categorization of locations and the activities respondents could undertake at each location. Respondents could input places travelled as one of five different options: home, work, school, bus stop or ferry terminal and other place. Table 2-2 shows the list of potential activities a person could choose for each place.

Table 2-2. List of potential activity purposes for survey respondent

Home	School	Other place
Working at home	Attending class	Routine shopping
All other activities at home	All other activities at school	Shopping for major purchases
		Household errands
Work	While travelling	Work-related errands
Work/Job	Change type of transportation	Personal business
All other activities at work	Dropped off passenger in car	Health care
	Picked up passenger in car	Eat meal outside of home
	Other	Civic/religious activities
		Recreation/entertainment
		Visit friends/relatives
		Other

2.2. Ethics review

As this study involved human participants, Dalhousie University required approval from the university's Social Sciences and Humanities Research Ethics Board (REB) before it could proceed. To comply with the highest ethical research standards, DalTRAC reviewed the study design to ensure that participants were not being exposed to undue risk and could give informed consent to the survey. The ethics approval also mandated the confidentiality we guarantee to participants and the safety measures DalTRAC has used to protect participant identity and data.

The NovaTRAC survey first received ethics approval in 2015 for its first iteration. For the 2018 Halifax survey, the amended questionnaire and study design were submitted and re-approved in 2017. Significant changes included the addition of a mail-in option, inclusion of Mayor's letter, promotion provisions for HRM and the use of a third-party telephone interviewing service provider. Table 2-3 shows the timeline for the 2017 ethics amendment process.

Table 2-3. Approval timeline for ethics amendments

Date	Event
March 2nd, 2017	Changes made to NovaTRAC survey, awaiting approval
May 23rd, 2017	Request for review and approval of changes to study sent to REB
June 5th, 2017	Details of proposed changes to survey design submitted to REB
July 24th, 2017	Amendment to the proposal submitted to REB
July 24th, 2017	Amendment approved by REB, survey began
September 26th, 2017	Annual report to REB, letter of approval for continuation granted
September 20th , 2018	Annual report to REB, request for extension submitted
October 1st, 2018	Letter of Approval for completion of the study granted

2.3. Survey instruments

The 2018 NovaTRAC Halifax survey utilized a multi-instrument data collection approach. DalTRAC created three survey instruments for use in the survey: a paper questionnaire, a telephone survey script, and a web survey tool. The range of survey options was designed to allow respondents flexibility in how they preferred to respond in order to elicit better participation. All three instruments used the same questionnaire including the travel log, and data from each was integrated automatically as the survey proceeded. The paper questionnaire and telephone survey scripts are available in Appendices A and B. The development of the custom web survey is detailed in Section 2.4.

2.4. Creation of web survey instrument

DalTRAC developed a custom computer assisted web interviewing (CAWI) instrument for this project. While a CAWI software package from Creative Research Systems was initially explored, an in-house custom solution allowed for the incorporation of travel log data including map search and automatic geocoding, and gave more flexibility over data storage. DalTRAC built a prototype web survey tool in 2015 which was tested in a pilot survey, then developed the first version of the current web survey during the 2016 NovaTRAC survey. The feedback from these developments allowed us to improve the survey tool for the 2018 Halifax survey, considering user interactions, map display issues, geocoding errors, data storage considerations and efficiency in configuring the software. The resulting 2018 CAWI tool was used for all data entry. A screenshot of the program and a sample of the code is shown in Figure 2-1. A customized version was made available to telephone interviewers and to lab staff to enter mail-in surveys. In this way, all data irrespective of the instrument used could be stored, managed and evaluated on a single platform administered by the DalTRAC team.

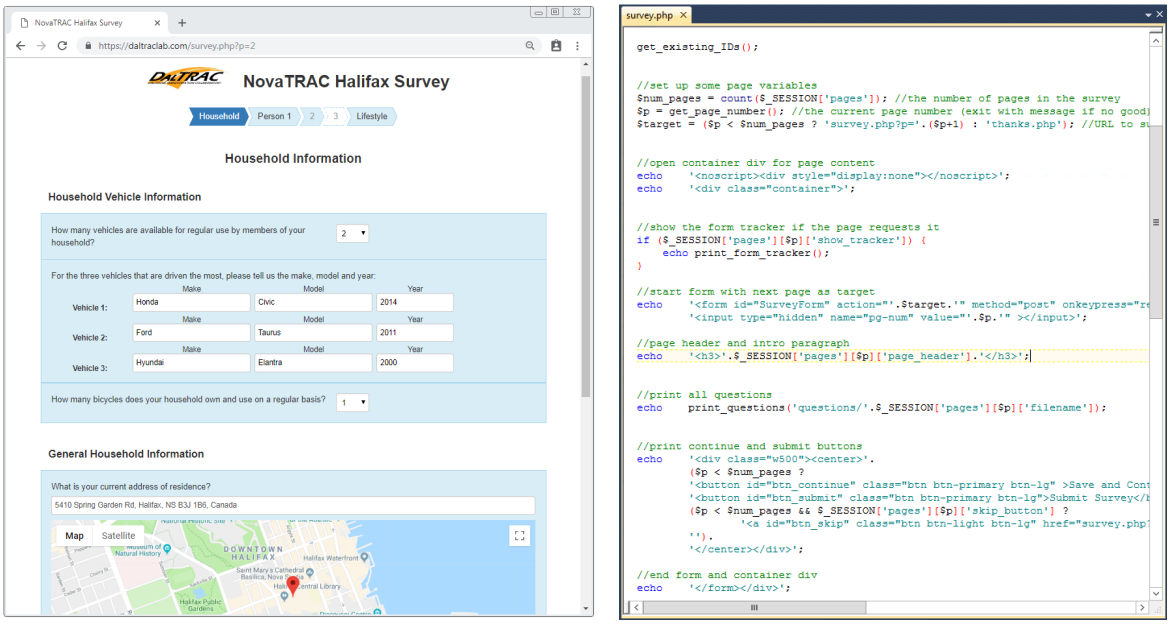

Figure 2-1. The first page of the web survey with test data; a PHP code sample

2.4.1. Front-end survey site

The web survey instrument consists of a front-end website built in the PHP language. The tool uses the Bootstrap framework to provide a flexible grid layout and ensure the compatibility of the site with desktop and mobile browsers (e.g. on iPhone or Android phones). Survey questions are stored in CSV data files, allowing non-programmers to change the survey without modifying the underlying program. Custom JavaScript functions were developed for interactive features, such as allowing users to add additional trips to their travel log.

Different versions of the web survey instrument were available for each type of user. For respondents entering the survey directly, a household code was required. This code allowed tracking of survey completions from sampled households. It also allowed respondents to return to complete an unfinished survey. The survey tool generated a page for the individual details and travel log of each household member. Telephone interviewers used a version of the survey that required an interviewer access code and displayed the telephone interview script. DalTRAC staff who entered mail-in surveys used a similarly modified version. The survey recorded the method used to enter data.

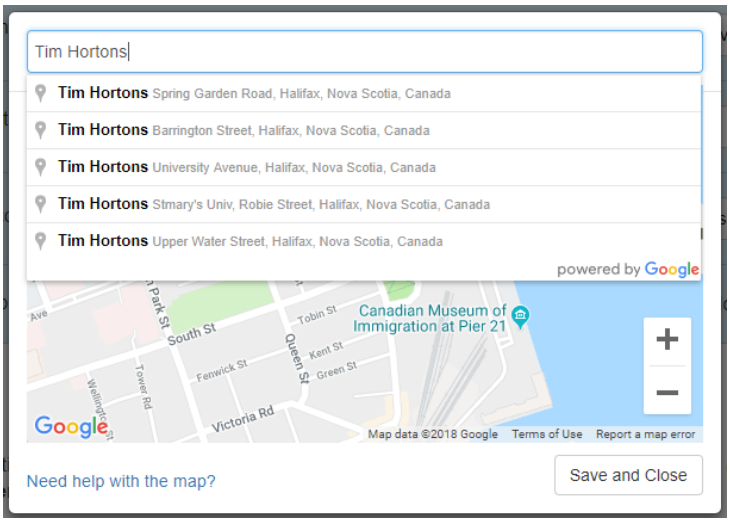

Figure 2-2. Searching by business name using the Google Maps API

As a key aim of the NovaTRAC Halifax survey was to collect information about travel behaviour, DalTRAC put a great deal of effort into ensuring respondents could enter information about their trips easily and accurately. Selection of trip destinations was done using Google Maps. Integration with the Google Places API allowed the respondent to search for a location by address or business/place name, as seen in Figure 2-2. Once the location name is entered, the location is shown on the map for verification; users can also drag a pin on the map to change the location. The location information is immediately stored as an address and latitude-longitude pair. The automatic geocoding and verification of addresses by respondents saved time and improved the quality of data relative to surveys geocoded after data entry. They also made it easier for respondents to enter places they visited on short trips and intermediate travel locations such as bus stops.

2.4.2. Back-end database

Data entered from the survey was stored in a relational MySQL database which comprised three linked tables: households, individuals and trips. The households table contained household-specific information such as home location. Each row in the household table related to one or more rows in the individuals table, which stored information about the individual such as age, gender and attitudes. Each individual related to zero or more rows in the trips table, which stored trip-specific information such as departure time and destination. Relations between the three tables were ensured by linked ID fields generated at the time the survey was taken. Name and contact information for the prize draw was collected in a separate table and not linked to the survey data.

For data analysis and export, DalTRAC created a view of the NovaTRAC database that automatically filtered out test data and incomplete surveys. Test surveys were conducted to train telephone interviewers, and the data was flagged as such and filtered before analysis. The Dalhousie ethics agreement requires the use of only completed surveys, so incomplete responses were also excluded.

2.5. Survey infrastructure

All data was collected and kept on a dedicated server owned by and physically located at Dalhousie University and provided in-kind for the project by DalTRAC. The server also hosted the web survey interface, which was only available via a secured (HTTPS) connection for encrypted data transmission. The DalTRAC server had dual 2.0 GHz Intel Xeon (x64) processors and 32 GB of RAM and ran on the Windows Server 2012 R2 operating system with an IIS 8 web server.

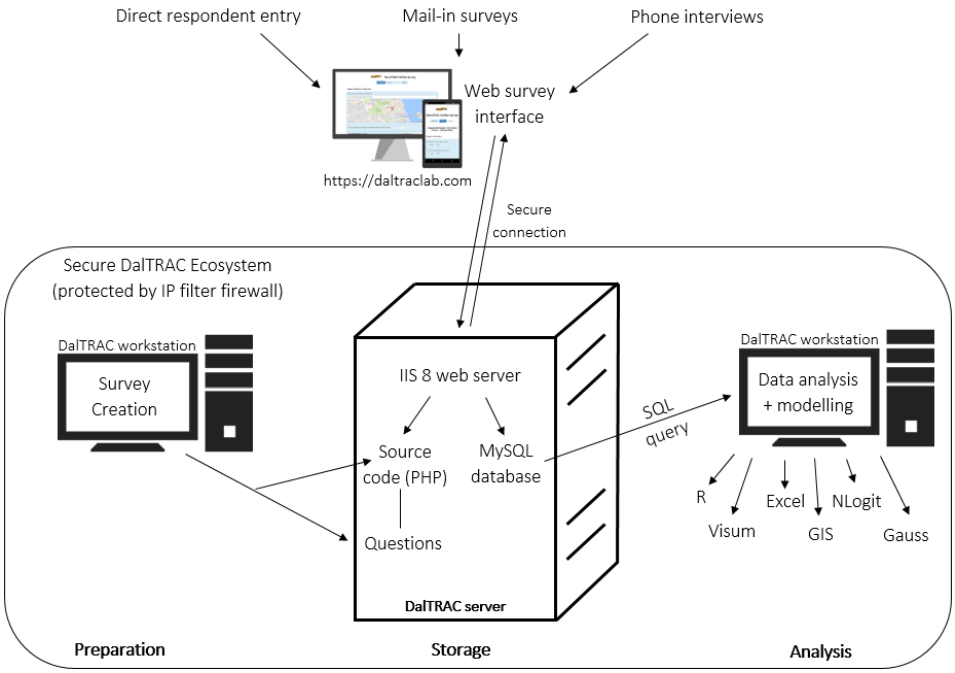

Figure 2-3. Survey infrastructure

Figure 2-3 shows how DalTRAC infrastructure was set up for the survey. Access to the server and its database was controlled by an IP filter which granted access only to workstations in the DalTRAC lab. Lab access is restricted by key cards carried by personnel. All data analysis was done on DalTRAC workstations, and no data was allowed to leave the site or be uploaded onto third-party computers.

2.6. Public outreach

To promote participation among selected households, DalTRAC publicized the NovaTRAC Halifax survey in several ways. Promotional tools included webpages, social media accounts, a promotional video, news articles, a radio interview and survey incentives. Earlier NovaTRAC surveys have experienced low response rates in part due to an unfamiliarly of travel surveys in HRM, so communications were designed to inform the public about the survey, including who was conducting it and why it was useful. Informational materials were also available in the survey package in order to raise confidence in the survey and improve the quality of completed surveys.

2.6.1. Web and social media

The primary tool for sharing information about the NovaTRAC Halifax survey was the DalTRAC website (dal.ca/sites/daltrac.html). On the site, DalTRAC developed a NovaTRAC survey page with information and resources such as a summary of the project, printable supplementary travel logs, links to media coverage and a list of project partners. The HRM website included a similar page with a project summary and answers to frequently asked questions.

A second tool used for survey promotion was social media, including Facebook and Twitter. These were used to reach the public with information about the survey and to encourage households to complete it. A campaign was conducted on both platforms; posts were published and boosted every few days once surveys were sent out to keep recipients informed on how to participate and to broaden the scope of people reached. Figure 2-4 shows an example image posted during the social media campaign and a newspaper article published on the week of the survey launch.

Figure 2-4. Example social media campaign image and news report

DalTRAC also partnered with PLANifax, a local non-profit video production team committed to making local planning issues exciting and accessible, to create an informative promotional video about the survey. The video was shared on DalTRAC's website, Facebook, and Twitter.

2.6.2. Traditional media

The survey was featured in a news article published by a local newspaper, Metro News, as shown in Figure 2-4. The news article was published just after surveys were sent out to maximize its impact. The principal investigator also conducted a 13-minute long interview on the Rick Howe Show, on a local news radio station (News 95.7), promoting the survey to radio listeners. The interview was shared on DalTRAC's YouTube account. Appendix C includes examples of media coverage of the survey.

2.6.3. Survey incentives

For completing the survey, DalTRAC offered participants the chance to be entered to win a $200 VISA gift card or one of ten $50 VISA gift cards. The survey incentive was communicated to recipients in the survey materials and through social and traditional media promotions. Respondents could enter the contest by submitting their name and contact information after completing the survey. The draw information was stored separately from survey responses.

2.7. Personnel training

As the project involved the design, administration and analysis of a large-scale travel survey, it was necessary to build capacity among the staff and students involved in the process. Over the course of the project, the principal investigator trained DalTRAC staff and students in operations such as survey design, record keeping, data analysis, and ethics review procedures. The survey project contributed to the academic programs of several PhD, Master of Planning and Master of Applied Science students (civil engineers).

Given the complexity of the travel log and the necessity of accurately recording geolocations, telephone interviewers also required training prior to conducting the survey. More than a dozen interviewers were trained over video conference on November 7th, 2017. The training session discussed the fundamentals of travel surveys, introduced the telephone survey script, reviewed priority questions for the survey, discussed how to answer potential respondent inquiries, and clarified the meaning of all questions and answer options on the survey. Interviewers also practiced entering test data before engaging with actual respondents.

3. Conduct of the Survey

The NovaTRAC Halifax survey invited a random sample of 12,000 households across HRM in two phases. Phase 1 consisted of approximately 2,000 households contacted via a random-digit dialing cellphone sample. Phase 2 consisted of 10,000 households contacted by random address and home phone number selection. In total, the survey sampled 6.4% of HRM's nearly 190,000 households recorded in the 2016 Census.

3.1. Telephone interviewing

DalTRAC contracted a third-party CATI service provider to conduct telephone interviews for both survey phases. An agreement for services was signed by Dalhousie University and the provider. DalTRAC established the survey methodology and the third party administered the interviews in consultation with our team.

Telephone interviewers used the NovaTRAC web survey interface described in Section 2.4 to enter respondent data, using a version that displayed the telephone interview script instead of the regular questionnaire, as shown in Figure 3-1. The third-party vendor employed their own CATI software to assign calls and track calls made; they did not enter any survey data into their system.

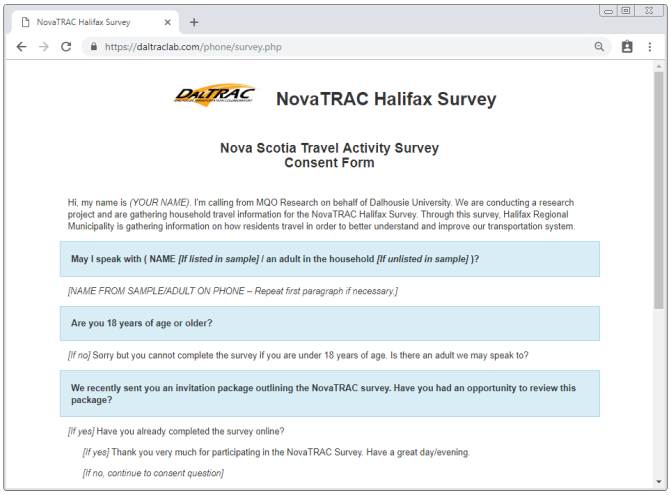

Figure 3-1. Screenshot of the web survey instrument with telephone interview script

Calls were made on evenings and weekends to have the highest probability of reaching respondents at home. Callers would start an interview by ensuring the respondent was eligible for the survey (resident of HRM age 18 or over), then describing the survey and asking if the respondent consented to participate. If the household could not be reached, interviewers scheduled up to five calls over the course of a few weeks, until they received a response indicating whether the household wanted to complete the survey. The service provider completed calling for samples of 5,000 numbers in approximately two months.

3.2. Phase 1: Cellphone sample

The first phase of data collection was conducted from October through December 2017 with a cellphone sample survey of approximately 2,000 households. This phase completed the larger landline sample from Phase 2 and served as a test pilot for telephone interviews.

3.2.1. Sample strategy

Phase 1 took a Random Digit Dialing (RDD) approach to generate a sample. Approximately 9,800 random numbers were generated in the 902 area code, of which the third-party CATI service provider estimates that about 5,200 were actual telephone numbers. Since the 902 area code covers Nova Scotia and Prince Edward Island, and HRM comprises 38% of that area's population, we estimate that about 2,000 real HRM numbers were dialed.

We conducted an RDD survey for two main reasons. First, traditional address-based sampling tends to have a bias towards higher-income households with longer residency, so by sampling phone numbers we were more likely to contact younger respondents, renters, new residents and cell-only households. Second, RDD allowed us to focus on ensuring the quality of the web and telephone interview instruments during the first phase without the overhead of a mail survey.

3.2.2. Survey protocol

Each selected phone number was first sent an SMS message which invited the individual to participate in the survey on behalf of their household, as shown in Figure 3-2. The text messages included a link to the online survey with a household code which would take the respondent directly to the survey page. One week later, a follow-up message was sent with a reminder about the survey invitation. Starting two weeks after the first message, each selected number which had not completed the survey online was called for a telephone interview, as described in Section 3.1.

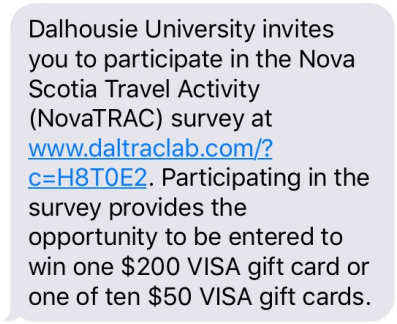

Figure 3-2. Sample invitation text message

For Phase 1, household codes were a random sequence of six letters and numbers in postal-code format (e.g. X1Y2Z3). They were not linked to the person's actual postal code.

3.3. Phase 2: Landline sample

The second phase of the NovaTRAC Halifax survey consisted of two waves of 5,000 households each, for a total of 10,000 households. The first wave started in June 2018 with telephone interviews until the end of August. The second started in September 2018 with calls until the end of November. The last day to complete the survey was November 30, 2018.

3.3.1. Sample strategy

10,000 respondent households were randomly selected from Canada Post's residential address list in two waves of 5,000 addresses each. Households required a name, address and phone number to be included in the sample. The boundaries of the sample area were defined by Forward Sortation Area (FSA), and included all FSAs within HRM, shown in Table 3-1. The B2T and B2S areas are primarily in HRM but include the communities of Enfield, Elmsdale and Lantz in Hants County. Twelve households from these communities responded and were included in the dataset since in all cases they travelled into HRM on their travel day.

Table 3-1. Forward Sortation Areas for the survey

B0J	B2R	B2S	B2T	B2V
B2W	B2X	B2Y	B2Z	B3A
B3B	B3E	B3G	B3H	B3J
B3K	B3L	B3M	B3N	B3P
B3R	B3S	B3T	B3V	B3Z
B4A	B4B	B4C	B4E	B4G

3.3.2. Survey protocol

Each household on the list was sent a survey package by mail. Households had the option to complete the survey online or to fill it out it on paper and mail it back to DalTRAC in a pre-paid return envelope. Mailed responses were entered into the web survey tool by DalTRAC staff. Two weeks after each mailing, households who had not completed the survey were contacted for telephone interviews as described in Section 3.1.

DalTRAC contracted a local commercial printing company to print and mail the surveys. Our staff proofed the printed versions before they were sent. Following Canada Post regulations, the list of households with addresses was sent directly to the commercial printer while DalTRAC and the CATI service provider received the list with phone numbers, ensuring that each unit received only as much confidential information as necessary. The list included a unique household code which was printed on the survey questionnaire and served as the web survey access code. The code consisted of the household's FSA followed by a number incrementing from 1 to 10,000 (e.g. B3J01234).

3.3.3. Survey mail package

The printed survey package for Phase 2 included the following items:

- *Consent letter:* Brief description of the survey including how to participate, voluntary consent required for each member of the household, how to fill in the travel log and privacy protections. This letter ensured that respondents could give informed consent when participating in the survey.
- *Letter from the Mayor:* Letter from the Mayor of HRM encouraging selected residents to participate. Travel survey literature suggests such letter increases the response rate (TTS Transportation Information Steering Committee, 2014).
- *Information brochure:* Two-sided brochure explaining the NovaTRAC survey, what participation would include, why we needed detailed information, how to participate, confidentiality, why they should participate, the online survey address and contact information.
- *Questionnaire brochure:* Survey questionnaire with household access code.
- *Travel log:* Two blank travel logs for recipients to fill in their travel information for one weekday.
- *Prepaid return envelope*.

3.4. Monitoring and analysis

During the survey response period, DalTRAC closely monitored the data collection process to ensure that survey tools worked as anticipated and data quality was high. After survey completion, the team conducted a check of the data to find and fix minor issues observed during data collection.

3.4.1. Monitoring during the survey

The DalTRAC team monitored incoming data throughout the survey. For example, completion rates for each question (reported in Section 4.3 below) were spot checked throughout the survey process and found satisfactory. Overall, the web survey tool worked as expected and data monitoring found no major issues.

We also worked closely with the third-party CATI service provider throughout the data collection process. The vendor collected feedback from telephone interviewers and passed along any issues, which we promptly discussed and resolved. We encountered some difficulties in Phase 1, such as confusion among interviewers who used test household codes to enter real data. These were solved quickly, and Phase 2 went smoothly. The feedback received from interviewers was valuable for DalTRAC to understand how respondents interacted with the web survey tool.

To coordinate between the different types of data entry (direct web entry, telephone interview, and mail-in survey), DalTRAC provided the CATI service provider with a secure page which listed all household codes with complete surveys, to be taken off the call list. The telephone interviewer in turn sent us a weekly list of respondents who had requested to be sent a link to the survey. DalTRAC staff then sent a follow-up email to those participants, prompting completion of the survey.

3.4.2. Data quality standards

Overall, the quality of responses was satisfactorily high. Most survey data did not require any post-survey quality control, however, we anticipated that data from the complex travel log would require some inspection. After the survey was complete, we submitted the travel log data to several checks. We manually inspected any travel logs with trips which had a duration over 2 hours, the same destination as origin, a trip origin or destination outside of Nova Scotia, or a trip which had a speed over three times the average speed for the mode of travel.

Manual inspection determined if a trip was reasonable given its origin, destination, timing and the characteristics of the individual who made it. For instance, a trip over two hours would be reasonable if the traveller was driving from Halifax to Cape Breton, but not reasonable if they were driving within Bedford. Unreasonable trips were revised if possible and deleted as a last resort. For example, for back-to-back out-of-home activities with an unreasonably long trip between, the respondent was assumed to return home between activities. In a few cases, the respondent apparently searched for a place by name and chose a result in a different city (e.g. a business in Chester, NY instead of Chester, NS). These cases were identified and manually fixed to ensure the quality of the data.

3.5. Survey timeline

The timeline of the survey's data collection process is shown in Table 3-2.

Table 3-2. Survey timeline for data collection

Date	Event
Phase 1 (Cell phone sample, October–December 2017)	
Oct. 19	Web survey instrument opened
Oct. 23 – 26	Text messages sent out to around 2,000 HRM numbers
Oct. 24	Phase 1 social media campaign begins
Nov. 1 – 4	Reminder text messages sent
Nov. 7	Training session for telephone interviewers
Nov. 8	Telephone interviews begin for cell sample
Dec. 12	Telephone interview end for cell sample
Phase 2 (Landline phone sample, June–November 2018)	
June 4	First list of 5,000 households received from Canada Post
June 21	First wave of survey packages printed and mailed out
June 25	Phase 2 social media campaign begins
July 5	Telephone interviews begin for first wave
Aug. 26	Telephone interviews end for first wave
Aug. 31	Second list of 5,000 households received from Canada Post
Sept. 21	Second wave of survey packages printed and mailed out
Oct. 3	Telephone interviews begin for second wave
Nov. 30	Telephone interviews end for second wave; web survey instrument closed

4. Completion Statistics and the Sample

This section introduces the sample collected by the NovaTRAC Halifax survey, including completion rates, composition and quality of the sample data, and how the sample is weighted for analysis.

4.1. Completion rate

The NovaTRAC Halifax survey invited 12,000 randomly selected households in HRM to participate. Of these, 2,333 households completed the survey, for an overall completion rate of 19.4%.

4.1.1. Completions by phase

As described above, the survey was conducted in three parts, with a cellphone (random-digit dialing) sample followed by two waves of landline (mailout) samples. Completion rates for the survey improved as the phases progressed, as shown in Table 4-1.

Table 4-1. Completion rates for project phases

Phase	Dates	Sample	Sampled households	Completed households	Completion rate
1	Oct–Dec 2017	Cellphone	2000	314	15.7%
2a	June–Aug 2018	Landline	5000	986	19.7%
2b	Sept–Nov 2018	Landline	5000	1033	20.7%
		Total	12000	2333	19.4%

4.1.2. Completions by survey instrument

Table 4-2 shows that telephone survey responses comprised 64.9% of households in our final sample. 23.9% of respondents in the landline sample mailed their surveys in, which was not an option for the cellphone sample.

Table 4-2. Summary of responses by survey instrument

		Web entry		Telephone survey		Mail-in survey		
Phase	Method	Number	% of phase	Number	% of phase	Number	% of phase	Total
1	Cellphone	95	30.3%	219	69.7%	–		314
2a	Landline	116	11.8%	601	61.0%	269	27.3%	986
2b	Landline	127	12.3%	693	67.1%	213	20.6%	1033
	Total	338	14.5%	1513	64.9%	482	20.7%	2333

4.2. Sample composition

The data collected by the NovaTRAC Halifax survey falls into three categories: household, person and trip data, which have datasets of different sizes. The survey was distributed to households and received 2,333 household responses. The survey asked for responses from each member of the household. In total, 4,159 people provided information for the survey, an average of 1.8 per household. This is less than the average number of people per household reported below since household members could decline to participate. Each individual respondent provided information on their trips, and a total of 13,637 trips were recorded.

Table 4-3. Sample composition for each survey phase

Phase	Sample	Households	Persons	Trips
1	Cellphone	314	593	2118
2a	Landline	986	1749	5563
2b	Landline	1033	1817	5956
	Total	2333	4159	13637

Certain survey questions, including those on health, attitudes and occupation, were only asked to the survey's primary respondent. These questions have a sample size equal to the total number of households.

4.3. Completion rate by question

The survey had a good question-by-question completion rate, with most questions receiving responses from over 97% of respondents. Some respondents were reluctant to provide their household income, which had an 82.0% completion rate. The tables below detail the proportion of survey respondents who provided an answer for each question. For the items on vehicle information in Table 4-4, the values represent the completion rate for households who should have responded based on the number of vehicles they own.

Table 4-4. Completion rates for household questions

	Completion rate		Completion rate
Household size (# people)	99.7%	Home location	98.1%
Number of household vehicles	99.8%	Years lived at the location	99.7%
Vehicle 1 information	97.9%	Dwelling type	99.8%
Vehicle 2 information	97.6%	Home ownership status	99.7%
Vehicle 3 information	95.9%	Household income	82.0%
Number of bicycles	99.0%		

Table 4-5. Completion rates for individual questions

	Completion rate (all individuals)		Completion rate (primary respondents)
Drivers' licence ownership	98.7%	Occupation	97.0%
Transit pass ownership	98.6%	Flexible work hours	97.6%
Gender	98.3%	Level of physical activity	98.9%
Age	96.3%	Height	97.5%
Level of education	97.5%	Weight	90.4%
Employment status	91.5%	Health status	98.5%
Day of travel log	97.4%	Attitude towards life	96.8%
		Stress levels	97.2%

Individual questions had very high completion rates, as shown in Table 4-5 and Table 4-6. Individuals' body weight and employment status had the lowest completion rates, but both were over 90%.

Table 4-6. Completion rates for attitudes and preferences questions

	Completion rate (primary respondents)
I enjoy riding a bicycle	98.8%
I prefer walking to driving whenever possible	98.9%
I feel happier when riding the bus than driving	98.8%
I take pride in owning a car	98.8%
Driving provides me freedom	98.9%
I am fully satisfied with my commute	98.8%
My commute makes me feel stressed	98.6%
I am happy with where I live	99.1%
I invest a lot of time into the community I live in	98.6%
A suburban environment offers the best quality of life	98.9%
I limit my driving because it's bad for air quality	98.8%

As seen in Table 4-7, the travel logs had reasonably high completion rates. Some respondents were reluctant to enter addresses for certain locations they visited, especially for personal errands such as visits to medical appointments.

Table 4-7. Completion rates for travel log

	Completion rate		Completion rate
Origin address	87.3%	Mode of travel	99.2%
Destination address	88.4%	Travel companions	99.0%
Departure time	87.2%	Destination location type	99.9%
Arrival time	97.7%	Activity	98.7%

4.4. Weighting

4.4.1. Preliminary sample analysis

A preliminary analysis of demographics in the sample showed a significantly higher rate of completion of the survey by older individuals than working age or youth cohorts. This is a unique case in comparison to similar surveys in the literature. The skew can be seen in the distribution of the sample by age in Figure 4-1 and by employment in Figure 4-2, which compare the NovaTRAC Halifax sample to 2016 Census data. The overrepresentation is likely due to the greater likelihood of older individuals to have landlines and a higher rate of engagement on the survey from senior citizens.

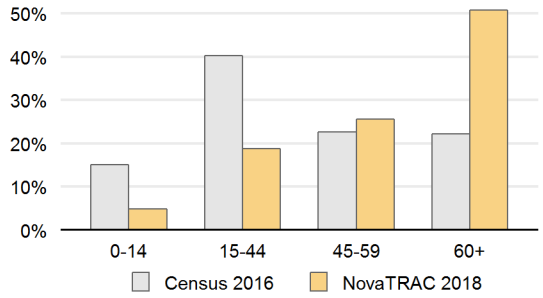

Figure 4-1. Age compared to census (unweighted)

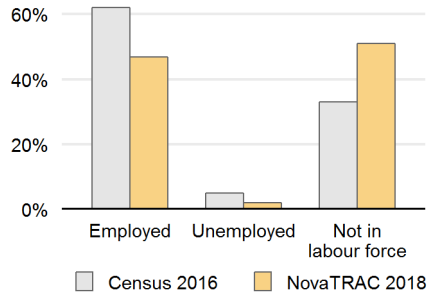

Figure 4-2. Employment (unweighted)

The preliminary analysis also considered other demographic characteristics such as household size and income as well as the spatial distribution of respondents; these were found to be acceptable compared to 2016 Census data.

4.4.2. Weighting method

To compensate for the overrepresentation of older individuals, the sample is weighted at the person level. Individuals are assigned a weight according to 5-year age cohorts. Figure 4-3 shows the sample rate for each cohort, i.e. the percent of the census population of that cohort included in the sample. In total, 4,159 individuals were sampled from a population of 403,390, so the mean sample rate is 1.0%.

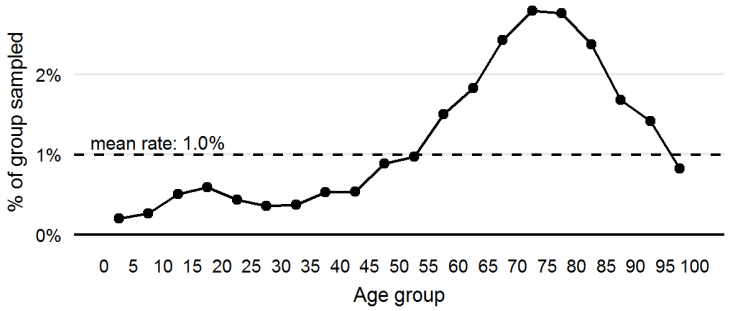

Figure 4-3. Sample rate by 5-year age cohort

The weight for each age cohort scales the size of the cohort to 1.0% of its census population. Cohorts below age 55 have sample rates below 1.0% and so have weights above 1, and cohorts above age 55 have sample rates above 1.0% and so have weights below 1. Household, individual and trip data is all weighted accordingly. Trips have the weight of the individual that took the trip, and households have the average weight of their members.

4.4.3. Weighted sample composition

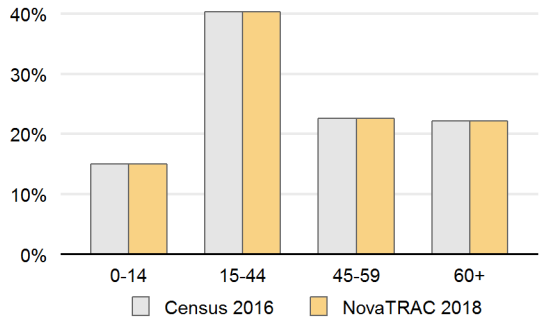

Figure 4-4. Age compared to census (weighted)

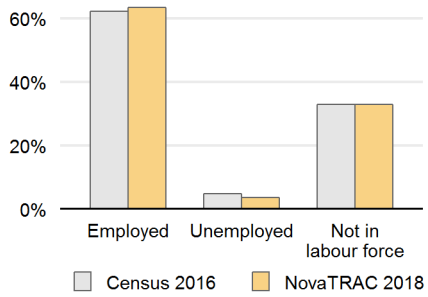

Figure 4-5. Employment (weighted sample)

Weighting brings the NovaTRAC sample demographics largely in line with those of the 2016 Census. By construction, the weighting scheme matches the sample's distribution of ages to the 2016 Census data, as shown in Figure 4-4. The weighted data also matches the levels of employment in HRM with census results, as seen in Figure 4-5. The values for both unweighted and weighted age and employment distributions are reported in Table 4-8.

Table 4-8. Distribution of ages and level of employment compared to census

	Ages				Level of employment		
	0-14	15-44	45-59	60+	Employed	Unemployed	Not in labour force
Census	15.0%	40.3%	22.6%	22.1%	62.1%	4.9%	33.0%
Unweighted	4.9%	18.8%	25.6%	50.8%	46.9%	2.1%	51.1%
Weighted	15.0%	40.3%	22.6%	22.1%	63.4%	3.7%	32.8%

Verification against the demographic and spatial characteristics mentioned above was conducted. The weighted data was a better match to the 2016 Census data than the unweighted data in all cases. All further analysis and results in this report use the weighted dataset.

5. Results

This section summarizes the results of the NovaTRAC 2018 survey, giving an overview of travel behaviour for Halifax Regional Municipality as a whole. All results presented in this chapter use the final weighted dataset, which is representative of the overall HRM population.

5.1. Demographic characteristics

5.1.1. Household demographics

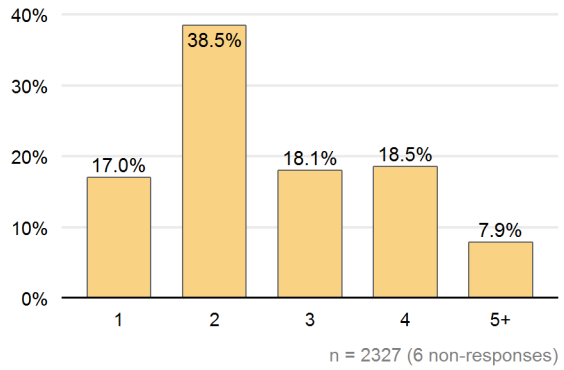

Figure 5-1. Household size (# people) distribution

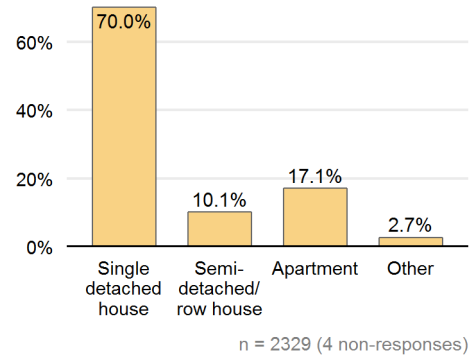

Figure 5-2. Dwelling type distribution

The survey shows that the average household size in HRM is 2.7 people. Figure 5-1 shows the distribution of household sizes across the municipality. A plurality of households (38.5%) have two people. 70.0% of households in HRM live in single detached homes, as shown in Figure 5-2. 77.7% of households own the home they live in, 19.9% rent and 2.5% have another type of home ownership status. Figure 5-3 shows the distribution of household income across the municipality.

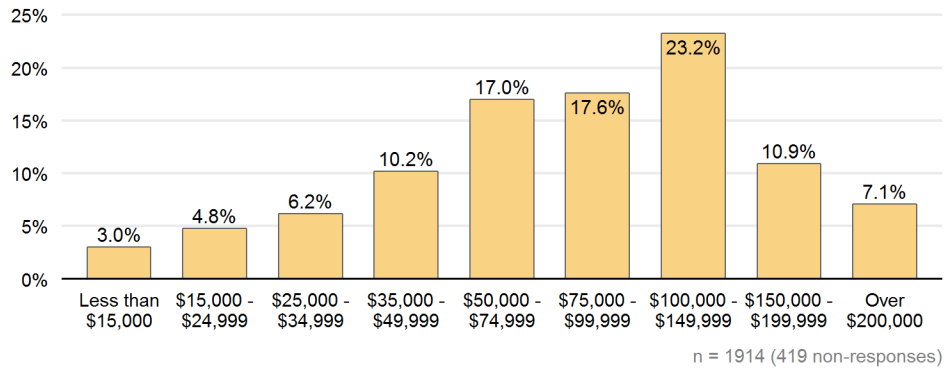

Figure 5-3. Household income distribution

5.1.2. Individual demographics

51.4% of respondents to the survey were female, 48.4% were male and 0.1% were other genders. Individual results presented below by gender only include male and female due to the low sample size for other genders.

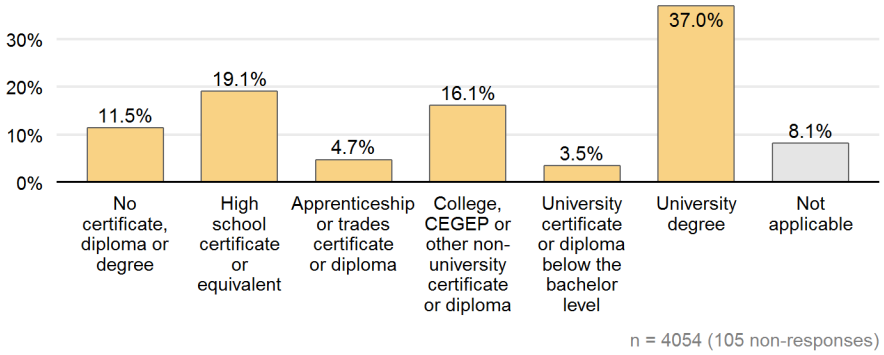

Figure 5-4. Level of education of HRM residents

Figure 5-4 shows the distribution of HRM residents' level of education. 37% of residents have a university degree. The sample includes children still completing school, who are counted as either 'no certificate' or 'not applicable'. The level of employment and occupations of HRM residents are shown in Figure 5-5 and Table 5-1.

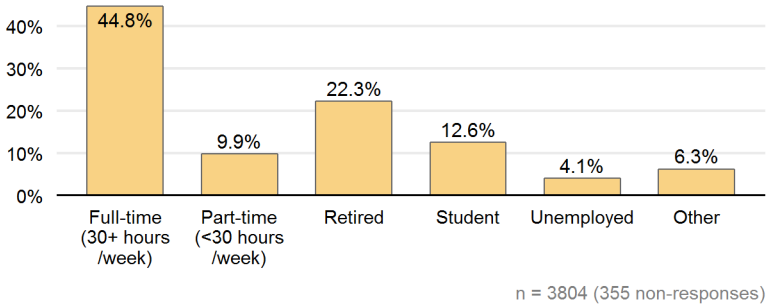

Figure 5-5. Level of employment of HRM residents

Table 5-1. Occupation categories of HRM residents

Occupation Category	Proportion	Occupation Category	Proportion
Management	7.2%	Sales & service	9.3%
Business, finance & admin	8.8%	Trades, transport & equipment operators	5.4%
Natural & applied sciences	2.8%	Natural resources & agriculture	0.8%
Health	9.5%	Manufacturing & utilities	2.2%
Education, law & social services	16.4%	Other/ unsure	7.3%
Art, culture, recreation & sport	1.3%	Not applicable	29.2%

5.2. Mobility tool ownership

A substantial majority of residents—87.1% of those age 16 or above—have a drivers' licence, as shown in Table 5-2. Only 8.5% of individuals purchase a monthly transit pass.

Table 5-2. Drivers' licence and transit pass ownership

	Yes	No	Not applicable
Drivers' licence (all ages)	73.0%	14.6%	12.3%
Drivers' licence (age 16+)	87.1%	12.9%	-
Monthly transit pass	8.5%	91.5%	-

5.2.1. Vehicle ownership

HRM households own on average 1.6 vehicles, and there are 0.77 vehicles per person in the municipality. Most households in HRM (52.5%) own more than one vehicle, as seen in Figure 5-6. Under one in ten households (9.2%) do not own a vehicle.

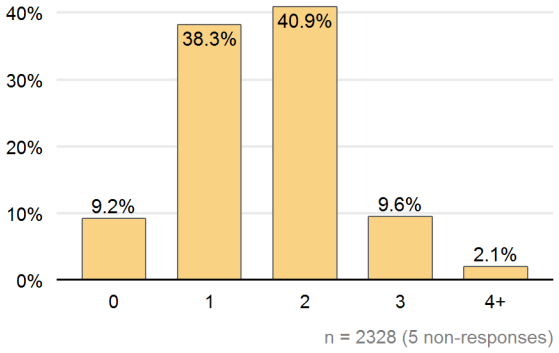

Figure 5-6. Number of vehicles owned per household

Residents of HRM own more compact cars and SUVs than other vehicle classes, Figure 5-7 shows. Examples of vehicles from each class are given in Appendix D.

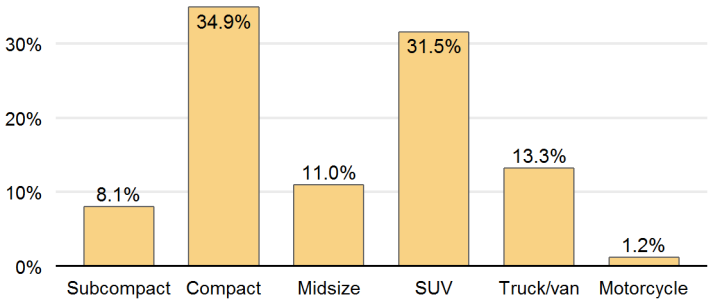

Figure 5-7. Distribution of classes of vehicle owned by HRM households

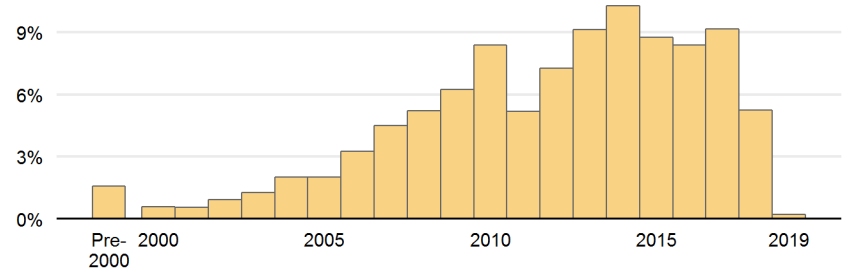

Figure 5-8. Distribution of year of manufacture for vehicles owned by HRM households

Most vehicles (71.9%) owned by HRM households were made since 2010. The median vehicle owned in 2018 was manufactured in 2013. Figure 5-8 and Table 5-3 show the distribution of year of manufacture for HRM vehicles.

Table 5-3. Distribution of year of manufacture for vehicles owned by HRM households

Pre-2000	2000-04	2005-09	2010-14	2015-19
1.6%	5.3%	21.2%	40.2%	31.7%

5.2.2. Bicycle ownership

HRM households own 0.9 bicycles on average. 38.8% of households own a bicycle, as Figure 5-9 shows.

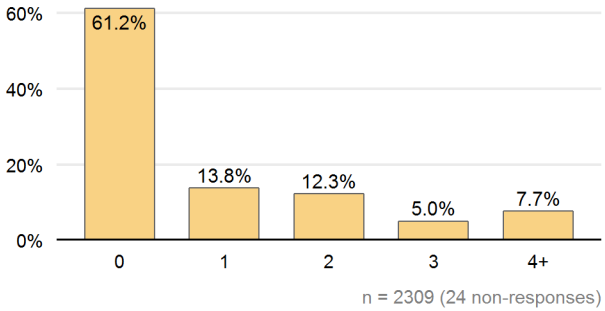

Figure 5-9. Number of bicycles owned per household

5.3. Trip rates

HRM residents take 3.3 trips on average during a typical weekday. On average, households collectively take 6.9 trips per weekday. Trips are counted as one way movement from an origin to a destination, so travelling from home to work and back counts as two trips. For travel with multiple stops (e.g. running errands), each portion of the journey from one place to another is counted as a trip. Most individuals take between two and five trips per day, as shown in Figure 5-10. A significant portion of individuals (15.6%) did not report any trips on the travel day, and few individuals (6.0%) reported more than eight trips.

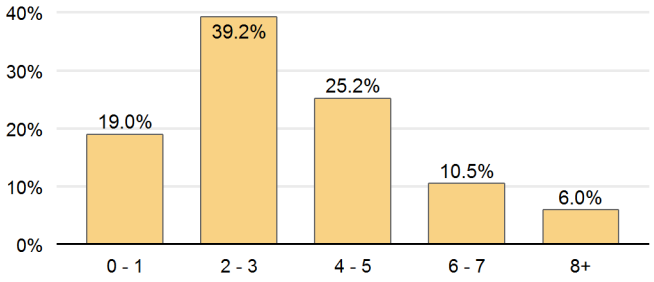

Figure 5-10. Distribution of number of trips per day for individuals

5.3.1. Trip rates by trip purpose

Trips are categorized by purpose according to their origin and destination. For example, home-based work trips are those in which people go directly from home to work or vice versa. HRM residents take on average 0.5 trips between home and work per weekday, as seen in Figure 5-11. Individuals with full-time employment take on average 0.9 home-based work trips per weekday, while individuals without full-time employment take 0.2 of these trips per day on average.

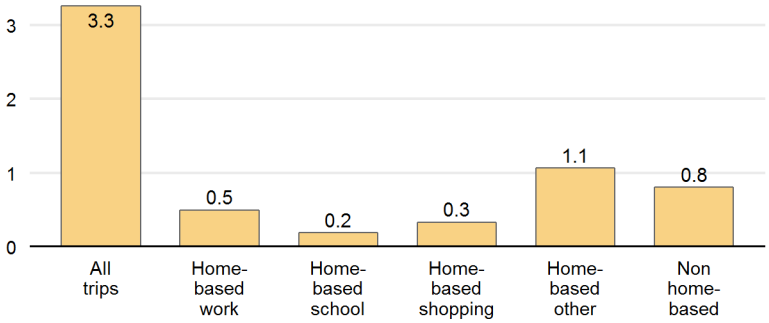

Figure 5-11. Average daily trips per capita by purpose

HRM residents take 1.1 home-based other trips per day on average. Home-based other trips count all trips which start or end at home but do not involve work, school or shopping. They could include running errands, eating outside of the home or visiting friends or family, for example. On average, individuals take 0.8 trips per day between places that are not their home.

Table 5-4. Average daily trips by purpose for individuals and households

	All trips	Home-based work	Home-based school	Home-based shopping	Home-based other	Non home-based
Households	6.9	1.1	0.3	0.7	2.2	1.8
Individuals	3.3	0.5	0.2	0.3	1.1	0.8
Male	3.3	0.5	0.2	0.3	1.1	0.8
Female	3.3	0.5	0.2	0.4	1.1	0.8

Table 5-4 shows the average number of daily trips made for each purpose. In the table, the sum of averages by purpose is less than total average trips since some trips did not have enough information to determine their purpose. Table 5-5 shows the distribution of individuals' trips by purpose. On average, 17.3% of an individuals' trips are made between home and work. Men and women make the same number of trips on average and have similar distributions of trips by purpose.

Table 5-5. Distribution of trip purposes

	Home-based work	Home-based school	Home-based shopping	Home-based other	Non home-based
All individuals	17.3%	6.6%	11.5%	36.7%	27.9%
Male	18.4%	6.8%	10.7%	36.6%	27.5%
Female	15.8%	6.5%	12.3%	37.0%	28.4%

The survey recorded the origin and destination of trips, shown in Table 5-6. 17.1% of trips in HRM are made between home and work, and 45.2% of trips are made between home and places other than work or school. 'Work' and 'School' relate to the individual making the trip, so for example a parent dropping their child off at school counts as 'School' for the child and 'Other place' for the parent. 2.8% of all trips are made between home and a transit stop, and 1.5% are made between two transit stops.

Table 5-6. Percent of all trips made between origins and destinations

Origin \ Destination	Home	Work	School	Transit stop	Other place
Home	0.6%	9.0%	3.5%	1.4%	22.0%
Work	8.2%	1.4%	0.0%	0.8%	4.3%
School	3.1%	0.1%	0.0%	0.2%	0.9%
Transit stop	1.4%	0.9%	0.3%	1.5%	0.3%
Other place	23.2%	3.2%	0.4%	0.5%	12.9%

5.3.2. Trip rates by age

Individuals from age 35-44 tend to make the most trips with 4.1 per day on average, as shown in Table 5-7. HRM residents under age 25 average only 2.7 trips per day. The daily trip rate also drops off for older individuals. Younger women take slightly more trips per day than younger men, while the pattern is reversed for those above age 45.

Table 5-7. Average number of trips per day by age

	0 - 14	15 - 24	25 - 34	35 - 44	45 - 54	55 - 64	65 - 74	75 - 84	85+
All	2.7	2.7	3.4	4.1	3.9	3.6	3.4	2.7	1.7
Male	2.7	2.5	3.3	4.1	4.0	3.8	3.6	3.1	2.1
Female	2.7	2.9	3.4	4.1	3.8	3.4	3.2	2.2	1.5

5.4. Mode share

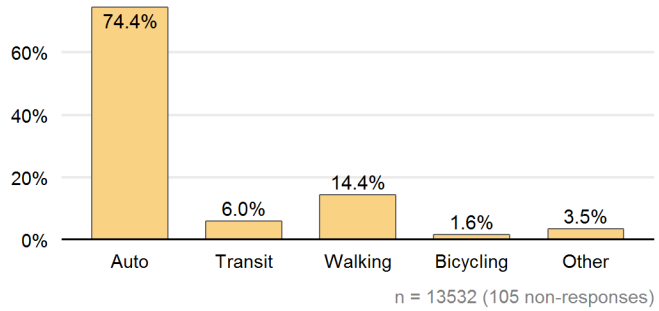

Figure 5-12. Mode share for all trips

74.4% of all trips in HRM are made by auto, while 16.0% are made by active transportation and only 6.0% by transit, as shown in Figure 5-12 and Table 5-8. For this analysis, auto includes driving or being a passenger in private vehicles, including sharing the ride with family members or carpooling; transit includes bus, ferry and community transit; and other modes include school bus and taxi trips and any unlisted means of transportation.

Table 5-8. Mode share for all trips

	Auto	Transit	Walking	Bicycling	Other
All trips	74.4%	6.0%	14.4%	1.6%	3.5%
Male	75.0%	6.0%	13.4%	2.1%	3.4%
Female	73.9%	6.1%	15.2%	1.2%	3.7%

5.4.1. Mode share by purpose

Mode share for trips in HRM varies widely by the purpose of the trip, as seen in Figure 5-13 and Table 5-9a. Auto modes dominate for all trip types except school trips. Four out of five trips (79.9%) between home and work are made by auto, while only 11.3% of home-based work trips are made by active modes (walking and cycling).

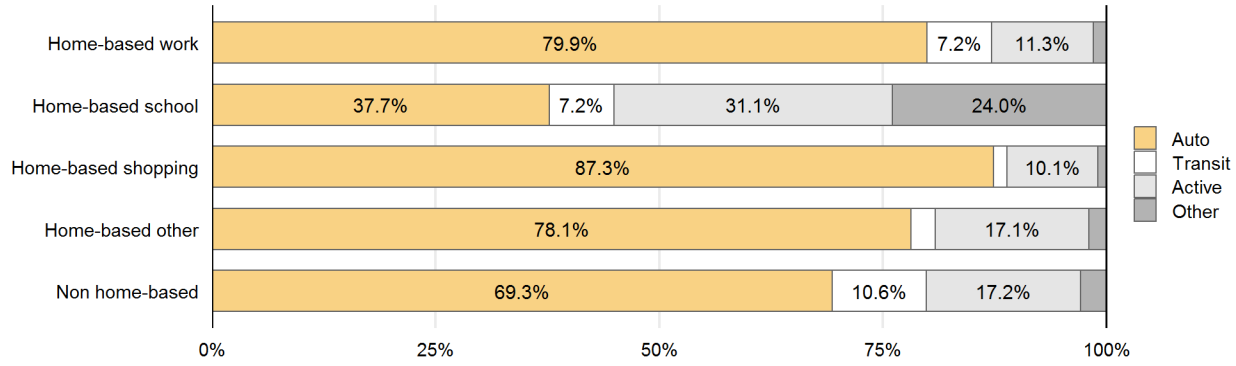

Figure 5-13. Mode share by trip purpose

Table 5-9a. Mode share by trip purpose

	Auto	Transit	Walking	Bicycling	Other
Home-based work	79.9%	7.2%	8.2%	3.1%	1.5%
Home-based school	37.7%	7.2%	28.0%	3.2%	24.0%*
Home-based shopping	87.3%	1.6%	9.4%	0.7%	1.0%
Home-based other	78.1%	2.7%	15.5%	1.6%	2.0%
Non home-based	69.3%	10.6%	16.4%	0.8%	3.0%

* 22.7% school bus, 1.3% other modes

Home-based school trips, which include K-12 and postsecondary students, have the most different modal split from the overall distribution: 28.0% walking and 22.7% school bus, with only 37.7% auto. Of school trips made by auto, 70% are by vehicle passengers, whereas 60% to 90% of auto trips for other purposes are made by drivers. For home-based shopping trips, a large majority (87.3%) are made by auto. Walking is more common for trips that are not for work or shopping. The relatively high rate of transit use for non home-based trips (10.6%) likely reflects trips between bus stops.

In order to compare NovaTRAC modal split for commuting with that of Census 2016, we have extracted all home-based work, and post-secondary school trips. In addition, shorter trips such as transfers between different modes of transportation, passengers dropped-off or picked-up in cars, among others, which are part of work trips are eliminated. Table 5-9b shows the commute modal share from NovaTRAC and Census 2016. The mode share for auto drivers and passengers are 68.4% and 9.3% respectively from the NovaTRAC survey, and 70.4% and 7.3% according to the 2016 Census. There are slight discrepancies among transit mode share and active transportation usage between the two data sources. The percentage of active transportation is greater in the NovaTRAC survey than that of the Census 2016. Conversely, transit mode share is lesser than that of the Census. However, we would like to caution using a direct comparison between these two data sources for two major reasons: a) The census does not include trip information so the modes of transportation are portrayed as the primary mode for the journey to work, and the NovaTRAC survey includes travel diary information which is more detailed trip representation, and b) The census was conducted in 2016, and the survey timeline for the NovaTRAC survey is 2018-19.

Table 5-10b. Commute mode share comparison with Census 2016

		NovaTRAC 2018	Census 2016
Auto	All Auto	77.7%	77.7%
	Auto driver	68.4%	70.4%
	Auto passenger	9.3%	7.3%
Transit		8.2%	11.8%
Active transportation		12.6%	9.2%
Other		1.6%	1.2%

5.5. Travel distance

As shown in Table 5-10, residents of HRM travel 25.5 km per day on average over all modes. Average vehicle kilometres travelled (VKT) per capita is 23.3 km. Men tend to travel slightly longer distances than women. 13.8% of individuals travel more than 50 km per weekday.

Table 5-11. Daily average travel distance (kilometres) per capita

	All modes	Auto	Transit	Active
All individuals	25.5	23.3	1.2	0.6
Male	28.3	25.9	1.3	0.6
Female	23.4	21.3	1.1	0.6

Looking at each trip separately, the average one-way trip in HRM is 9.2 km long. Shorter trips are more common than longer ones, as seen in Figure 5-14. Over half (52.5%) of all trips are under 5 km.

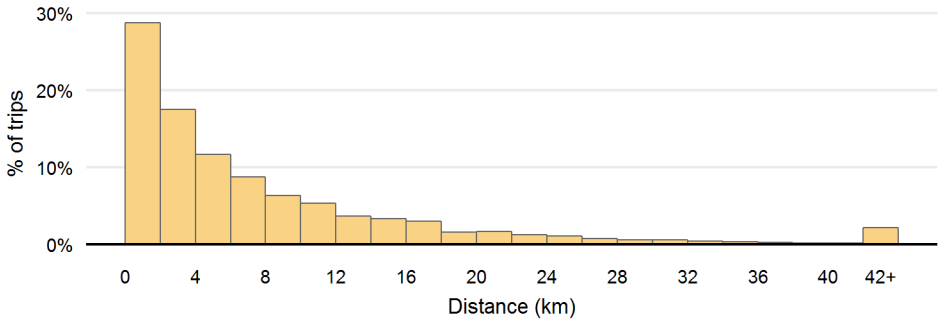

Figure 5-14. Distribution of trip distances (one-way)

Table 5-12. Distribution of trip distances (one-way)

	0 – 1.9 km	2 – 9.9 km	10 – 29.9 km	30+ km
All trips	28.8%	44.3%	22.5%	4.4%
Male	27.9%	43.2%	23.9%	5.0%
Female	29.7%	45.3%	21.4%	3.6%

Table 5-11 provides the distribution of one-way trip distances over four categories. Almost 30% of trips made by HRM residents are less than 2 km long, a walkable distance for many people. Only 4.4% of trips are over 30 km long. Women tend to make slightly fewer trips over 10 km and more trips under 10 km than men.

5.5.1. Trip distance by purpose

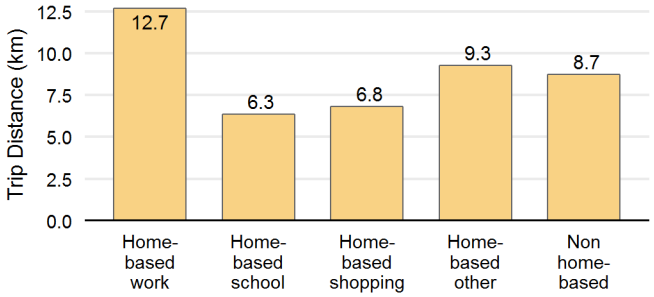

Figure 5-15. Average trip distance (kilometres) by trip purpose

Trips made for different purposes have varying average distances, as shown in Figure 5-15. Commuting trips tend to be the lengthiest; the average home-based work trip (one-way) in HRM is 12.7 km. Home-based school and shopping trips tend to be the shortest, under 7 km on average. Other trips average around 9 km long.

Table 5-13. Average trip distance (kilometres) by trip purpose

	All purposes	Home-based work	Home-based school	Home-based shopping	Home-based other	Non home-based
All trips	9.2	12.7	6.3	6.8	9.3	8.7
Male	10.1	13.9	5.2	7.0	10.2	9.8
Female	8.3	11.2	7.0	6.7	8.4	7.8

Table 5-12 shows the average distance of trips made by each purpose categorized by gender. Men tend to commute slightly farther to work (13.9 km on average) than women do (11.2 km on average).

Table 5-13 shows distributions of one-way trip distances in four categories for each trip purpose. School trips have the largest percentage of trips under 2 km, at 44.2%, while only 11.3% of home-based work trips are that short. On the other hand, 7.2% of work commuting trips are 30 km or more.

Table 5-14. Distribution of trip distances for each purpose

	0 – 1.9 km	2 – 9.9 km	10 – 29.9 km	30+ km
Home-based work	11.3%	43.6%	37.9%	7.2%
Home-based school	44.2%	39.4%	13.8%	2.7%
Home-based shopping	28.7%	49.5%	20.4%	1.4%
Home-based other	28.7%	46.8%	20.4%	4.2%
Non home-based	35.7%	40.5%	19.2%	4.7%

5.5.2. Trip distance by mode

Individuals travel further by certain modes than others, as shown in Figure 5-16. The average trip distance by auto is 11.1 km, while the average walking and cycling trip distances are much shorter.

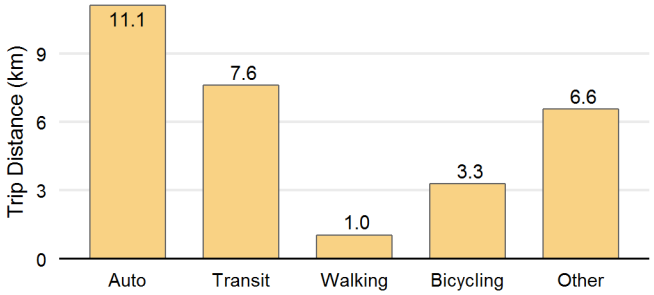

Figure 5-16. Average trip distance (kilometres) by trip mode

Table 5-14 below reports the average distance for trips subdivided by mode and purpose. Work trips tend to be the longest across most modes; the average work trip by auto is 14.5 km long.

Table 5-15. Average trip distance (kilometres) by mode choice and purpose

	Auto	Transit	Walking	Bicycling	Other
All trips	11.1	7.6	1.0	3.3	6.6
Male	12.0	8.4	1.1	3.3	7.5
Female	10.2	7.0	1.0	3.1	5.8
Home-based work	14.5	8.9	2.0	4.2	4.8
Home-based school	10.1	7.8	1.2	2.5	6.9
Home-based shopping	7.5	4.6	1.4	2.6	1.4
Home-based other	11.1	8.0	0.9	3.2	6.2
Non home-based	10.9	7.2	0.8	2.6	6.6

5.6. Travel time

Residents of HRM travel for 53.7 minutes per day on average. For most people, a large majority of this time is spent in a vehicle; individuals spend on average 39.2 minutes per day travelling as an auto driver or passenger. Among individuals who took transit trips, the daily average time on transit was 61.1 minutes. For those who made trips by active transportation, the daily average time walking or cycling was 34.1 minutes.

Considering separate trips, the average one-way trip made in HRM takes 19.1 minutes. As Figure 5-17 shows, the bulk of trips made are under 20 minutes long, though almost one in twenty trips (4.2%) is over an hour long.

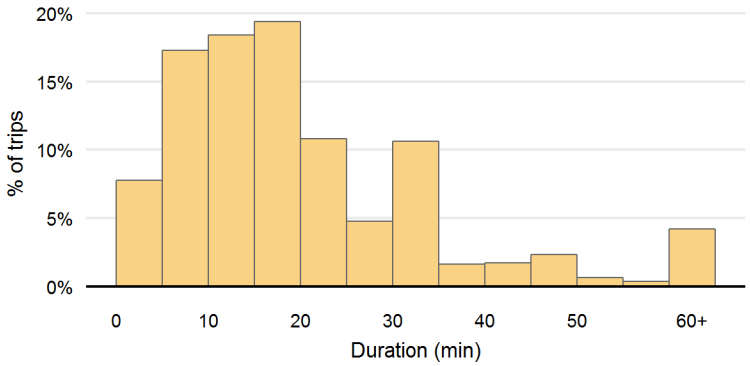

Figure 5-17. Distribution of trip durations (one-way)

Table 5-15 reports the distribution of one-way trip lengths in time categories. Almost four in five trips (78.4%) take less than half an hour, and over 95% of trips take under an hour.

Table 5-16. Distribution of trip durations (one-way)

	0 – 9 min	10 – 29 min	30 – 59 min	60+ min
All trips	25.1%	53.3%	17.4%	4.2%
Male	24.7%	53.5%	17.1%	4.8%
Female	25.5%	53.3%	17.5%	3.7%

5.6.1. Travel time by purpose

Figure 5-18 and Table 5-16 show the average duration for trips made by HRM residents by the purpose of the trip.

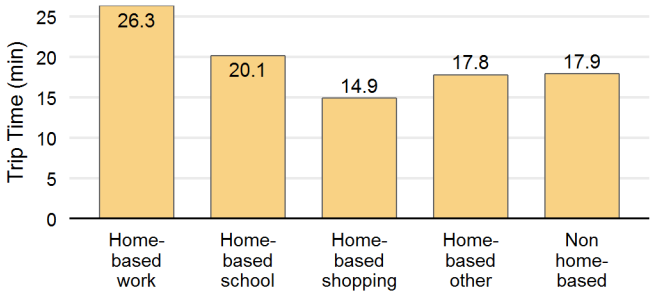

Figure 5-18. Average trip time (minutes) by trip purpose

Commuting trips take the longest time on average, at 26.3 minutes. Though home to school trips are the shortest distance on average, they take more time than most trips for other purposes since they are often made by slower modes such as walking or school bus. Shopping trips take the least time, at 14.9 minutes on average.

Table 5-17. Average travel time (minutes) by trip purpose

	All modes	Home-based work	Home-based school	Home-based shopping	Home-based other	Non home-based
All trips	19.1	26.3	20.1	14.9	17.8	17.9
Male	19.6	27.0	18.5	14.3	18.6	18.3
Female	18.7	25.5	21.5	15.4	17.1	17.6

Table 5-17 shows the distributions of trip times for each purpose. Shopping trips and non-home based trips have the highest proportion of short trips, with over 30% of trips in each category taking under ten minutes. For comparison, only 8.5% of work trips take under ten minutes, and 40.6% of these trips take over half an hour.

Table 5-18. Distribution of travel time for each purpose

	0 – 9 min	10 – 29 min	30 – 59 min	60+ min
Home-based work	8.5%	50.9%	32.5%	8.1%
Home-based school	21.9%	54.3%	17.5%	6.3%
Home-based shopping	31.2%	54.0%	13.5%	1.2%
Home-based other	26.5%	55.8%	14.3%	3.5%
Non home-based	31.2%	51.4%	13.9%	3.5%

5.6.2. Travel time by mode

The average duration of trips by mode is displayed in Figure 5-19. Auto trips take 18.8 minutes on average, while transit trips average over half an hour (31.8 minutes). Approximately 15% of transit trips include a transfer. People appear less willing to spend time walking, as the average walking trip takes 13.6 minutes. The average cycling trip duration is 17.5 minutes.

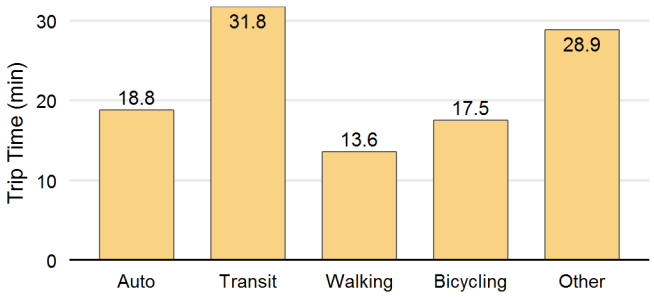

Figure 5-19. Average trip time (minutes) by mode choice

The durations for each mode by trip purpose are shown in Table 5-18. Work trips take the longest time across most modes. For auto, home to work trips take 25.3 minutes on average, while shopping trips take only 14.1 minutes on average.

Table 5-19. Average travel time (minutes) by mode choice and purpose

	Auto	Transit	Walking	Bicycling	Other
All trips	18.8	31.8	13.6	17.5	28.9
Male	19.1	33.4	13.8	19.4	31.1
Female	18.4	30.5	13.4	14.1	27.1
Home-based work	25.3	45.8	21.5	19.4	25.6
Home-based school	17.0	45.6	14.7	13.5	24.1
Home-based shopping	14.1	36.6	17.3	20.9	22.6
Home-based other	18.1	30.9	13.3	16.8	28.1
Non home-based	17.9	23.5	10.2	17.9	42.0

Transit trips are longer across all purposes, and especially long for work or school trips. The average trip to work or school by transit takes over 45 minutes. Walking trips to work are also longer on average than other walking trips, averaging 21.5 minutes. The difference in cycling trips to work is less pronounced, as bike trips for all purposes except school average between 16 and 21 minutes long.

5.7. Travel accompaniment

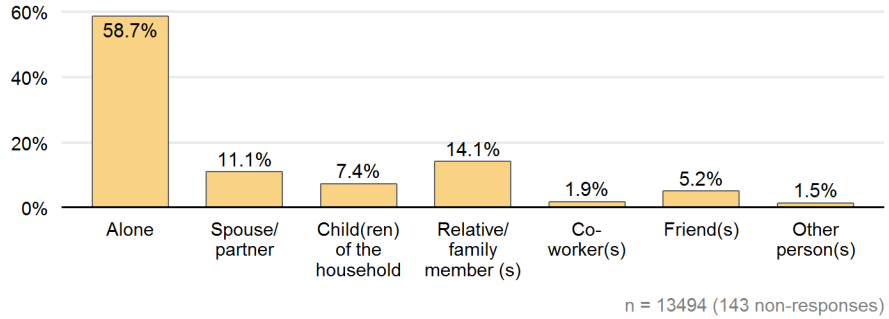

Figure 5-20. Distribution of trip accompaniment

More than half of all trips (58.7%) in HRM are made by people travelling alone, as seen in Figure 5-20.

Table 5-20. Distribution of trip companions

	Alone	Partner	Child	Relative	Co-worker	Friend	Other
All trips	58.7%	11.1%	7.4%	14.1%	1.9%	5.2%	1.5%
Male	60.5%	11.7%	5.7%	13.7%	2.0%	4.3%	2.0%
Female	57.0%	10.4%	9.1%	14.6%	1.8%	6.0%	1.1%

Table 5-19 shows the distribution of who people travel with. Most trips made with two or more people are between family members such as partners, parents and children, or other relatives. Women are more likely to travel with children than men are.

5.7.1. Accompaniment by purpose

There is a large variance in trip companions according to the purpose of the trip, as shown in Table 5-20. Commuting trips are the most likely to be taken alone, with only 15.5% of those trips having a companion.

Table 5-21. Distribution of trip accompaniment by purpose

	Alone	Partner	Child	Relative	Co-worker	Friend	Other
Home-based work	84.5%	4.5%	1.8%	3.8%	4.0%	0.9%	0.4%
Home-based school	39.8%	1.2%	6.9%	31.3%	0.0%	13.0%	7.8%
Home-based shopping	59.4%	19.1%	5.1%	12.7%	0.2%	3.1%	0.3%
Home-based other	47.8%	13.9%	12.8%	18.9%	0.2%	5.2%	1.1%
Non home-based	61.4%	9.9%	4.9%	10.7%	4.4%	7.1%	1.5%

Trips for non-work purposes are much more likely to be accompanied by another person. For trips between home and school, 31.3% are accompanied by a family member such as a sibling or parent, and 13.0% are accompanied by a friend, while only 39.8% are done alone. Shopping trips are accompanied by a spouse or partner 19.1% of the time and another family member 17.8% of the time. Other trips from home, such as for errands or recreation, are often done with family members including partners (13.9%), children (12.8%) and other relatives (18.9%).

5.7.2. Accompaniment by mode

Mode share also relates to who travels together. Almost half of auto trips (45.1%) of all auto trips are taken with one or more companions, whereas only 11.8% of transit trips and 9.4% of bicycle trips are made with other people. Table 5-21 shows the proportions of trips of different modes made by type of trip companion.

Table 5-22. Distribution of trip accompaniment by mode

	Alone	Partner	Child	Relative	Co-worker	Friend	Other
Auto	54.9%	13.2%	8.1%	16.0%	2.1%	4.5%	1.2%
Transit	88.2%	3.4%	1.1%	3.6%	0.5%	2.2%	1.0%
Walking	65.6%	5.9%	7.7%	12.5%	1.1%	7.0%	0.3%
Bicycling	90.6%	1.6%	6.1%	0.0%	0.0%	1.8%	0.0%
Other	48.4%	3.0%	3.4%	4.0%	5.1%	19.9%	16.3%

5.8. Travel behaviour by time of day

Residents of HRM travel most frequently in the morning and afternoon peak times, 6am to 9am and 3pm to 6pm. As shown in Figure 5-21, there is a moderate amount of travel activity between peak hours, and the travel activity falls off gradually until around midnight. In this section, trips are counted by their start time.

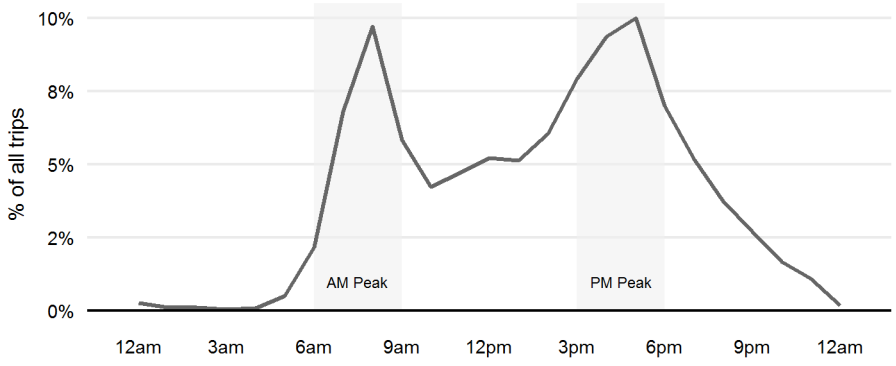

Figure 5-21. Distribution of trips by start time

Table 5-22 shows the distribution of trips made by time of day. 20.8% of trips are made within the AM peak, and 27.5% of trips are made in the PM peak hour. Table 5-23 shows the average number of trips made by each person in the specified timeframe.

Table 5-23. Distribution of trips by time of day

	AM peak (6-9am)	Midday (9am-3pm)	PM peak (3-6pm)	Evening (6pm-12am)	Overnight (12-6am)
All trips	20.8%	30.7%	27.5%	19.6%	1.4%
Male	22.4%	28.5%	28.2%	19.4%	1.5%
Female	19.3%	32.8%	26.9%	19.7%	1.3%

Table 5-24. Average number of trips per person by time of day

	AM peak (6-9am)	Midday (9am-3pm)	PM peak (3-6pm)	Evening (6pm-12am)	Overnight (12-6am)
All persons	0.7	1.0	0.9	0.6	0.04
Male	0.7	0.9	0.9	0.6	0.05
Female	0.6	1.1	0.9	0.6	0.04

5.8.1. Trip purposes

Trips for different purposes tend to be made at different times of day, as shown in Figure 5-22. Trips between home and work are most often made in the AM peak and PM peak periods. Most school trips are made around 8am and 3pm, reflecting the K-12 school day. Shopping trips are most common in the afternoon or evening.

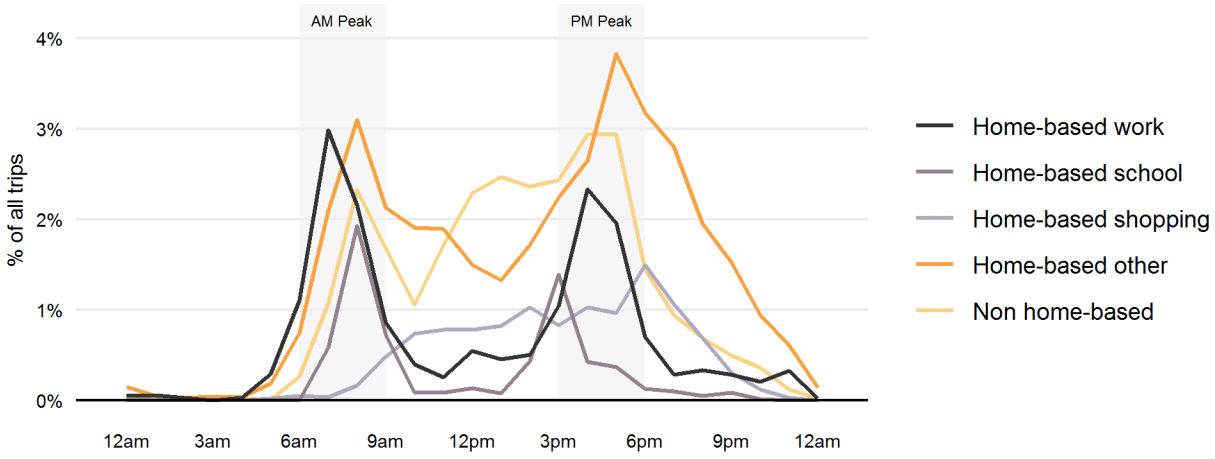

Figure 5-22. Distribution of trips by hour and purpose

Table 5-24 shows what types of trips are happening during each segment of the day. In the AM peak, 30.8% of trips are between home and work and 1.4% of trips are for shopping. Conversely, only 9.5%

of trips made in the midday are between home and work, and 15.8% of midday trips are home-based shopping. Most overnight trips are made between 5am and 6am and likely reflect early commuters.

Table 5-25. Distributions of trip purposes for each time of day

	Home-based work	Home-based school	Home-based shopping	Home-based other	Non home-based
All times	17.3%	6.6%	11.5%	36.7%	27.9%
AM peak (6-9am)	30.8%	14.5%	1.4%	32.1%	21.1%
Midday (9am-3pm)	9.5%	4.5%	15.8%	33.4%	36.8%
PM peak (3-6pm)	19.3%	7.0%	10.7%	33.1%	29.9%
Evening (6pm-12am)	10.4%	1.7%	17.2%	52.0%	18.7%
Overnight (12-6am)	42.9%	0.0%	2.6%	43.4%	11.1%

5.8.2. Mode choice

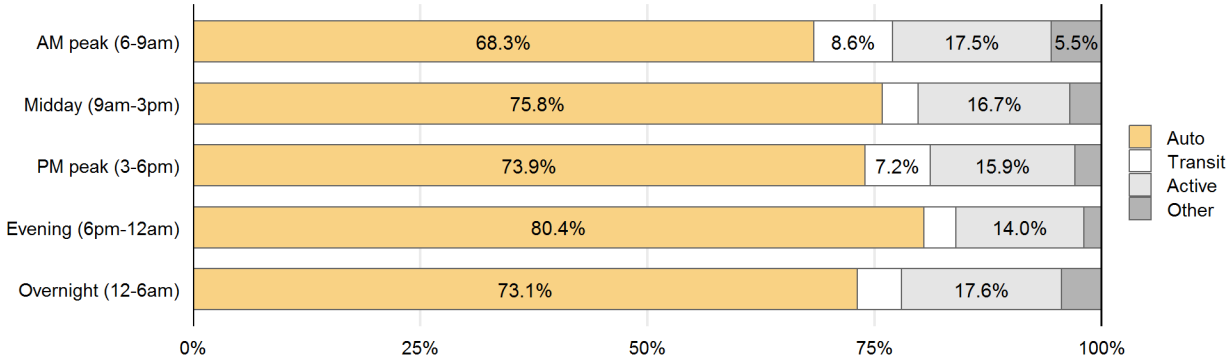

Figure 5-23. Distribution of travel modes for each time of day

There are some variations in modal split at different times of day, as seen in Figure 5-23 and Table 5-25. Auto use as a proportion of all modes is slightly lower in the AM peak, partially due to a higher rate of school bus (in 'other') travel at that time. Transit use is highest in the morning and afternoon peak hours.

Table 5-26. Distribution of travel modes for each time of day

	Auto	Transit	Walking	Bicycling	Other
All times	74.4%	6.0%	14.4%	1.6%	3.5%
AM peak (6-9am)	68.3%	8.6%	15.9%	1.6%	5.5%
Midday (9am-3pm)	75.8%	4.0%	15.0%	1.7%	3.5%
PM peak (3-6pm)	73.9%	7.2%	14.4%	1.6%	3.0%
Evening (6pm-12am)	80.4%	3.5%	12.4%	1.6%	2.0%
Overnight (12-6am)	73.1%	4.8%	13.7%	3.9%	4.5%

5.8.3. Trip distance

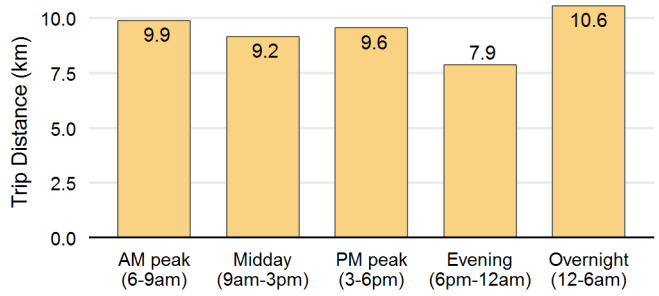

Figure 5-24. Average one-way trip distance by time of day

The average distance of one-way trips made in HRM varies slightly by time of day, as shown in Figure 5-24. Evening trips are the shortest, being 7.9 km on average, whereas overnight trips are the longest, at an average of 10.6 km.

Table 5-27. Distribution of trip distances (one-way) for each time of day

	0 – 1.9 km	2 – 9.9 km	10 – 29.9 km	30+ km
All times	28.8%	44.3%	22.5%	4.4%
AM peak (6-9am)	26.4%	43.6%	24.9%	5.1%
Midday (9am-3pm)	31.6%	43.6%	20.7%	4.1%
PM peak (3-6pm)	27.5%	45.2%	22.9%	4.4%
Evening (6pm-12am)	28.9%	45.2%	22.0%	3.8%
Overnight (12-6am)	21.5%	42.5%	31.0%	4.9%

Table 5-26 shows how trip distances break down for each time of day, and Table 5-27 displays the average distance for trips by mode during each part of the day. Average distances for all modes of travel vary slightly by time of day, with the lengthiest trips for each mode being taken in the AM and PM peak hours.

Table 5-28. Average one-way trip distance (kilometers) by time of day for each travel mode

	AM peak (6-9am)	Midday (9am-3pm)	PM peak (3-6pm)	Evening (6pm-12am)	Overnight (12-6am)
All modes	9.9	9.2	9.6	7.9	10.6
Auto	12.4	11.2	11.5	9.1	13.2
Transit	8.6	5.8	8.2	7.0	*
Walking	1.2	0.9	1.1	0.9	0.9
Bicycling	4.0	3.0	3.5	2.5	*
Other	7.0	5.5	7.1	7.5	*

* Not enough data

5.8.4. Travel time

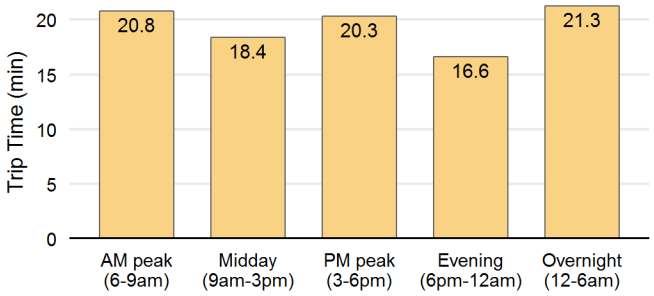

Figure 5-25. Average one-way travel time by time of day

Similar to trip distances, the duration of trips varies by time of day. Midday and evening trips tend to be shorter than trips made at other times of day, as shown in Figure 5-25.

Table 5-29. Distribution of travel time (one-way) for each time of day

	0 – 9 min	10 – 29 min	30 – 59 min	60+ min
All times	25.1%	53.3%	17.4%	4.2%
AM peak (6-9am)	22.6%	52.1%	20.4%	4.9%
Midday (9am-3pm)	27.1%	54.1%	14.7%	4.1%
PM peak (3-6pm)	23.0%	51.9%	20.3%	4.9%
Evening (6pm-12am)	27.7%	55.0%	14.7%	2.6%
Overnight (12-6am)	20.2%	59.6%	12.1%	8.1%

Table 5-28 displays the distribution of trip duration for different times of day. Table 5-29 shows the average time taken to make trips by each mode at each time of day. As with trip distance, the average duration of trips by most modes is longer in the peak periods than off-peak.

Table 5-30. Average one-way travel time (minutes) by time of day for each travel mode

	AM peak (6-9am)	Midday (9am-3pm)	PM peak (3-6pm)	Evening (6pm-12am)	Overnight (12-6am)
All modes	20.8	18.4	20.3	16.6	21.3
Auto	21.3	18.2	20.0	15.8	20.1
Transit	31.0	29.7	32.9	31.2	*
Walking	12.7	14.1	13.8	13.5	12.4
Bicycling	19.5	16.3	19.3	14.9	*
Other	23.7	27.4	30.3	45.3	*

* Not enough data

5.9. Auto travel

5.9.1. Vehicle choice

Households may use certain vehicles that they own more often than others. The distribution of vehicle classes used for auto trips, shown in Figure 5-26, is therefore different than the vehicle ownership by class shown in Figure 5-7. In particular, while only 31.5% of vehicles owned are SUVs, 36.2% of vehicles used for trips are SUVs, indicating that HRM residents often prefer to use them for trips.

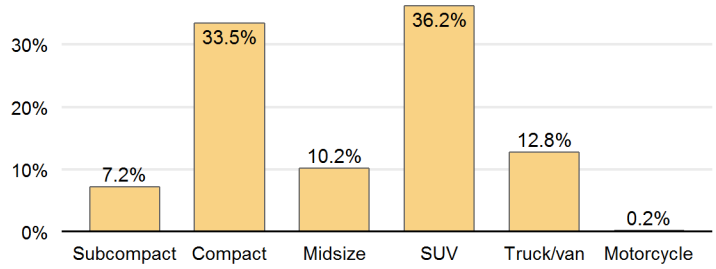

Figure 5-26. Distribution of vehicle classes used for vehicle trips

Table 5-30 shows how often vehicles of each class are used for trips made by individuals of different genders, and Table 5-31 displays the distribution of year of manufacture. Women are more likely to drive smaller vehicles and SUVs, while men are much more likely to drive trucks.

Table 5-31. Distribution of vehicle classes used for vehicle trips

	Subcompact	Compact	Midsize	SUV	Truck/van	Motorcycle
All trips	7.2%	33.5%	10.2%	36.2%	12.8%	0.2%
Male	6.5%	28.8%	10.6%	33.6%	20.3%	0.2%
Female	8.0%	37.8%	9.3%	38.9%	5.8%	0.2%

Table 5-32. Year of manufacture for vehicles used for all vehicle trips

	Pre-2000	2000-04	2005-09	2010-14	2015-19
All	0.4%	2.3%	18.8%	40.8%	37.7%
Male	0.7%	2.1%	20.4%	41.8%	35.0%
Female	0.2%	2.0%	17.3%	40.0%	40.6%

5.9.2. Vehicle occupancy

The overall vehicle occupancy rate on HRM roads is estimated to be 1.41 people per vehicle, as seen in Table 5-32. Vehicle trips taken in the afternoon and evening tend to have the highest occupancy. Trips between home and school have a particularly high vehicle occupancy, as primary and secondary students are often driven to school. Home-based work trips have the lowest vehicle occupancy rates.

Table 5-33. Vehicle occupancy indices by time of day and trip purpose

	Occupancy index (trip-based)	Occupancy index (distance-based)
All trips	1.41	1.41
AM Peak (6-9am)	1.38	1.24
Midday (9am-3pm)	1.35	1.43
PM peak (3-6pm)	1.52	1.45
Evening (6pm-12am)	1.55	1.61
Overnight (12-6am)	1.16	1.10
Home-based work	1.14	1.09
Home-based school	3.37	1.61
Home-based shopping	1.36	1.40
Home-based other	1.61	1.67
Non home-based	1.40	1.43

The vehicle occupancy rates in this section are estimates since the NovaTRAC survey did not directly ask about the number of people travelling together on each trip. Following methodology established by Toronto's Transportation Tomorrow Survey, two occupancy indices are calculated. The trip-based index is the total number of auto driver and passenger trips divided by the number of auto driver trips; the distance-based index is the total distance of auto driver and passenger trips divided by the distance of auto driver trips. The distance-based occupancy index gives more weight to longer trips and better represents the number of people per vehicle that would be observed in a count.

5.10. Attitudes and preferences

Table 5-33 shows the distribution of responses to all questions on respondents' attitudes and lifestyle preferences. HRM residents are for the most part happy with their commutes: 61.5% agree that they are fully satisfied with their commute, and only 18.0% say their commute makes them feel stressed. A full 90.3% of residents are happy with where they live, and many (46.4%) invest a lot of time into their communities. More people agree that the suburbs offer the best quality of life (47.1%) than disagree (22.9%). Few individuals (26.0%) limit their driving due to its impacts on air quality.

Table 5-34. Responses to attitude and lifestyle preference questions

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree	Not applicable
I enjoy riding a bicycle	12.0%	12.1%	13.8%	30.8%	16.2%	15.2%
I prefer walking to driving whenever possible	7.0%	16.6%	15.2%	36.0%	21.6%	3.7%
I feel happier when riding the bus than driving	27.4%	30.7%	13.0%	9.0%	5.1%	14.8%
I take pride in owning a car	3.7%	7.6%	21.8%	36.5%	22.7%	7.6%
Driving provides me freedom	1.9%	2.5%	5.5%	41.0%	43.0%	6.1%
I am fully satisfied with my commute	4.0%	10.7%	9.9%	35.3%	26.2%	14.0%
My commute makes me feel stressed	22.5%	32.4%	12.6%	13.5%	4.5%	14.4%
I am happy with where I live	1.6%	3.1%	4.3%	36.9%	53.4%	0.7%
I invest a lot of time into the community I live in	5.2%	21.6%	23.6%	33.9%	12.5%	3.3%
A suburban environment offers the best quality of life	7.3%	15.6%	27.1%	33.7%	13.4%	2.9%
I limit my driving because it's bad for air quality	11.3%	32.0%	22.6%	21.1%	4.9%	8.0%

HRM residents demonstrate mixed opinions about their attitudes and preferences towards different travel modes. Most residents prefer walking to driving as seen in Figure 5-27, but a majority also take pride in owning a car and feel that driving provides them freedom, as in Figure 5-28. A lower proportion of residents (14.1%) indicated that they feel happier riding the bus than driving. On the other hand, almost half (47%) of residents enjoy riding a bicycle.

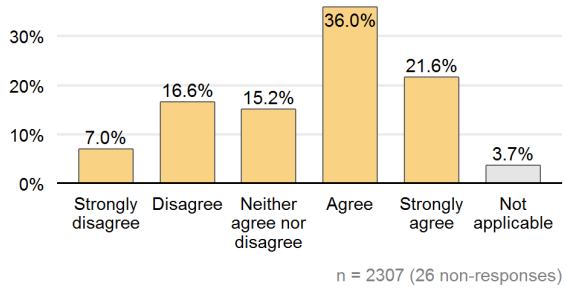

Figure 5-27. I prefer walking to driving if possible

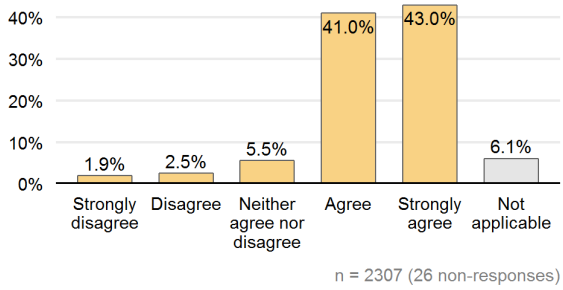

Figure 5-28. Driving provides me freedom

6. Regional Comparisons

This section presents weighted results from the NovaTRAC Halifax survey for three regions within HRM: the regional centre, the suburbs and rural areas. The regional centre area was defined by the draft Centre Plan, and suburbs are areas within HRM's Urban Transit Service Boundary but outside the regional centre. Other areas are identified as rural. Households and individuals are counted toward the region in which they reside.

6.1. Spatial distribution of sample

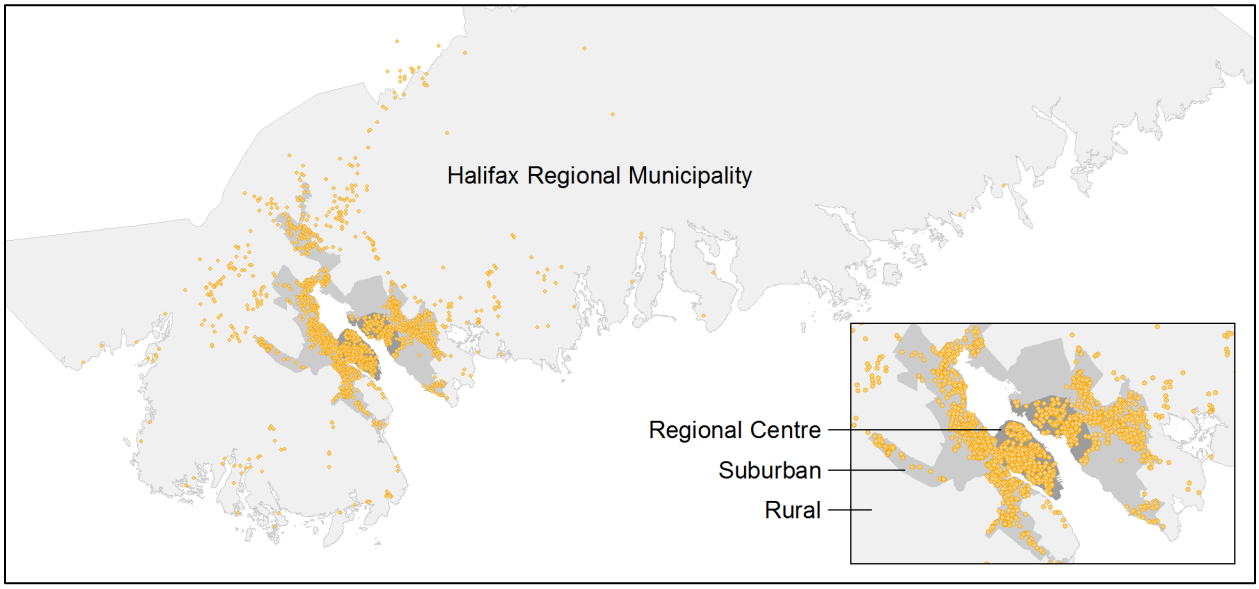

Figure 6-1. Respondents' home locations

The NovaTRAC Halifax sample is well spatially distributed across HRM (see Figure 6-1), and the distribution of both households and population in the sample closely match the 2016 Census, as shown in Figure 6-2 and Figure 6-3. The higher proportion of suburban and lower proportion of rural respondents may indicate a change in the distribution of HRM's population since 2016.

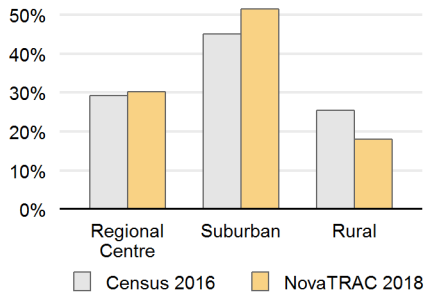

Figure 6-2. Distribution of households vs. census

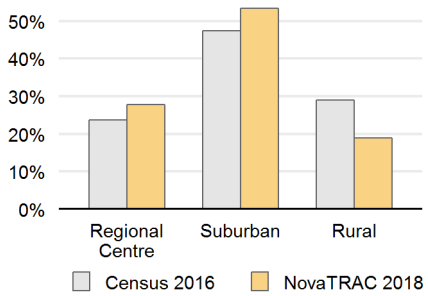

Figure 6-3. Distribution of population vs. census

Table 6-1. Distribution of households and population by region

	Households			Population		
	Regional Centre	Suburban	Rural	Regional Centre	Suburban	Rural
Census	29.3%	45.2%	25.5%	23.6%	47.4%	29.0%
NovaTRAC	30.3%	51.6%	18.1%	27.8%	53.3%	19.0%

6.2. Demographic characteristics

6.2.1. Household demographics

The regions vary in household characteristics, as shown in Table 6-2 and Table 6-3. The regional centre has the highest proportion of single-person households, apartments and renters, while rural areas have more multi-person households and single detached homes. Table 6-4 shows how household incomes vary by region. The regional centre has greater proportion of low-income households, while rural areas have more high-income households.

Table 6-2. Distribution of household size by region

	Average	1	2	3	4	5+
All HRM	2.7	17.0%	38.5%	18.1%	18.5%	7.9%
Regional Centre	2.4	26.7%	37.4%	15.4%	14.7%	5.8%
Suburban	2.7	15.1%	40.3%	18.5%	16.8%	9.3%
Rural	3.0	5.9%	35.7%	21.2%	28.9%	8.3%

Table 6-3. Distribution of dwelling type and ownership status by region

	Dwelling type				Ownership status		
	Single detached	Semi-detached /row	Apartment	Other	Owner	Renter	Other
All HRM	70.0%	10.1%	17.1%	2.7%	77.7%	19.9%	2.5%
Regional Centre	58.6%	9.4%	28.7%	3.2%	63.7%	33.7%	2.7%
Suburban	68.9%	13.1%	15.1%	2.9%	80.9%	17.1%	1.9%
Rural	94.0%	2.4%	2.0%	1.7%	94.4%	2.6%	3.0%

Table 6-4. Distribution of gross household income by region

	< $15k	$15k-$24k	$25k-$34k	$35k-$49k	$50k-$74k	$75k-$99k	$100k-$149k	$150k-$199k	≥ $200k
All HRM	3.0%	4.8%	6.2%	10.2%	17.0%	17.6%	23.2%	10.9%	7.1%
Regional Centre	5.8%	6.6%	7.4%	12.0%	15.3%	16.0%	19.2%	10.2%	7.5%
Suburban	2.5%	4.3%	6.6%	10.1%	16.9%	19.6%	23.2%	10.8%	5.9%
Rural	0.2%	2.2%	3.2%	8.2%	17.3%	16.0%	29.3%	13.3%	10.4%

6.2.2. Individual demographics

The distribution of ages across the three regions is shown in Table 6-5. Suburban areas have a higher proportion of children under 15, whereas the regional centre has a higher proportion of individuals above age 65.

Table 6-5. Distribution of ages of HRM residents by region

	0 - 14	15 - 24	25 - 34	35 - 44	45 - 54	55 - 64	65 - 74	75 - 84	85+
All HRM	15.0%	13.0%	14.3%	13.0%	15.0%	14.1%	9.4%	4.4%	1.8%
Regional Centre	12.3%	12.8%	16.4%	10.7%	14.3%	13.9%	11.0%	5.7%	3.0%
Suburban	17.2%	12.3%	14.1%	13.5%	13.5%	13.8%	9.3%	4.8%	1.5%
Rural	12.8%	16.3%	10.2%	14.9%	20.9%	14.7%	7.6%	1.9%	0.6%

Table 6-6 shows how HRM residents' level of education is distributed for each region. The regional centre has a higher proportion of university-educated residents and a lower portion of individuals with trades certificates than suburban and rural regions.

Table 6-6. Level of education of HRM residents by region

	No certificate	High school	Trades certificate	College diploma	Some university	University degree	Not applicable
All HRM	11.5%	19.1%	4.7%	16.1%	3.5%	37.0%	8.1%
Regional Centre	8.8%	15.2%	2.7%	12.7%	3.2%	49.7%	7.7%
Suburban	13.2%	19.9%	5.0%	17.2%	3.5%	32.8%	8.3%
Rural	10.1%	22.9%	7.0%	17.3%	2.9%	31.0%	8.8%

The distribution of employment levels is somewhat similar across the regions of HRM, as shown in Table 6-7. The regional center, suburbs and rural areas have 40.6%, 45.5% and 49.1% full-time employees respectively. The regional centre has more retirees than other regions, and a slightly higher proportion of students.

Table 6-7. Level of employment of HRM residents by region

	Full-time	Part-time	Retired	Student	Unemployed	Other
All HRM	44.8%	9.9%	22.3%	12.6%	4.1%	6.3%
Regional Centre	40.6%	10.5%	25.4%	14.1%	3.8%	5.6%
Suburban	45.5%	10.2%	21.5%	12.5%	4.5%	5.9%
Rural	49.1%	8.5%	18.6%	12.0%	2.9%	9.0%

6.3. Mobility tool ownership

The survey shows a variance in access to mobility tools by region. In rural areas, 95.3% of individuals age 16 or above have a drivers' licence, while in the regional centre the rate is 80.9%. Respondents from the regional centre are substantially more likely to own a monthly transit pass than those from more rural areas, as seen in Table 6-8.

Table 6-8. Individual drivers' licence and transit pass ownership by region

	Drivers' Licence (all ages)	Drivers' Licence (age 16+)	Monthly Transit Pass
All HRM	73.0%	87.1%	8.5%
Regional Centre	70.4%	80.9%	13.7%
Suburban	72.2%	88.0%	7.3%
Rural	79.9%	95.3%	4.7%

6.3.1. Vehicle ownership

Rural areas have higher vehicle ownership per household than urban areas, as shown in Figure 6-4. On average, households in the regional centre own 1.2 vehicles while those in rural areas own 2.1 vehicles.

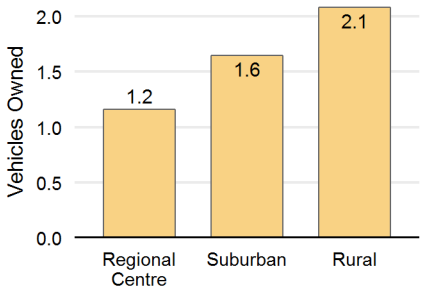

Figure 6-4. Average household vehicles owned by region

The distributions for each region of the number of vehicles owned by households is shown in Table 6-9. Almost one in five (19.6%) households in the regional centre do not own a vehicle, while no respondents from rural areas do not own a vehicle.

Table 6-9. Distribution of household vehicles owned by region

	Average	0	1	2	3	4+
All HRM	1.6	9.2%	38.3%	40.9%	9.6%	2.1%
Regional Centre	1.2	19.6%	50.1%	26.5%	3.2%	0.5%
Suburban	1.6	6.4%	37.5%	43.8%	9.8%	2.5%
Rural	2.1	0.0%	18.4%	58.7%	19.8%	3.2%

Table 6-10 displays the distributions of vehicle classes owned by households situated in each region of HRM. Residents of the regional centre and suburbs have similar ownership patterns, while rural residents are more likely to own trucks and less likely to own small cars.

Table 6-10. Distribution of vehicle classes owned by households by region

	Subcompact	Compact	Midsize	SUV	Truck/van	Motorcycle
All HRM	8.1%	34.9%	11.0%	31.5%	13.3%	1.2%
Regional Centre	9.1%	36.2%	12.1%	31.9%	9.1%	1.5%
Suburban	8.3%	36.8%	11.0%	31.3%	11.3%	1.2%
Rural	6.6%	29.7%	10.2%	31.2%	21.2%	1.1%

The distributions for each region of the manufacturing year of vehicles owned by HRM households are shown in Table 6-11. Suburban residents are slightly more likely to own vehicles made since 2010, whereas rural households are somewhat more likely to own vehicles built before 2005.

Table 6-11. Year of manufacture for vehicles owned by households by region

	Pre-2000	2000-04	2005-09	2010-14	2015-19
All HRM	1.6%	5.3%	21.2%	40.2%	31.7%
Regional Centre	1.5%	6.6%	22.7%	38.4%	30.7%
Suburban	1.3%	3.7%	19.7%	42.2%	33.1%
Rural	2.4%	8.3%	21.1%	37.9%	30.3%

6.3.2. Bicycle ownership

Table 6-12 shows the distributions of number of bicycles owned per household for the three regions. Suburban households are the most likely not to own any bicycles, while those in the regional centre are the most likely to own one bicycle.

Table 6-12. Distribution of household bicycles owned by region

	Average	0	1	2	3	4+
All HRM	0.9	61.2%	13.8%	12.3%	5.0%	7.7%
Regional Centre	0.9	59.7%	17.1%	10.8%	4.3%	8.1%
Suburban	0.8	64.0%	12.7%	11.2%	5.2%	6.9%
Rural	1.1	54.4%	12.1%	17.7%	6.2%	9.7%

6.4. Trip rates

There is not much difference in trip rates by region. Residents of rural areas take slightly fewer trips per day on average than residents in suburban areas or the regional centre, as shown in Figure 6-5.

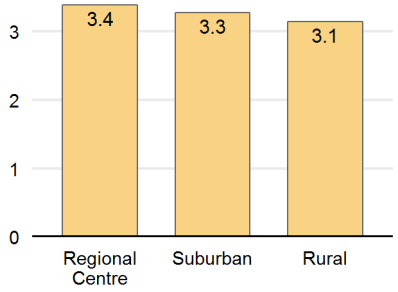

Figure 6-5. Average daily trips per capita by region

6.4.1. Trip rates by purpose

Regions exhibit very similar rates of trips by each purpose, as seen in in Table 6-13. Residents of the regional centre take slightly more trips between home and places that are not work, school or shopping, which could include sections of multi-part trips such as walking to a bus stop.

Table 6-13. Daily average trips per capita by region

	All trips	Home-based work	Home-based school	Home-based shopping	Home-based other	Non home-based
All HRM	3.3	0.5	0.2	0.3	1.1	0.8
Regional Centre	3.4	0.5	0.2	0.3	1.2	0.8
Suburban	3.3	0.5	0.2	0.4	1.1	0.8
Rural	3.1	0.6	0.2	0.3	1.0	0.8

The distribution of trip purposes for each region is shown in Table 6-14.

Table 6-14. Distribution of trip purposes by region

	Home-based work	Home-based school	Home-based shopping	Home-based other	Non home-based
All HRM	17.3%	6.6%	11.5%	36.7%	27.9%
Regional Centre	16.8%	7.9%	10.9%	39.0%	25.3%
Suburban	16.4%	5.8%	12.3%	36.5%	29.0%
Rural	20.0%	7.2%	10.3%	34.1%	28.4%

6.4.2. Trip rates by age

The average number of trips per day by age cohort is shown in Table 6-15, calculated by region.

Table 6-15. Average number of trips per day by age and region

	0 - 14	15 - 24	25 - 34	35 - 44	45 - 54	55 - 64	65 - 74	75 - 84	85+
All HRM	2.7	2.7	3.4	4.1	3.9	3.6	3.4	2.7	1.7
Regional Centre	2.8	3.1	3.7	3.6	4.3	3.9	3.5	2.5	1.3
Suburban	2.5	2.7	3.4	4.2	4.1	3.5	3.3	2.9	2.2
Rural	3.3	2.4	2.8	4.7	3.1	3.1	3.2	1.8	1.6

6.5. Mode share

Mode share differs significantly by region. Figure 6-6 shows that auto trips (driver and passenger) make up 58.1% of trips in the regional centre, whereas in rural areas 87.0% of all trips are made by auto.

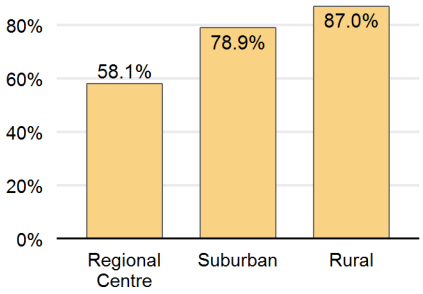

Figure 6-6. Proportion of all trips made by auto by region

The distribution of modes for all trips in each region is displayed in Table 6-16. In the regional centre, over 30% of trips are made by active modes—26.1% by walking and 4.6% by cycling. Active transportation is used less in suburban and especially rural areas, where distances to travel are greater. Transit use also drops significantly from suburban to rural areas, potentially due to lower levels of transit service outside the Urban Transit Service Boundary and the low density of rural areas.

Table 6-16. Trip mode share by region

	Auto	Transit	Walking	Bicycling	Other
All HRM	74.4%	6.0%	14.4%	1.6%	3.5%
Regional Centre	58.1%	8.3%	26.1%	4.6%	3.0%
Suburban	78.9%	6.2%	11.3%	0.6%	3.0%
Rural	87.0%	1.8%	4.9%	0.2%	6.0%

6.5.1. Mode share by purpose

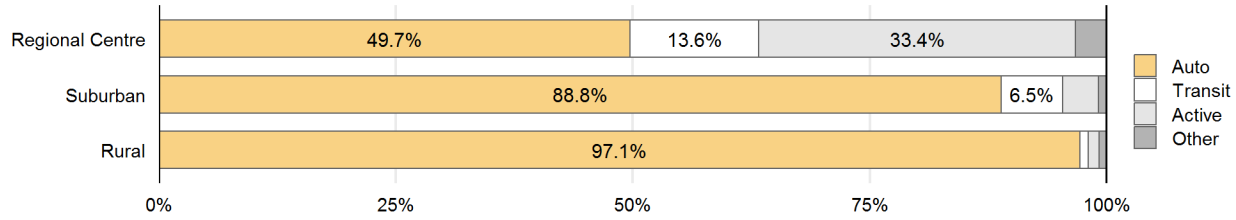

Figure 6-7. Commuting (home-based work) mode share by region

The regions within HRM also show different mode-share patterns for trips by purpose, in some cases dramatically so. Figure 6-7 shows that, while less than half (49.7%) of commute trips for regional centre residents are made by auto, 97.1% of rural residents' commute trips are made by auto. Table 6-17 also shows the modal split for commuting trips in each region.

Table 6-17. Mode share for home-based work trips by region

	Auto	Transit	Walking	Bicycling	Other
All HRM	79.9%	7.2%	8.2%	3.1%	1.5%
Regional Centre	49.7%	13.6%	23.9%	9.5%	3.3%
Suburban	88.8%	6.5%	3.0%	0.8%	0.9%
Rural	97.1%	0.9%	0.8%	0.3%	0.8%

Trips between home and school show a varied mode split by region as well, shown in Table 6-18. Many home-based school trips, potentially by university students, are done by walking in the regional centre (42.7%), while in rural areas most students travel by auto or other modes such as school bus. These trips include grade school and college/university students.

Table 6-18. Mode share for home-based school trips by region

	Auto	Transit	Walking	Bicycling	Other
All HRM	37.7%	7.2%	28.0%	3.2%	24.0%
Regional Centre	31.5%	11.2%	42.7%	8.2%	6.4%
Suburban	37.6%	6.5%	27.6%	0.9%	27.5%
Rural	47.9%	2.4%	5.1%	0.0%	44.6%

The next three tables break down other types of trips by region. The pattern for non-work or school trips is similar to the pattern observed in overall mode share. Residents of the regional centre are more likely to make trips by walking, while suburban and especially rural residents are more likely to make trips by auto. For example, home-based shopping trips are made by auto 73.7% of the time by regional centre residents, 90.0% of the time by suburban residents and 99.5% of the time by those who live in rural areas.

Table 6-19. Mode share for home-based shopping trips by region

	Auto	Transit	Walking	Bicycling	Other
All HRM	87.3%	1.6%	9.4%	0.7%	1.0%
Regional Centre	73.7%	3.2%	19.8%	1.7%	1.5%
Suburban	90.0%	1.3%	7.2%	0.4%	1.1%
Rural	99.5%	0.0%	0.2%	0.3%	0.0%

Table 6-20. Mode share for home-based other trips by region

	Auto	Transit	Walking	Bicycling	Other
All HRM	78.1%	2.7%	15.5%	1.6%	2.0%
Regional Centre	66.6%	4.0%	23.1%	4.4%	1.8%
Suburban	81.2%	2.6%	14.0%	0.5%	1.7%
Rural	88.3%	0.9%	7.3%	0.2%	3.4%

Table 6-21. Mode share for non home-based trips by region

	Auto	Transit	Walking	Bicycling	Other
All HRM	69.3%	10.6%	16.4%	0.8%	3.0%
Regional Centre	53.0%	11.5%	29.7%	2.4%	3.4%
Suburban	71.5%	12.5%	13.8%	0.3%	1.9%
Rural	84.1%	3.9%	6.4%	0.2%	5.4%

6.6. Travel distance

On average, residents of the regional centre travel the shortest distance over the course of a day, while rural residents tend to cover the longest daily distances, as seen in Figure 6-8. The difference is almost entirely made up by the average distance travelled by vehicle, displayed in Figure 6-9. Table 6-22 shows the breakdown of average distance travelled per day for vehicle, active and transit modes.

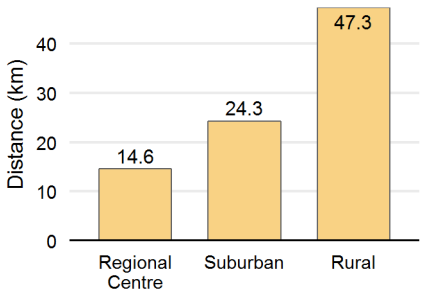

Figure 6-8. Average total travel distance per capita for all modes by region

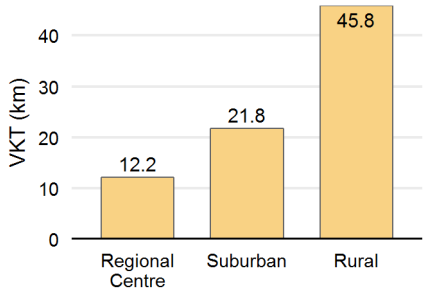

Figure 6-9. Average distance travelled by vehicle (VKT) per capita by region

Table 6-22. Daily average distance travelled (kilometres) per capita by region

	All modes	Auto	Transit	Active
All HRM	25.5	23.3	1.2	0.6
Regional Centre	14.6	12.2	1.1	1.2
Suburban	24.3	21.8	1.6	0.5
Rural	47.3	45.8	0.4	0.1

6.6.1. Trip distance by purpose

Trips for all purposes tend to be several times longer in rural areas than the suburbs or the regional centre, as seen in Table 6-23. The average commuting trip is 4.9 km in the regional centre, 11.9 km in suburban areas and 24.1 km in rural areas.

Table 6-23. Average trip distance (kilometres) by purpose and region

	Home-based work	Home-based school	Home-based shopping	Home-based other	Non home-based
All HRM	12.7	6.3	6.8	9.3	8.7
Regional Centre	4.9	2.3	3.4	5.0	7.1
Suburban	11.9	5.4	6.0	9.2	7.9
Rural	24.1	15.2	14.4	16.9	12.9

6.6.2. Trip distance by mode

As expected, auto and transit trips tend to be longer in rural and suburban areas than in the regional centre, as shown in Table 6-24. The average auto trip is 7.2 km in the regional centre and 18.2 km in rural areas. The same is not true of walking trips, which have a shorter average length in rural areas than other regions. It is possible that the lack of congestion and availability of parking in rural areas make driving an attractive choice even for moderately short trips, meaning that shorter trips make up a greater portion of walking trips in those areas.

Table 6-24. Average trip distance (kilometres) by mode and region

	Auto	Transit	Walking	Bicycling	Other
All HRM	11.1	7.6	1.0	3.3	6.6
Regional Centre	7.2	5.0	1.0	2.8	3.2
Suburban	9.8	9.1	1.1	5.1	7.1
Rural	18.2	11.5	0.6	*	7.4

* Not enough data

6.7. Travel time

Rural residents of HRM spend more time travelling per day than those who live in the suburbs or the regional centre (see Figure 6-10). The regional differences in travel time are not as pronounced as seen in daily travel distance, since urban residents travel more often by slower modes such as walking and may face generally slower driving conditions.

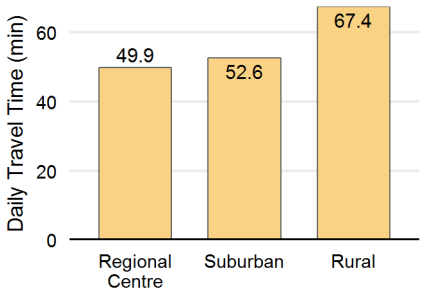

Figure 6-10. Average daily travel time by all modes by region

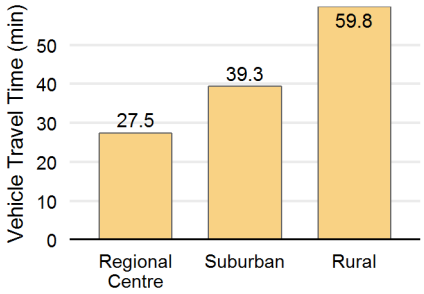

Figure 6-11. Average daily travel time in a vehicle by region

Figure 6-11 and Table 6-25 show the average time individuals in each region travel by vehicle, active transportation and transit per day. On average, regional centre residents spend 27.5 minutes in a vehicle per day, while rural residents spend nearly an hour (59.8 minutes) in a vehicle per day.

Table 6-25. Daily average time travelled (minutes) per capita by region

	All modes	Auto	Transit	Active
All HRM	53.7	39.2	5.1	6.3
Regional Centre	49.9	27.5	6.1	13.4
Suburban	52.6	39.3	6.0	4.5
Rural	67.4	59.8	1.9	1.8

6.7.1. Travel time by purpose

Average durations for trips of different purposes show similar patterns, seen in Table 6-26. Trips taken in the regional centre take the least time on average, while rural trips tend to be the longest.

Table 6-26. Average travel time (minutes) by purpose and region

	Home-based work	Home-based school	Home-based shopping	Home-based other	Non home-based
All HRM	26.3	20.1	14.9	17.8	17.9
Regional Centre	21.9	17.8	13.6	15.7	18.0
Suburban	25.5	20.1	14.2	17.7	17.4
Rural	33.6	23.9	18.9	21.6	19.2

6.7.2. Travel time by mode

Like trip distances, Table 6-27 shows that average durations for auto and transit modes are highest in rural areas and that average durations for walking trips are lower in rural areas than the regional centre.

Table 6-27. Average travel time (minutes) by mode and region

	Auto	Transit	Walking	Bicycling	Other
All HRM	18.8	31.8	13.6	17.5	28.9
Regional Centre	16.2	27.2	15.1	15.5	35.8
Suburban	17.8	34.2	12.0	27.5	31.6
Rural	23.9	37.1	11.8	*	19.9

* Not enough data

6.8. Travel accompaniment

As shown in Table 6-28, the regions are fairly similar to each other with regards to solo and joint travel. Residents of the regional centre are less likely to travel with children, likely since they are less likely to have children as discussed above. However, they are more likely to travel with friends.

Table 6-28. Distribution of trip accompaniment by region

	Alone	Partner	Child	Relative	Co-worker	Friend	Other
All	58.7%	11.1%	7.4%	14.1%	1.9%	5.2%	1.5%
Regional Centre	62.1%	11.2%	5.8%	10.9%	1.9%	7.3%	0.8%
Suburban	56.5%	11.2%	7.4%	16.1%	2.2%	4.6%	2.0%
Rural	59.9%	10.2%	10.2%	13.6%	1.3%	3.7%	1.2%

6.9. Travel behaviour by time of day

Trip start times for residents of all three regions show a similar pattern, with a peak in both morning (6am to 9am) and afternoon (3pm to 6pm), as seen in Figure 6-12.

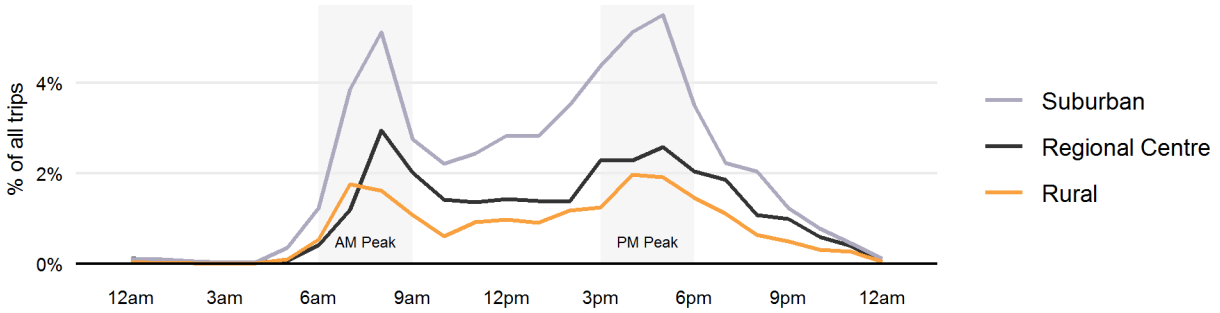

Figure 6-12. Distribution of trips by start time and region

Table 6-29 shows the proportion of trips made by residents of each region which start in each time period. Suburban residents make more of their trips during the day and relatively fewer during the evening compared to residents of both the regional centre and rural areas.

Table 6-29. Distribution of trip start times by region

	AM peak (6-9am)	Midday (9am-3pm)	PM peak (3-6pm)	Evening (6pm-12am)	Overnight (12-6am)
All HRM	20.8%	30.7%	27.5%	19.6%	1.4%
Regional Centre	19.2%	30.6%	25.6%	23.2%	1.3%
Suburban	21.4%	31.0%	28.6%	17.4%	1.6%
Rural	21.4%	30.0%	27.4%	20.2%	1.0%

6.10. Auto travel

6.10.1. Vehicle choice

Table 6-30 and Table 6-31 report the distribution of vehicle classes and years of manufacture used for auto trips made by residents of each region.

Table 6-30. Distributions of vehicle classes used for vehicle trips by region

	Subcompact	Compact	Midsize	SUV	Truck/van	Motorcycle
All HRM	7.2%	33.5%	10.2%	36.2%	12.8%	0.2%
Regional Centre	9.5%	35.4%	11.8%	37.2%	6.1%	0.1%
Suburban	7.0%	34.7%	10.6%	36.1%	11.4%	0.2%
Rural	5.2%	28.5%	7.7%	35.3%	23.1%	0.3%

Table 6-31. Distributions of year of manufacture for vehicles used for vehicle trips by region

	Pre-2000	2000-04	2005-09	2010-14	2015-19
All HRM	0.4%	2.3%	18.8%	40.8%	37.7%
Regional Centre	0.5%	4.8%	22.5%	36.1%	36.0%
Suburban	0.4%	1.2%	17.4%	43.0%	38.0%
Rural	0.6%	2.6%	17.9%	39.9%	39.1%

6.10.2. Vehicle occupancy

As shown in Table 6-32, residents of the regional centre have the highest vehicle occupancy rates. Suburban and rural residents generally take vehicle trips with fewer occupants. See Section 5.9.2 for a discussion of occupancy indices.

Table 6-32. Vehicle occupancy indices by region

	Occupancy index (trip-based)	Occupancy index (distance-based)
All HRM	1.41	1.41
Regional Centre	1.47	1.59
Suburban	1.42	1.40
Rural	1.35	1.36

6.11. Attitudes and preferences

There are some differences in attitudes toward transportation across urban, suburban and rural HRM, which are shown in Table 6-33. People who live in the regional centre are more likely to have favourable attitudes towards transit and be less invested in driving than suburban and rural residents. 21.0% of regional centre residents feel happier riding a bus than driving, compared to only 7.7% of rural residents, whereas 74.3% of those in rural areas take pride in owning a car as opposed to 41.0% of those in the regional centre. However, the rural-urban divide was not seen across all questions. Residents of all regions are about as likely to enjoy riding a bicycle, be satisfied with their commute, be happy with where they live, and invest time in their community.

Table 6-33. Percent of respondents by region who agree or strongly agree with statement

	All HRM	Regional Centre	Suburban	Rural
I enjoy riding a bicycle	47.0%	48.2%	44.8%	52.5%
I prefer walking to driving whenever possible	57.6%	64.3%	54.3%	53.6%
I feel happier when riding the bus than driving	14.1%	21.0%	12.0%	7.7%
I take pride in owning a car	59.2%	41.0%	64.9%	74.3%
Driving provides me freedom	84.0%	71.6%	87.3%	96.8%
I am fully satisfied with my commute	61.5%	62.7%	61.0%	59.6%
My commute makes me feel stressed	18.0%	11.3%	19.6%	25.1%
I am happy with where I live	90.3%	91.6%	89.8%	90.3%
I invest a lot of time into my community	46.4%	46.2%	46.3%	48.6%
A suburban env. offers the best quality of life	47.1%	29.0%	51.3%	63.4%
I limit my driving because it's bad for air quality	26.0%	32.9%	22.0%	25.9%

7. Conclusion

The Halifax Household Travel Activity Study 2018 collected information on how HRM residents travel to better understand and improve the region's transportation systems. Comprising a random sample of 2,333 households and 4,159 people, the results of the survey can be generalized to the population of HRM. The study serves as a benchmark for travel behaviour as the municipality starts to implement its Integrated Mobility Plan (IMP), which aims to move the region toward active and transit modes. The 2014 HRM Regional Plan set the target that by 2031, at least 30% of trips will be made by walking, bicycling or transit, while no more than 70% will be made by private vehicle. This study will help develop strategies to achieve those goals by targeting appropriate trip markets, socio-demographic groups and regions for priority investments.

The study provides key insights on travel behaviour within HRM. On average, households in the region own 1.6 vehicles. Residents make 3.3 trips per day on average, of which 74.4% are made by auto. The average daily distance travelled by an HRM resident is 25.5 km, of which 23.3 km are in an auto. 58.7% of trips in the region are made by individuals travelling alone. Much of the information provided by the survey, such as data on different types of trips (work, school, shopping, etc.), was not previously available for HRM.

The survey data also provides insights into travel behaviour for regions within HRM. This report looked at three areas of interest: the regional centre, the suburbs and rural areas. Unsurprisingly, vehicle ownership and use are highest in rural areas and lowest in the regional centre. Indeed, the average rural household owns 2.1 vehicles and makes 87.0% of trips by auto, while the average household in the regional centre owns 1.2 vehicles and makes 58.1% of trips by auto. In the regional centre, 8.3% of all trips by residents are taken by transit, 26.1% are made by walking, and 4.6% by cycling. Understanding the differences in how residents travel across HRM will help the municipality target transportation policies and investments to fit urban, suburban or rural travel patterns.

The inclusion of data on HRM residents' attitudes toward travel modes and lifestyle preferences provides a look at what may be possible for transportation in the region, not just what exists now. For example, 57.6% of residents prefer walking to driving and 47.0% enjoy cycling. The preference for active modes over driving is highest in the regional centre, which is relatively walkable and has shorter travel distances, but also exists in the suburbs and rural areas. Improving transit service and bicycle infrastructure and creating built environments conducive to walking could expose latent demand for these modes, reducing dependency on driving.

This study provides useful insights for evidence-based transportation policy making in HRM. The information contained in this report will be used as the knowledge base on which informed decisions can be made. In particular, many of the statistics reported here can be used in IMP metrics, establishing baseline values to measure against when evaluating the success of that plan. The municipality therefore should follow up on this study with future travel behaviour surveys to gauge progress and provide evidence to guide future policy.

The data DalTRAC has collected will have many uses beyond this report. In this phase, we have primarily explored travel behaviour for the region; further statistical analysis is necessary to examine the relationships between travel behaviour and associated factors. The data will therefore contribute to DalTRAC researchers and student research projects, each of which will also provide value to HRM in exploring and explaining causal relationships and further insights of travel behaviour in the region. The inclusion of health data and attitudes/lifestyle preferences may provide especially interesting avenues for future research. The dataset may also enable analysis of different trip market segments and demographic groups such as elderly populations. Furthermore, this survey provides valuable datasets for developing transportation network models for the Halifax Regional Municipality.

Through this project, DalTRAC has also built a survey tool and data collection infrastructure which can be leveraged for future studies. The web survey instrument, which served as the core of the survey process, was designed to offer the flexibility to conduct future surveys, with questions modified or added as appropriate. Ultimately, DalTRAC hopes that the 2018 project will be the start of an ongoing partnership between HRM and Dalhousie University to establish a regular data collection program for the region's travel behaviour.

7.1. Lessons learned

From the 2018 Halifax Household Travel Activity Study, the lessons learned for future travel surveys are as follows:

1. We found that including an official letter from the Mayor in the survey invitation package helped to increase credibility and demonstrate the usefulness of the survey for practical transportation planning purposes. Future surveys should include a letter from a government leader encouraging recipients to participate.

2. An issue unique to our sample was the overrepresentation of senior citizens compared to working-age and youth cohorts. While this can be addressed by sample weighting as we did, future survey projects should also reach out more to younger age groups. Such a strategy could include substantial paid advertising on social media and/or targeted campaigns to underrepresented groups as the survey progresses.

3. We expected a higher level of direct web entry for the survey but found that most responses instead came through telephone or mail-in surveys. As direct web entry is the most cost-effective survey instrument, future surveys should aim to develop a comprehensive strategy for a Computer Assisted Web Interviewing (CAWI) approach. One possible path could be launching a continuous survey program in which anyone can participate that runs for an extended period (e.g. one to two years) and relies solely on CAWI, supported by an extensive social media campaign. Such a continuous survey could yield a large number of completions, offsetting the need for expensive random sampling-based mail-out surveys. Another method could be random sampling from email addresses, if reliable email lists can be procured from commercial vendors.

4. Our experience with telephone interviews has convinced us that they are expensive but effective. Conducting a large-scale telephone interview survey requires professional interviewers using CATI software, with a proper understanding of how to complete the survey. If a comprehensive survey is desired in a five year or ten year interval, the studies should include telephone interviewing to collect travel behaviour data until proven alternatives are available.

7.2. Recommendations

This study recommends that HRM should undertake regular travel surveys, either at five- or two-year intervals. A five-year survey should take a more comprehensive sampling and data collection approach similar to that employed in the 2018 study. Two-year (or annual) surveys may take a continuous, open-to-all survey approach, leveraging the CAWI tool to reduce the cost of the survey. A 2020 travel survey will be beneficial to compare against the 2018 survey results, which will track progress made through the implementation of the Integrated Mobility Plan. Regardless, dedicated efforts in data collection and evidence-based decision-making are essential to achieve the transportation targets of the 2014 Regional Plan. The 2018 HRM Travel Activity Study provides a benchmark for the region. Regular surveys will help in tracking progress periodically and increase residents' familiarity with travel surveys, yielding better quality data useful for transportation planning and network modelling purposes.

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