# CURRENT STATE OF WEB-BASED SURVEY METHODS

## Appendices

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## Table of Contents

# APPENDIX A: ANNOTATED BIBLIOGRAPHY

**INTRODUCTION:**

This annotated bibliography outlines and summarizes the literature that was reviewed in preparation of the technical report regarding web-based surveys. Each entry contains 8 sections: the title and author(s) of each article, the citation for the article, "tags" that correspond to one of the eight categories listed in the outline presented below, a summary of the article, the potential applications of the article's findings to the TTS 2.0 project, and the strengths and weaknesses of said findings.

**Web-based Survey Report Outline:**

1. Introduction
2. Sampling frame and response rates (TAGS: Sample Frame)
3. The current state of web surveys (TAGS: Comparison, Design, Case Study, State-of-the-Art)
4. Household vs. Individual surveys (TAGS: HH or Individual)
5. Potential for multi-day data collection (TAGS: Multi-day)
6. Empirical analysis of TTS data
7. Under-representation of Subgroups by Web Surveys (TAGS: Subgroups)
8. Recommendations for Pilot Testing

| | |
|---|---|
| *Title* | **A Human Factors and Survey Methodology-based Design of a Web-based Adverse Event Reporting System for Families** |
| *Author(s)* | J.P. Daniels, A.D. King, D.D. Cochrane, R. Carr, N.T. Shaw, J. Lim, J.M. Ansermino |
| *Citation* | Daniels, J.P., King, A.D., Cochrane, D.D., Carr, R., Shaw, N.T., Lim, J., Ansermino, M. (2010). A human factors and survey methodology-based design of a web-based adverse event reporting system for families. *International Journal of Medical Informatics*, 339-348. |
| *Tags* | Review, Design |
| *Summary* | The purpose of this study was to develop a web-based system (the Family Reporting System) to elicit adverse event reports from families of children admitted to hospital through survey methodology and human factors techniques. Respondents received no training prior to using the system, with a specific question being used to determine the category under which the adverse event fell. Responses were provided via drop-down menus, and parents were asked to compete the Lewis Computer System Usability Questionnaire once their children were discharged, in order to determine usability issues. The face validity and usability of the FRS were evaluated. |
| *Potential Applications* | • Outlines a method for usability testing, that could be applied to the final design of the TTS 2.0 survey |
| *Strengths* | • Provides a framework for usability and validity testing |
| *Weaknesses* | • Did not involve the surveying of a general population<br>• Not related to travel data |

| *Title* | **Activity Recognition for a Smartphone and Web-based Travel Survey** |
|---|---|
| *Author(s)* | Y. Kim, F. Pereira, F. Zhao, A. Ghorpade, P. Zegras, M. Ben-Akiva |
| *Citation* | Kim, Y., Pereira, F.C., Zhao, F., Ghorpade, A., Zegras, P.C., Ben-Akiva, M. (2014). Activity Recognition for a Smartphone and Web-based Travel Survey. *Pattern Recognition (ICPR), 2014 22nd International Conference on,* 432-437. |
| *Tags* | Design, State-of-the-Art, HH or Individual, Multi-day |
| *Summary* | This article describes the Future Mobility Survey, a smartphone-based travel survey that was developed and field tested in Singapore, which collected travel data for over 100 participants over multiple days. Activity and transportation information were collected through a smartphone app, and was validated through an interactive web-based validation process. The smartphone app utilized GPS, Wi-Fi communication systems, and the accelerometer on the smartphone to collect trip data. Stop and mode detection algorithms were run on the raw data and presented to users in the form of travel diaries. Each user had to collect travel data for 14 days, with a minimum of 5 days' worth of data having to be validated. Machine learning algorithms were used to improve the accuracy of the activity recognition. |
| *Potential Applications* | • The FMS is an example of a web-smartphone hybrid design that can be used to collect travel data over a multi-day period<br>• The TTS 2.0 survey could incorporate an app similar to that used in the FMS to collect travel data, and then validate it using a web interface |
| *Strengths* | • This article presents a framework of a survey design that could be applied to the Greater Golden Horseshoe |
| *Weaknesses* | • The neither representativeness of the sample nor the methods of recruiting participants are mentioned<br>• It is unclear how the data collected through the FMS is used |

| | |
|---|---|
| ***Title*** | **Adapting an Online Transit Journal Planner into a Low-cost Travel Survey Tool** |
| *Author(s)* | L. Schmitt, S. Harris, G. Currie |
| *Citation* | Schmitt, L., Harris, S., Currie, G. (2014). Adapting an Online Transit Journey Planner into a Low-Cost Travel Survey Tool. Transportation Research Record: Journal of the Transportation Research Board, 8-15. |
| *Tags* | Design, Case Study |
| *Summary* | This paper describes the experiences of the investigators during the development of an online survey tool in the Journey planner section of a Transit Passenger Information Website (TWIPS). The systems were developed in Melbourne and Victoria, AUS, which asked every fourth user of the Journey planner tool to take a follow-up survey after completing the trip for which the planner was used. First, a two-question poll of users to the side of the Journey planner appeared to the side of the Journey planner, after which users were invited to complete a follow-up survey regarding the trip that was planned using the Journey planner. If the poll was completed, the responses to the two questions, as well as the trip planned in the Journey planner itinerary were saved. |
| *Potential Applications* | • This poll is an example of a satellite survey that could be conducted on transit users to supplement data collected by the core survey |
| *Strengths* | • This type of survey allows transit riders to be contacted directly<br>• Allows transit trips to be captured |
| *Weaknesses* | • This type of survey would likely over-represent younger members of the population<br>• May only be able to capture a small portion of trips made by transit users |

| *Title* | **An Automated GPS-based Prompted Recall Survey with Learning Algorithms** |
|---|---|
| *Author(s)* | J. Auld, C. Williams, A. Mohammadian, P. Nelson |
| *Citation* | Auld, J., Williams, C., Mohammadian, A., Nelson, P. (2009). An Automated GPS-based Prompted Recall Survey with Learning Algorithms. *Transportation Letters: The International Journal of Transportation Research*, 59-79. |
| *Tags* | Design, State-of-the-Art, HH or Individual |
| *Summary* | This article documents the recent developments in the field of GPS travel surveying and the ways in which GPS technology have been incorporated into household travel survey methods. GPS technology has the potential to collect more accurate travel data, while using trip characteristics to deduce travel purposes. Automated data collection allows cleaning and validation to occur without manual input, and eliminates the possibility of data entry errors. |
| *Potential Applications* | • The information contained in this article can be used to guide a pilot study in which travel data is collected by handheld GPS devices or by smartphone apps |
| *Strengths* | • The algorithms used in this paper were able to collect data regarding and produce information on trips that were made by the participants of the study<br>• A similar algorithm could be applied to data collected in the TTS, with validation conditions adjusted for use in the GGH |
| *Weaknesses* | • The algorithms used by the investigators are still not perfect, and require an iterative approach to yield high-quality data |

| *Title* | **Applying Web-based Survey Design Standards** |
|---|---|
| *Author(s)* | S. Crawford, S.E. McCabe, D. Pope |
| *Citation* | Crawford, S., McCabe, S.E., Pope, D. (2005). Applying Web-based Survey Design Standards. *Journal of Prevention and Intervention in the Community*, 43-66. |
| *Tags* | Review, Design |
| *Summary* | This article proposes and illustrates several web-based survey design standards developed by researchers based on projects involving web surveys. When designing what is presented to respondents, care must be taken when decisions regarding general screen design, test, question presentation, respondent input/ response format, and survey navigation are made. |
| *Potential Applications* | The guidelines outline by this report can be used to guide a web or smartphone interface of the TTS questionnaire, in addition to providing insight on how the current CATI interface could be improved |
| *Strengths* | The guidelines are general enough that they should hold true when applied to the TTS questionnaire |
| *Weaknesses* | These guidelines do not directly pertain to travel surveys<br>The information is somewhat outdated |

| *Title* | **Characteristics of Web Based Surveys and Applications in Travel Research** |
|---|---|
| *Author(s)* | R. Alsnith |
| *Citation* | Alsnith, R. (2006). Characteristics of Web Based Surveys and Applications in Travel Research. *Travel Survey Methods. Quality and Future Directions*, 569-592. |
| *Tags* | Review, Design, Comparison, Sample Frame |
| *Summary* | This article discusses the different type of web surveys, factors that influence response rates, and issues associated with web-based travel surveys. Alsnith compares the characteristics of web surveys with those of more traditional survey methods, and touches on challenges when carrying out mixed-mode surveys. He concludes by outlining basic design principles and discussing methods to increase response rates. |
| *Potential Applications* | The principles outlined in this paper can guide the design of a web-based TTS questionnaire |
| *Strengths* | The contents of this paper pertain directly to the use of web applications in travel research |
| *Weaknesses* | Does not outline a method for conducting a travel survey exclusively via web applications, rather Alsnith argues that web applications should be used as part of a mixed-mode survey |

| *Title* | **Combining Web and Face-to-face in Travel Surveys: Comparability Challenges?** |
|---|---|
| *Author(s)* | C. Bayart, P. Bonnel |
| *Citation* | Bayart, C., Bonnel, P. (2012). Combining Web and Face-to-face in Travel Surveys: Comparability Challenges?. *Transportation*, 1147-1171. |
| *Tags* | Design, Comparison, Case Study |
| *Summary* | This paper compares the travel behaviours of web survey respondents to those of respondents to face-to-face surveys, with the goal of the study being to compare the aggregate data from the web-based and face-to-face samples. The study tried to compare the effect of socioeconomic differences between the internet respondents and the standard respondents, the effect of any differences in travel between internet and face-to-face respondents, and the effect of said differences. The authors express their doubts that a web-based survey could be used to survey an entire population with the goal of collecting representative data, due to issues with the sampling frame. The authors note that web respondents tend to omit shorter trips, and have higher disposable incomes, be more likely to own a car, and possess a higher level of education than face-to-face survey respondents. |
| *Potential Applications* | The results of this study could be used to try and reduce instrument bias<br>The finding of this study could be used to help guide the TTS 2.0 design |
| *Strengths* | The comparative nature of this study allows parallels to be made in relation to the design of the TTS, which may allow for conclusions to be drawn |
| *Weaknesses* | The conclusions drawn from this study mainly apply to a face-to-face context, thus they may be less applicable to telephone surveys |

| *Title* | **Comparing a Cell Phone Survey and a Web Survey of University Students** |
|---|---|
| *Author(s)* | Y. Woo, S. Kim, M.P. Couper |
| *Citation* | Woo, Y., Kim, S., Couper, M.P. (2014). Comparing a Cell Phone Survey and a Web Survey of University Students. *Social Science Computer Review*, 399-410. |
| *Tags* | Design, Comparison, Case Study |
| *Summary* | This paper discusses of an experiment conducted using an annual survey of university students at a large university in South Korea, with a sample frame that included both cellphone numbers and email addresses. A sample of 1000 students was selected, with 500 students being assigned complete the survey via cellphone and web, respectively. The 2010 Dongguk University Time Use Survey (DUTUS) was used to compare the results of web and cellphone surveys. Up to six contacts are made by the investigators to survey participants. The authors attempted to quantify measurement error in the survey by comparing the responses provided by the participants with information that was available through university records. |
| *Potential Applications* | The results of this study could be used to try quantify measurement error<br><br>The design of this study could inform the design of a potential satellite survey of younger populations |
| *Strengths* | This paper details the administration of a survey that specifically targets university students |
| *Weaknesses* | The manner in which cellphones are utilized in this study does not fully utilize the features of smartphones |

| | |
|---|---|
| ***Title*** | **Comparing Survey Results Obtained via Mobile Devices and Computers: An Experiment with a Mobile Web Survey on a Heterogeneous Group of Mobile Devices Versus a Computer-Assisted Web Survey** |
| *Author(s)* | M. de Bruijne, A. Wijnant |
| *Citation* | de Bruijne, M., Wijnant, A. (2013). Comparing Survey Results Obtained via Mobile Devices and Computers: An Experiment with a Mobile Web Survey on a Heterogeneous Group of Mobile Devices Versus a Computer-Assisted Web Survey. *Social Science Computer Review*, 482-504. |
| *Tags* | Design, Comparison, Case Study, State-of-the-Art, Response Rates |
| *Summary* | This paper discusses a comparison between the results from a mobile device-assisted web survey and a computer-assisted web survey, in order to determine possible mode effects on answer behaviour. The authors found that perceived enjoyment, perceived trustworthiness, behavioural attitudes, and self-congruity are important factors in determining whether a person is willing to complete a mobile survey, while perceived usefulness, perceived costs, and perceived social pressures have little impact on participation. They also point out that maximum user-friendliness is essential for mobile surveys, in order to stimulate a willingness to participate and to motivate respondents to provide valid data throughout the questionnaire. Participants were to complete one of three surveys: computer-assisted, mobile device-assisted, and computer-assisted with the same layout as the mobile survey. The survey was administered to 661 members of the CentERpanel, with 379 samples being collected via the "correct" mode. |
| *Potential Applications* | This study provides insights regarding the design considerations that pertain to surveys conducted via mobile device<br><br>The results of this study can be used to guide the design of a mobile version of a web-based TTS |
| *Strengths* | This touches on a relatively new topic – web surveys that are completed on mobile devices |
| *Weaknesses* | The results of this survey may not be applicable to a general population, as the participants of this study fill out online surveys on a regular basis |

| *Title* | **Conducting Research on the Internet: Online Survey Design, Development, and Implementation Guidelines** |
|---|---|
| *Author(s)* | D. Andrews, B. Nonnecke, J. Preece |
| *Citation* | Andrews, D., Nonnecke, B., Preece, J. (2003). Conducting Research on the Internet: Online Survey Design, Development, and Implementation Guidelines. *International Journal of Human-Computer Interaction*, 185-210. |
| *Tags* | Design, Sample Frame, State-of-the-Art |
| *Summary* | This article discusses the distinct technological, demographic, and response rate characteristics that affect how electronic surveys should be designed, and how and where they should be implemented. The paper discusses guidelines that should be taken into account when designing of a web survey, such as that it should account for the fact that it will be viewed across multiple modes and browsers. The authors list *Cold Fusion, Survey Whiz, and Factor Whiz* as applications that have the potential to mitigate the challenges associated with using web surveys. The authors also discuss methods for improving response rates. |
| *Potential Applications* | The design principles outlined in this paper could guide the design of the TTS 2.0 web questionnaire<br><br>The applications listed in this paper can be investigated, and potentially utilized to implement a web survey |
| *Strengths* | The information is general enough that it can be applied to the design of TTS 2.0 |
| *Weaknesses* | The information is somewhat outdated<br><br>The guidelines are not specific to travel surveys |

| *Title* | **Deriving and Validating Trip Purposes and Travel Modes for Multi-day GPS-based Travel Surveys: A Large- Scale Application in the Netherlands** |
|---|---|
| *Author(s)* | W. Bohte, K. Maat |
| *Citation* | Bohte, W., Maat, K. (2009). Deriving and Validating Trip Purposes and Travel Modes for Multi-day GPS-based Travel Surveys: A Large- Scale Application in the Netherlands. *Transportation Research Part C 17*, 285-297. |
| *Tags* | Design, State-of-the-Art, HH or individual, Multi-day |
| *Summary* | Discusses a method that combines GPS logs, GIS technology, and an interactive web-based validation application to collect travel data. It was conducted in the Netherlands in 2007, where 1104 of the 1200 participants successfully completed the week-long survey. This project demonstrated that GPS technology could be used to collect reliable multi-day data. The goal of the project was to develop a method to collect data regarding trip modes, trip purpose, the location of origins and destinations, trip distances, times, and trip durations with minimal burden to the user. The validation tool utilized a map interface, with a corresponding table of trips that were made in a given day. The raw data was cleaned by applying a number of algorithms, and trip purposes were deduced using machine learning algorithms and GIS data. Modes were deduced with varying degrees of success, and more trips per tour were reported when GPS devices were used to collect data than were reported in the 2006 Dutch Travel Survey. |
| *Potential Applications* | The results of this study could help guide the implementation of a mixed smartphone-and-web survey design<br><br>The algorithms used to clean the data and the methods used to deduce trip purpose could be modified for application in the GGH<br><br>The results of this study and the subsequent validation of data against the 2006 DTS can be used to determine whether there was an instrument bias between web and landline surveys in the 2011 TTS |
| *Strengths* | This study touches on the collection of travel data on the individual level, however it does not mention the potential to aggregate the individual-level data into household-level data |
| *Weaknesses* | The results of the comparison between this study and the 2006 DTS may not be directly applicable to the TTS, depending on how the DTS was conducted<br><br>Handheld GPS devices do not have the same battery life issues that plague smartphones, and it is easier to extend the battery life of GPS devices |

| *Title* | **Design Effects in the Transition to Web-based Surveys** |
|---|---|
| *Author(s)* | D.A. Dillman, J.D. Smyth |
| *Citation* | Dillman, D.A., Smyth, J.D. (2007). Design Effects in the Transition to Web-based Surveys. *American Journal of Preventive Medicine*, S90-S96. |
| *Tags* | Review, Design |
| *Summary* | This paper focuses on measurement error and discusses how the use of a web survey affects the asking and answering of questions. The paper outlines several web-specific design considerations that must be taken into account, particularly pertaining to how responses vary depending on the instrument used. Dillman and Smyth go on to discuss how the arrangement of radio buttons, the creation of subgroups among response options, and the size of an answer box affect the nature of responses. |
| *Potential Applications* | The design considerations in this paper could potentially help guide the design of a web-based TTS questionnaire |
| *Strengths* | The design considerations that are outlined pertain to such basic elements of a survey that they would be applicable to the design of any questionnaire, including web |
| *Weaknesses* | The paper does not contain any considerations that pertain directly to travel surveys<br><br>The authors do not discuss considerations that pertain to the design and/ or wording of survey questions |

| *Title* | **Designing Inclusive Transport Surveys: Sampling Disadvantaged** |
|---|---|

**People**

| | |
|---|---|
| *Author(s)* | A. Delbosc, G. Currie |
| *Citation* | Delbosc, A., Currie, G. (2010). Designing Inclusive Transport Surveys: Samplig Disadvantaged People. *Australian Transport Research Forum 2010 Proceedings*. |
| *Tags* | Design, State-of-the-Art, Case Study, Subgroups |
| *Summary* | This paper investigates how travel surveys perform in covering socially disadvantaged groups as part of a major research program examining links between transport and disadvantage, social exclusion, and well-being in Victoria, Australia. A follow-up survey, using an existing household travel survey as a sample frame, was developed and utilized *snowballing* and *location sampling* in order to recruit participants. The authors identify five attribute that contribute to making a population to reach, and note that one's living conditions can lead to their exclusion from official sample frames. The authors partnered with agencies that offered services to socially disadvantaged populations in an attempt to directly contact said populations. The use of a prior travel survey as a sample frame, the long survey requirement, and the existence of an opt-in process were identified as factors that worked to restrict participation from a range of disadvantaged people. |
| *Potential Applications* | This study sheds light on populations that are "hidden" from the sample frame of the TTS as currently constructed<br><br>The methods used to contact members of so-called socially disadvantaged populations could potentially be applied by the TTS in a satellite survey |
| *Strengths* | This paper provides valuable insights regarding populations that have the potential to be missed by the TTS |
| *Weaknesses* | The methods for recruiting members of socially disadvantaged populations presented in this paper are unlikely to yield a representative sample of said populations |

| *Title* | **Development of a Global Positioning System Web-based Prompted Recall Solution for Longitudinal Travel Surveys** |
|---|---|
| *Author(s)* | S. Greaves, S. Fifer, R. Ellison, G. Germanos |
| *Citation* | Greaves, S., Ellison, R., Germanos, G. (2010). Development of a Global Positioning System Web-based Prompted Recall Solution for Longitudinal Travel Surveys. *Transportation Research Record: Journal of the Transportation Research Board*, 69-77. |
| *Tags* | Design, HH or Individual, State-of-the-Art, Case Study |
| *Summary* | This article describes the results of a study conducted by the University of Sydney, which details the development of a GPS collection method for a longitudinal (10 week) study of driver behaviour. GPS data was wirelessly transmitted on a regular basis in order to ensure its quality, as well as to provide a basis for a prompted recall survey, to be completed online. Passive GPS devices were installed and was activated, via the cigarette lighter, when the engine was turned on, with the devices being delivered face-to-face. Summary files were downloaded on a nightly basis, and the study found that highly accurate data can be collected in this manner, with little response burden. The online PR survey utilized a tabular format (aimed to be intuitive to use), was integrated with Google Earth (due to its short refresh time), and gave users the option to view their trips (as a means to jog their memories). Participants were given personalized URLs and survey managers had the ability to remind/ prompt participants if they had not logged on in a while. The majority of participants accessed the interface at least once per week, and in exit interviews, expressed that the use of the interface became part of their normal web browsing routine. |
| *Potential Applications* | The TTS 2.0 survey could be designed to emulate their methods<br><br>This study is an example of how the core of a survey that consists of multiple modes could be used to collect travel data over a multi-day period |
| *Strengths* | The authors found that high quality data could be collected for a 10 week period<br><br>GPS devices were able to collect data regarding driver behaviour |
| *Weaknesses* | Mode data was not collected, because GPS devices were mounted in the cars of participants |

| *Title* | **Exploratory Analysis of a Smartphone-based Travel Survey in Singapore** |
|---|---|
| *Author(s)* | F. Zhao, F.C. Pereira, R. Ball, Y. Kim, Y. Han, C. Zegras, M. Ben-Akiva |
| *Citation* | Zhao, F., Pereira, F.C., Ball, R., Kim, Y., Han, Y., Zegras, C., Ben-Akiva, M. (2015). Exploratory Analysis of a Smartphone-based Travel Survey in Singapore. Journal of the Transportation Research Board. |
| *Tags* | Design, Comparison, Case Study, State-of-the-Art, HH or individual |
| *Summary* | This paper presents the findings of the 2012/3 field test of the Future Mobility Survey in Singapore. The FMS utilizes GPS-based data collection to create travel and activity diaries. The FMS was field tested in Singapore in conjunction with its 2012 Household Interview Travel Survey; the field test recruited over 1500 users and produced a large set of travel/ activity data which was validated by respondents. The FMS system was comprised of a smartphone app through which data was collects, the server database where data was processed and learning algorithms applied, and the web interface that respondents used to validate travel data. Issues with traditional surveys include: the tendency of respondents to report a typical (simple) day, the underreporting of short activities, travel times are estimated for short trips, people tend to display large day-to-day variabilities in the trips that they make, and that survey participants round their travel times to the nearest 5 or 10 minutes. The most significant finding of this study was that large intra-user day-to-day variabilities in travel and activity patterns make the taking of a one-day snapshot inadequate for reflecting travel patterns. |
| *Potential Applications* | The findings of this study may provide a motivation to collect travel data via GPS or smartphones rather than through interviews<br><br>The methods used by respondents to validate travel data could be applied to the design of the TTS, specifically to validate travel data collected via smartphone |
| *Strengths* | This project has the potential to act as a guide of how to operate a hybrid-core version of the TTS<br><br>The article outlines common issues that pertain to traditional travel surveys |
| *Weaknesses* | The authors make no mention of how the data that was collected via the FMS will be used |

| *Title* | **Household Travel Surveys: Where are we Going?** |
|---|---|
| *Author(s)* | P.R. Stopher, S. Greaves |
| *Citation* | Stopher, P.R., Greaves, S.P. (2007). Household Travel Surveys: Where are we Going?. *Transportation Research Part A*, 367-381. |
| *Tags* | Design, State-of-the-Art |
| *Summary* | This paper reviews the current issues that plague traditional travel surveys, and discusses where the authors believe the field of travel surveys are headed. The authors discuss the issues associated with travel diaries completed over the phone – such as the under-reporting of trips and the tendency of respondents to round travel times. The authors then introduce the uses of data collected via travel survey, and discuss the data needs of emerging models, such as the reduction of traffic analysis zones and the desire for point-geocoded data. Data fusion techniques are also discusses, such as the use of Monte Carlo simulation techniques to generate travel data given demographic and location characteristics. |
| *Potential Applications* | The information presented in this paper could have an influence on the nature of questions asked in the survey, particularly to collect data that will be used in "newer" types of models |
| *Strengths* | This paper outlines issues that must be dealt with when conducting a travel survey such as the TTS |
| *Weaknesses* | The issues with travel diaries completed over the phone have been identified in other papers |

| *Title* | **Improving Response to Web and Mixed-mode Surveys** |
|---|---|
| *Author(s)* | M.M. Millar, D.A. Dillman |
| *Citation* | Millar, M.M., Dillman, D.A. (2011). Improving Response to Web and Mixed-mode Surveys. *Public Opinion Quarterly*, 249-269. |
| *Tags* | Design, Sample Frame |
| *Summary* | This paper outlines the results of two experiments to evaluate strategies to improve response rates of web and mixed-mode surveys. Two experiments were conducted in which participants were divided into sub-groups; each sub-group was contacted in a different manner, and were given different options to respond to the survey. The study also tested the effect of offering response modes in sequence, determined how the use of a combination of mail and email contacts are affect response rates when individuals are asked to respond via web or when given a choice of modes, and tested the effectiveness of an initial postal contact, and the provision of a token cash incentive paid in advance. The authors state that when participants are given a simultaneous choice of response modes, each mode looks worse than it would alone due to the inherent process of weighing trade-offs. The paper outlines a method of contacting respondents know as *email augmentation*, and the study revealed that this method can increase response rates. |
| *Potential Applications* | The results of this study could be used to guide the design of a web survey of web-savvy users (a satellite to the core TTS design)<br><br>The methods for improving response rates could be emulated in the new TTS design, potentially modified to suit the demographics of the GGH or to satisfy cost constraints |
| *Strengths* | Some of the methods for improving response rates that were examined in the study resulted in an increase web response rates |
| *Weaknesses* | The population that was studied was web-literate<br><br>The costs of sending several letters to participants, as well as a token cash incentive, would be very costly for a 5% sample of the GGH |

| *Title* | **Innovations in Survey Research – An Application of Web-based Surveys** |
|---|---|
| *Author(s)* | S.J. Sills, C. Song |
| *Citation* | Sills, S.J., Song, C. (2002). Innovations in Survey Research - An Application of Web-based Surveys. *Social Science Computer Review*, 22-30. |
| *Tags* | Design, Case Study, Sample Frame |
| *Summary* | This article describes the creating and implementation of the International Student Survey, which was implemented at Arizona State University, in an attempt to explore factors than may influence one's choice of major. Dillman argued that the ideal survey controls for error by ensuring that each member of the population has an equal chance of being selected. The authors argue that the subject of the study, as well as the characteristics of the sample, have a significant impact on the response rate. In general, younger, better-educated, and wealthier males are overrepresented in internet surveys. The authors outline methods for increasing response rates. |
| *Potential Applications* | The findings of this paper could help guide how the investigators of the TTS elicit responses from participants<br><br>The presentation of the TTS to respondents can draw conclusions from the findings of this paper |
| *Strengths* | The findings of this paper are general enough to be applicable to the TTS |
| *Weaknesses* | Despite Dillman's suggestion regarding an ideal survey, the authors do not touch on the subject of creating a representative sampling frame for a web survey |

| *Title* | **Methods for the Design and Administration of Web-based Surveys** |
|---|---|
| *Author(s)* | T.K.L. Schleyer, J.L. Forrest |
| *Citation* | Schleyer, T.K.L., Forrest, J.L. (2000). Methods for the Design and Administration of Web-based Surveys. *Web-based Survey Design and Administration*, 416-425. |
| *Tags* | Design, Sample Frame |
| *Summary* | This paper describes the design, development, and administration of a web-based survey to determine the use of Internet in clinical practice. The authors outline features of web surveys that could potentially reduce response rates, such as graphics and animations, as well as present Dillman's principles for designing respondent-friendly web questionnaires. |
| *Potential Applications* | The findings of this study can be used as a cautionary tale, which can be used to inform the design of a TTS web survey, and particularly the pitfalls that should be avoided |
| *Strengths* | The results of this study are generalizable enough to be applied to the design of TTS 2.0 |
| *Weaknesses* | No information regarding methods of creating a representative sampling frame |

| *Title* | **Online Travel Surveys and Response Patterns** |
|---|---|
| *Author(s)* | B. Pan |
| *Citation* | Pan, B. (2010). Online Travel Surveys and Response Patterns. *Journal of Travel Research*, 121-135. |
| *Tags* | Sample Frame, Design |
| *Summary* | This paper reviews the benefits of and issues associated with online surveys as it relates to response rates, speed of response, representativeness of samples, and differences in results due to different survey media. Pan lists online survey creation tools, and discusses the challenges associated with conducting web surveys. Challenges include the non-representativeness of the sample collected via web survey, and the need to craft solicitation emails in order to differentiate them from spam emails. Pan argues that greater instances of contact, more personalized contact, and the use of pre-contacts are potential methods to increase response rates. |
| *Potential Applications* | The methods for increasing response rate proposed by Pan could be applied to the implementation of the TTS |
| *Strengths* | The findings are general enough in nature that they are applicable to the design of the TTS |
| *Weaknesses* | No explicit mention of creating a representative sampling frame |

| *Title* | **Optimization of Household Survey Sampling Without Sampling Frames** |
|---|---|
| *Author(s)* | K. Bostoen, Z. Chalabi |
| *Citation* | Bostoen, K., Chalabi, Z. (2006). Optimization of Household Survey Sampling without Sampling Frames. *International Journal of Edipemiology*, 751-755. |
| *Tags* | Sample Frame, State-of-the-Art |
| *Summary* | This paper explains how mathematical programming can be used to optimize the Expanded Programme of Immunization and other household survey sampling methods when sampling frames are either unavailable or unreliable. The EPI sampling method is one of the most popular sampling methods adopted by the WHO for use in low-income countries, and is derived from the Probability Proportional to Size method. The EPI method has occasionally resulted in non-representative data, and was validated by either using hypothetical scenarios in which clusters and households are generated artificially through computer scenarios, or real scenarios generated from data-rich surveys. The authors propose that mathematical programming methods would be a more efficient method of improving sampling methods by circumventing the need to use computing-intensive methods |
| *Potential Applications* | This method could be used to create a sampling frame from geographic clusters (e.g. blocks, neighbourhoods, census tracts, etc.), which could account for the expected response rate |
| *Strengths* | This method would allow a sampling frame to be created by using urban planning information created by municipalities |
| *Weaknesses* | The method is not described in the paper<br><br>This method of creating a sample frame may not yield a representative sampling frame, depending on the inclusion criteria<br><br>Depending on the level of granularity, it may not be possible to create a representative sampling frame |

| *Title* | **Route Choice Modelling Using GPS-based Travel Surveys** |
|---|---|
| *Author(s)* | N.S. Dhakar, S. Srinvasan |
| *Citation* | Dhakar, N.S., Srinivasan, S. (2014). Route Choice Modelling Using GPS-based Travel Surveys. *Journal of the Transportation Research Board*, 65-73. |
| *Tags* | HH or individual, State-of-the-Art, Case Study |
| *Summary* | The purpose of this study was to combine data from a large-scale GPS-based travel survey and GIS-based roadway network databases to develop route choice models. The data for the study came from the Chicago Regional Household Travel Inventory, and was originally comprised of over 6 million data points from 9981 trips made by 408 vehicle from 259 households. The trips with their origins and destinations in different subzones at both ends (4406 in total) were identified. For 2692 of said trips, an algorithm was applied in order to derive a choice set of alternate routes. The chance that a route predicted by the Path Size Logit model would be better than the deterministic shortest-path method ranged from 38-50%, which increased to 50-62% when trips did not choose a path similar to the shortest-time path. |
| *Potential Applications* | • The methodology used to create the model has the potential to be applied to the design of the TTS |
| *Strengths* | • This study shows that a moderately successful model can be estimated and calibrated using travel data that was collected on an individual level, however it is important to note that a route-choice model, not a demand model, was created |
| *Weaknesses* | • This methodology does not seem readily applicable to other modes |

| *Title* | **Sampling Frame Coverage and Domain Adjustment Procedures for Internet Surveys** |
|---|---|
| *Author(s)* | Z. Asan, H.O. Ayhan |
| *Citation* | Asan, Z., Ayhan, H.O. (2013). Sampling Frame Coverage and Domain Adjustment Procedures for Internet Surveys. *Quality & Quantity*, 3031-3042. |
| *Tags* | Sample Frame, State-of-the-Art, Case Study |
| *Summary* | This study aims to provide a methodology for domain weighting and adjustment procedures for free access web surveys that are based on restricted access surveys. Using population data from the 2007 Household Computer Technology Usage Survey and the 2008 Turkish Population and Health Survey, the demographic data collected from an open-access web survey was used to estimate the number of internet users in Turkey, applying expansion factors derived from a restricted access survey. The goal of this project was to propose an alternative methodological approach to adjust a non-probability sample on the basis of prior information obtained from a probability sample. Adjustment factors were calculated on the basis of gender and age groups. |
| *Potential Applications* | The results of this study could eliminate the need for the TTS to sample from a representative sampling frame, in that the data collected from a representative sample of the population (potentially the census) could be used to derive weighting and adjustment factors that would be applied to data collected from an unrepresentative sample |
| *Strengths* | This method has the potential to generalize the characteristics of an entire population from the data pertaining to a known, non-representative sample |
| *Weaknesses* | The investigators' estimates of the number of Internet users in Turkey was not verified<br><br>The less a particular demographic is represented, the greater the potential error associated with the use of weighting and expansion factors |

| *Title* | **Surveying the General Public over the Internet Using Address-based Sampling and Mail Contact Procedures** |
|---|---|
| *Author(s)* | B.L. Messer, D.A. Dillman |
| *Citation* | Messer, B.L., Dillman, D.A. (2011). Surveying the General Public over the Internet Using Address-based Sampling and Mail Contact Procedures. *Public Opinion Quarterly*, 429-457. |
| *Tags* | Sample Frame, Design, Case Study |
| *Summary* | This paper details the findings of several experiments that were conducted to test the effects of five different mailing implementation techniques: offering web and mail responses sequentially (web + mail and mail + web), providing a prepaid cash incentive, offering a web instruction card, using priority mail for follow-up contacts, and providing an additional cash incentive with the follow-up mailing. The US Postal Delivery Sequence File was used as the sampling frame, with the representativeness of the respondents being validated using data from the American Community Survey. The experiments that were conducted consisted of 9300 randomly selected residential addresses in Washington, with each participant randomly selected to be part of a treatment group. The study indicates that people with access to the internet tend to be younger, more educated, and tend to have higher incomes. The mail-only and web + mail groups obtained the respondents that were most representative of the population. |
| *Potential Applications* | The methods used to increase response rates could be applied to the TTS, though it will likely have to be modified because of the potential costs |
| *Strengths* | Some of the mailing implementation techniques were able to improve response rates<br><br>The mail-only and web + mail implementations were able to obtain samples that were most representative of the population |
| *Weaknesses* | The samples obtained were not perfectly representative of the population<br><br>Contacting a 5% sample of the GGH (roughly 400 000 people) would be very costly to implement |

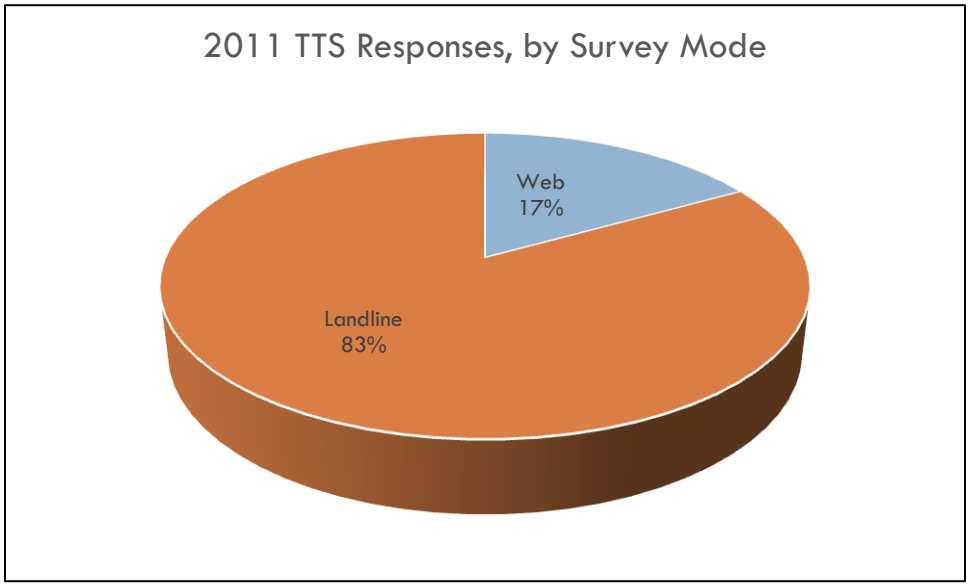
| *Title* | **The State of Survey Methodology: Challenges, Dilemmas, and New Frontiers in the Era of the Tailored Design** |
|---|---|
| *Author(s)* | M.J. Stern, I. Bilgen, D.A. Dillman |
| *Citation* | Stern, M.J., Bilgen, I., Dillman, D.A. (2014). The State of Survey Methodology: Challenges, Dilemmas, and New Frontiers in the Era of the Tailored Design. *Field Methods*, 284-301. |
| *Tags* | Comparison, Design |
| *Summary* | This article discusses the current state of survey methodology. The authors provide an overview of the effect that the mode of survey has on the participants' responses, as well as other differences between survey modes. The authors describe an alternative method of maintaining an "Internet panel", where a core panel is formed through the use of probability sampling, and stratified "refreshment" samples are combined to ensure the panel's representativeness. |
| *Potential Applications* | • This article identifies potential sources of bias that should be considered in the design of TTS 2.0 |
| *Strengths* | • This study provides insights regarding instrument bias |
| *Weaknesses* | • The authors do not mention a sampling frame from which the core panel can be chose via probability sampling<br>• There is no mention of the scale to which an Internet panel is applicable (in terms of population size) |

| *Title* | **Using Third-party Data for Travel Demand Modeling – Comparison of Targeted Marketing, Census, and Household Travel Survey Data** |
|---|---|
| *Author(s)* | J.D. Kressner, L.A. Garrow |
| *Citation* | Kressner, J.D., Garrow, L.A. (2014). Using Third-party Data for Travel Demand Modeling - Comparison of Targeted Marketing, Census, and Household Travel Sruevy Data. *Journal of the Transportation Research Board*, 8-19. |
| *Tags* | State-of-the Art |
| *Summary* | This paper investigates how targeted marketing data could be used as a source for up-to-date demographic and socioeconomic information. Firms compile TM data through public data, including birth certificates, property records, and change of address forms, as well as through credit card transaction data, credit reporting data, and email or marketing data. The article outlines the advantages and disadvantages of using TM data, as well as the applications of TM data. |
| *Potential Applications* | The information regarding the uses of TM data could be used as a supplement to the TTS data, depending on the data available in Canada/ the GTHA |
| *Strengths* | The information presented in this can guide how the TTS utilizes TM data that is available in Canada |
| *Weaknesses* | The information presented in this article may only pertain to TM data collected in the U.S. |

| *Title* | **Web-based Surveys – Best Practices Based on the Research Literature** |
|---|---|
| *Author(s)* | C. Parsons |
| *Citation* | Parsons, C. (2007). Web-Based Surveys: Best Practices Based on the Research Literature. *Visitor Studies*, 13-33. |
| *Tags* | Design, Sample Frame |
| *Summary* | This article reviews literature regarding the use and effectiveness of web surveys, and explores the similarities and differences between Web surveys and postal and telephone surveys, the opportunities and limitations of web surveys, and the use of Web surveys in visitor studies research. Parsons compares the different characteristics of web and traditional surveys, and argues that web surveys cannot be used to survey representative samples of the population because internet access is not ubiquitous. Parsons then describes methods of improving response rates, and provides "design tips" for the design of web surveys. |
| *Potential Applications* | These "design tips" can be applied to the design of a web questionnaire of the TTS<br><br>The methods of improving response rates can be integrated into the recruitment process of the TTS<br><br>Parsons makes an argument for a mixed-mode design, or a design that is exclusive of web surveys |
| *Strengths* | The information presented in this paper is general enough that it can be applied to a potential design of the TTS |
| *Weaknesses* | Parsons makes no mention of how to create a representative sampling frame for web surveys |

| | |
|---|---|
| ***Title*** | **Words, Numbers, and Visual Heuristics in Web Surveys: Is There a Hierarchy of Importance?** |
| *Author(s)* | V. Toepoel, D.A. Dillman |
| *Citation* | Toepoel, V., Dillman, D.A. (2011). Words, Numbers, and Visual Heuristics in Web Surveys: Is There a Hierarchy of Importance?. *Social Science Computer Review*, 193-207. |
| *Tags* | Design, State-of-the-Art |
| *Summary* | This paper discusses the results of two experiments conducted in two panels to investigate hoe survey responses are affected by visual heuristics. The authors designed the study to test the effects of visual heuristics outlined by Tourangeau (2004), as well as the hierarchy proposed by Tourangeau (2004). The study recruited participants through RDD, with the investigators providing equipment to complete the surveys when necessary. This panel was meant to be representative of the population, with households that dropped out being replaced. Two panels were recruited – one panel that had experience completing web surveys, and another panel in which the respondents were relatively new. The results of the study are used to inform tips for designing web surveys. |
| *Potential Applications* | The results of this study and the subsequent design tips can be used to guide the design of a web questionnaire |
| *Strengths* | The study considered the responses of both experienced and relatively new users to subtle changes in the layout of web surveys |
| *Weaknesses* | This study was conducted in the Netherlands, which may mean that the results may not be exactly the same for residents of the GTHA |

# APPENDIX B: COMPARISON OF WEB AND LANDLINE RESPONSES USING 2011 TTS DATA

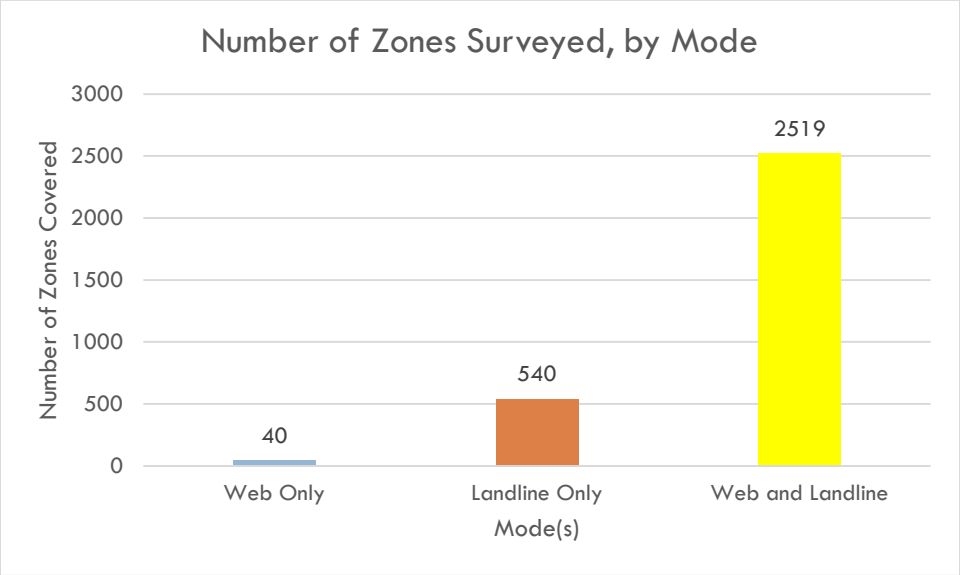


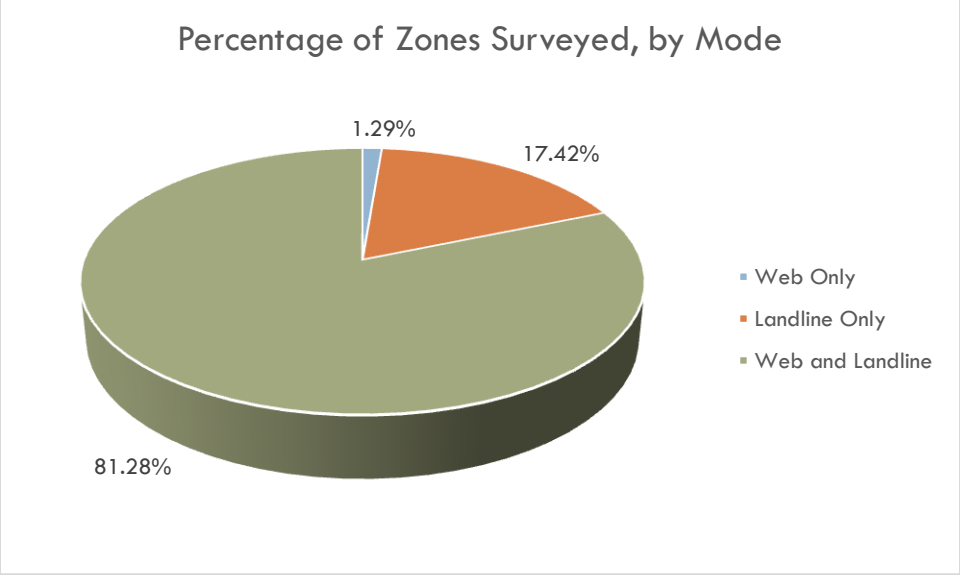

| Mode | Total Responses | Percentage |
|---|---|---|
| **Web** | 26863 | 16.88% |
| **Landline** | 132294 | 83.12% |
| **Total** | 159157 | 100.00% |

| Mode | Trip-Making Households | Non-Trip-Making Households | Total | Percentage |
|---|---|---|---|---|
| **Web** | 24338 | 2525 | 26863 | 16.88% |
| **Landline** | 114660 | 17634 | 132294 | 83.12% |
| **Total** | 138998 | 20159 | 159157 | 100.00% |

## Number of Zones Surveyed, by Response Mode

| Mode | Number of Zones Surveyed | Percentage |
|---|---|---|
| **Web Only** | 40 | 1.29% |
| **Landline Only** | 540 | 17.42% |
| **Web and Landline** | 2519 | 81.28% |
| **Total** | 3099 | 100.00% |



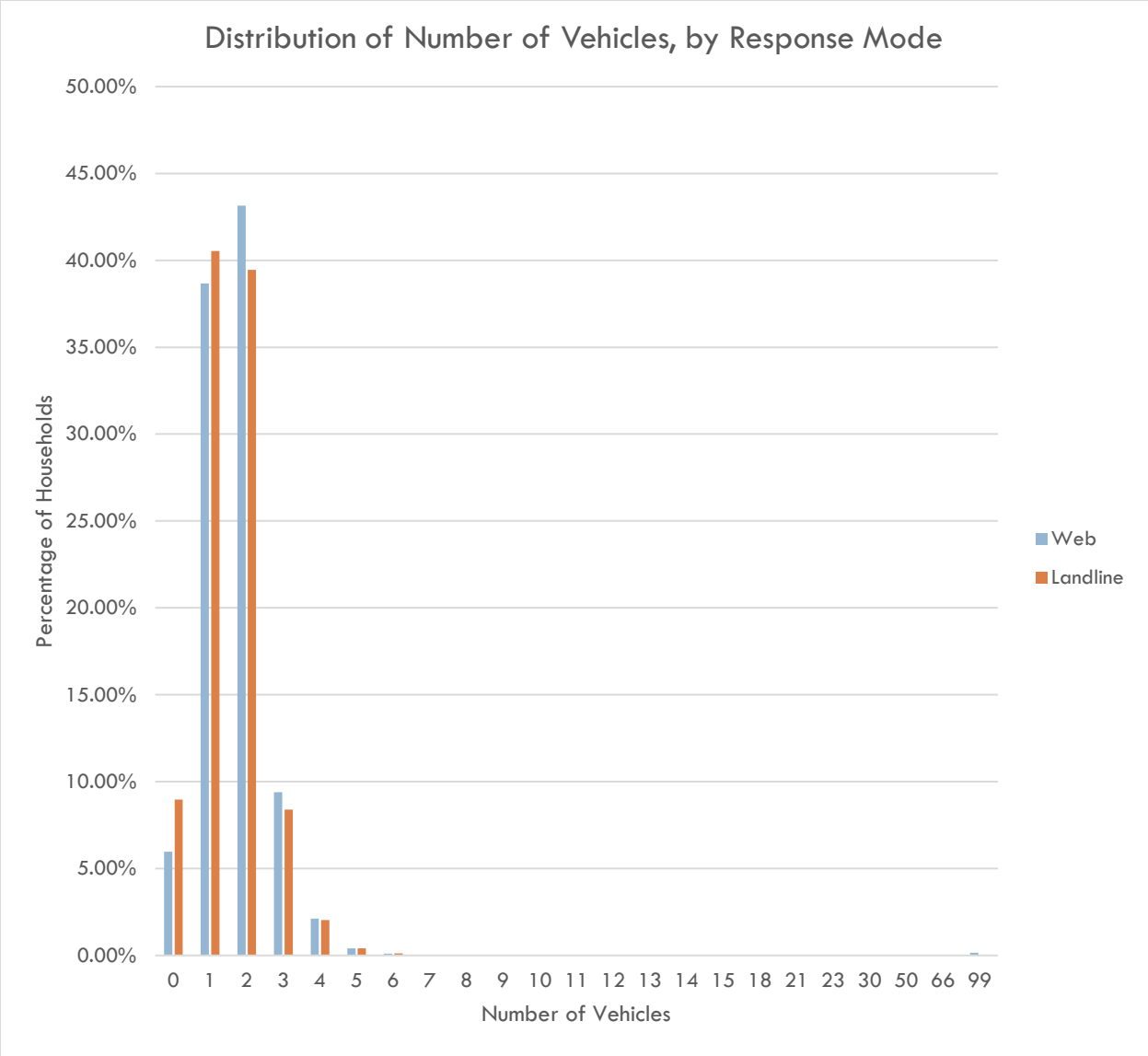



## Vehicle Ownership, by Mode

NOTE: Households that did not report making any trips had a value of "NULL" assigned to this variable

**Number of Households**

| **Number of** | Web | Landline | Non-Trip Makers | Total |
|---|---|---|---|---|
| **0** | 1454 | 10284 | 8319 | 20057 |
| **1** | 9411 | 46472 | 8908 | 64791 |
| **2** | 10499 | 45241 | 2521 | 58261 |
| **3** | 2287 | 9616 | 297 | 12200 |
| **4** | 515 | 2339 | 67 | 2921 |
| **5** | 100 | 471 | 10 | 581 |
| **6** | 26 | 134 | 3 | 163 |
| **7** | 5 | 45 | 8 | 58 |
| **8** | 3 | 15 | 0 | 18 |
| **9** | 0 | 9 | 1 | 10 |
| **10** | 0 | 3 | 0 | 3 |
| **11** | 0 | 3 | 1 | 4 |
| **12** | 0 | 8 | 3 | 11 |
| **13** | 0 | 2 | 1 | 3 |
| **14** | 0 | 3 | 1 | 4 |
| **15** | 0 | 0 | 1 | 1 |
| **18** | 0 | 1 | 0 | 1 |
| **21** | 0 | 2 | 0 | 2 |
| **23** | 0 | 1 | 0 | 1 |
| **30** | 0 | 1 | 0 | 1 |
| **50** | 0 | 1 | 0 | 1 |
| **66** | 0 | 1 | 0 | 1 |
| **99** | 38 | 8 | 18 | 64 |
| **Total** | 24338 | 114660 | 20159 | 159157 |

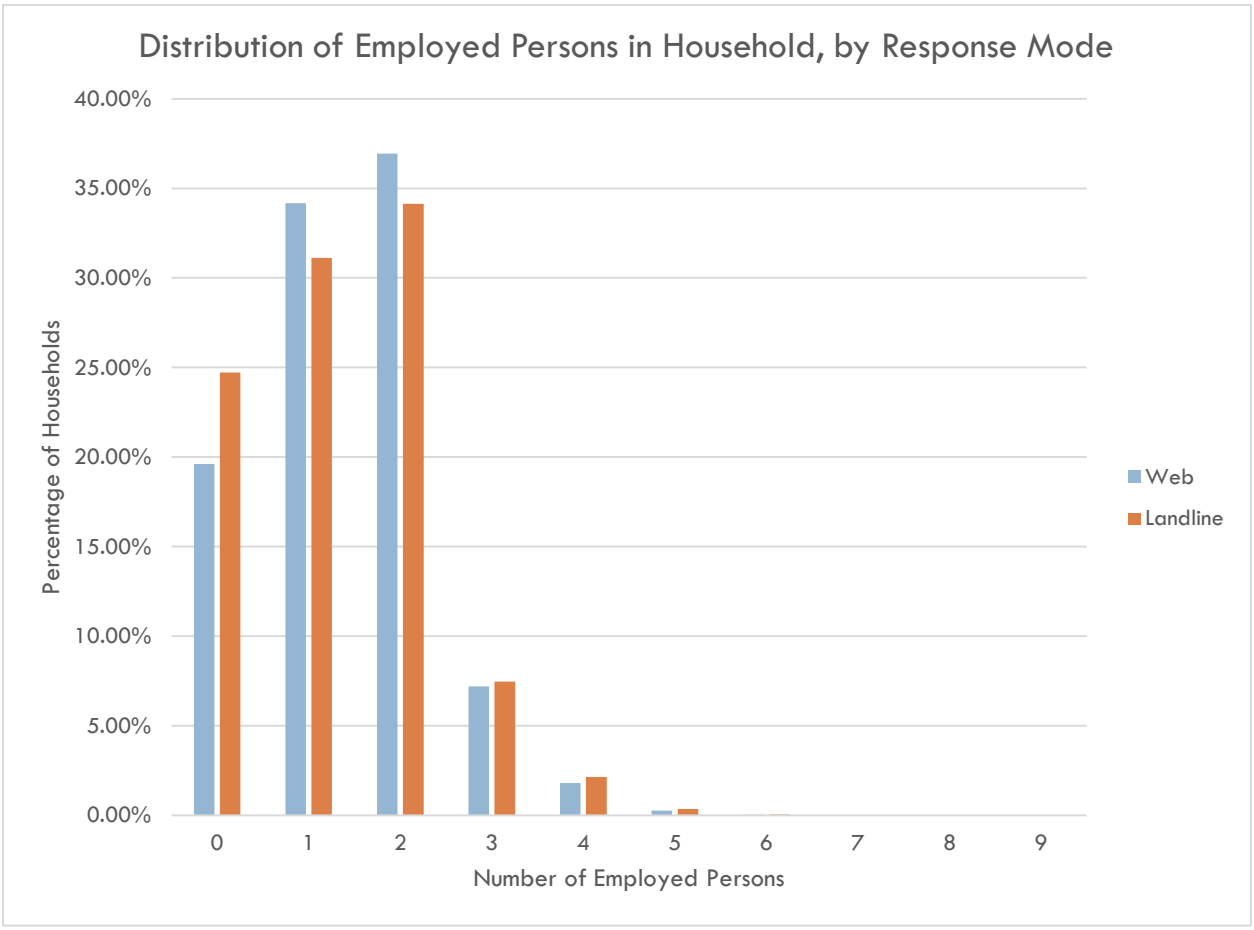

Distribution of Number of Vehicles, by Response Mode
50.00%
45.00%
40.00%
35.00%
30.00%
25.00%
20.00%
15.00%
10.00%
5.00%
0.00%
Percentage of Households
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 18 21 23 30 50 66 99
Number of Vehicles
Web
Landline

## Number of Employed Persons in Household

NOTE: Households that did not report making any trips had a value of "NULL" assigned to this variable

**Number of Households**

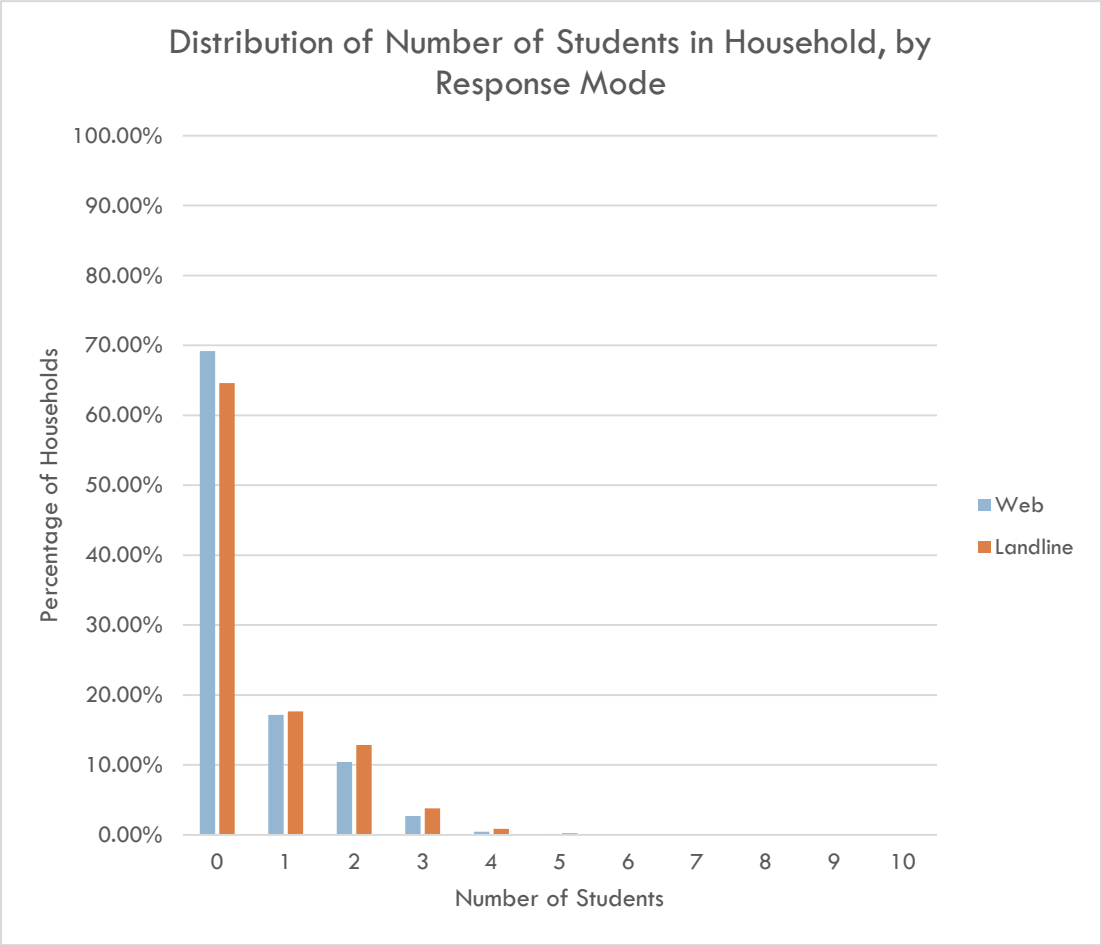
| Number of Employed Persons | Web | Landline | Total |
|---|---|---|---|
| **0** | 4772 | 28351 | 33123 |
| **1** | 8316 | 35686 | 44002 |
| **2** | 8991 | 39145 | 48136 |
| **3** | 1750 | 8557 | 10307 |
| **4** | 436 | 2457 | 2893 |
| **5** | 63 | 403 | 466 |
| **6** | 9 | 52 | 61 |
| **7** | 0 | 7 | 7 |
| **8** | 1 | 1 | 2 |
| **9** | 0 | 1 | 1 |
| **Total** | 24338 | 114660 | 138998 |


Distribution of Employed Persons in Household, by Response Mode
40.00%
35.00%
30.00%
25.00%
20.00%
15.00%
10.00%
5.00%
0.00%
Percentage of Households
0
1
2
3
4
5
6
7
8
9
Number of Employed Persons
Web
Landline

## Distribution of Number of Students in Household, by Response Mode:

NOTE: Households that did not report making any trips had a value of "NULL" assigned to this variable

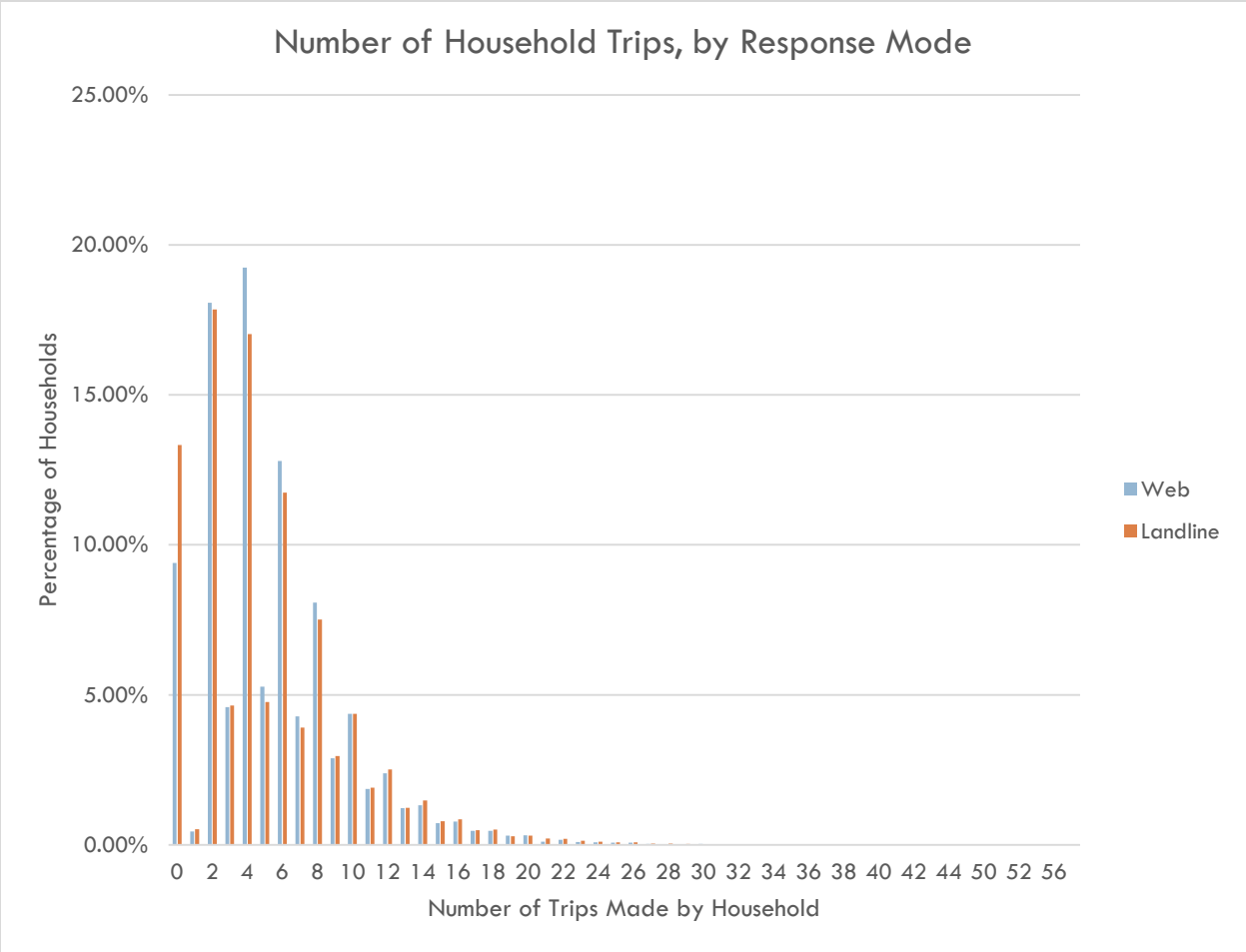
| | Response Mode | | |
|---|---|---|---|
| **Number of Students in Household** | Web | Landline | Total |
| **0** | 16841 | 74090 | 90931 |
| **1** | 4169 | 20235 | 24404 |
| **2** | 2538 | 14716 | 17254 |
| **3** | 650 | 4317 | 4967 |
| **4** | 109 | 996 | 1105 |
| **5** | 24 | 229 | 253 |
| **6** | 5 | 58 | 63 |
| **7** | 2 | 14 | 16 |
| **8** | 0 | 3 | 3 |
| **9** | 0 | 1 | 1 |
| **10** | 0 | 1 | 1 |
| **Total** | 24338 | 114660 | 138998 |


Distribution of Number of Students in Household, by Response Mode
100.00%
90.00%
80.00%
70.00%
60.00%
50.00%
40.00%
30.00%
20.00%
10.00%
0.00%
Percentage of Households
0
1
2
3
4
5
6
7
8
9
10
Number of Students
Web
Landline

## Number of Household Trips, by Response Mode:

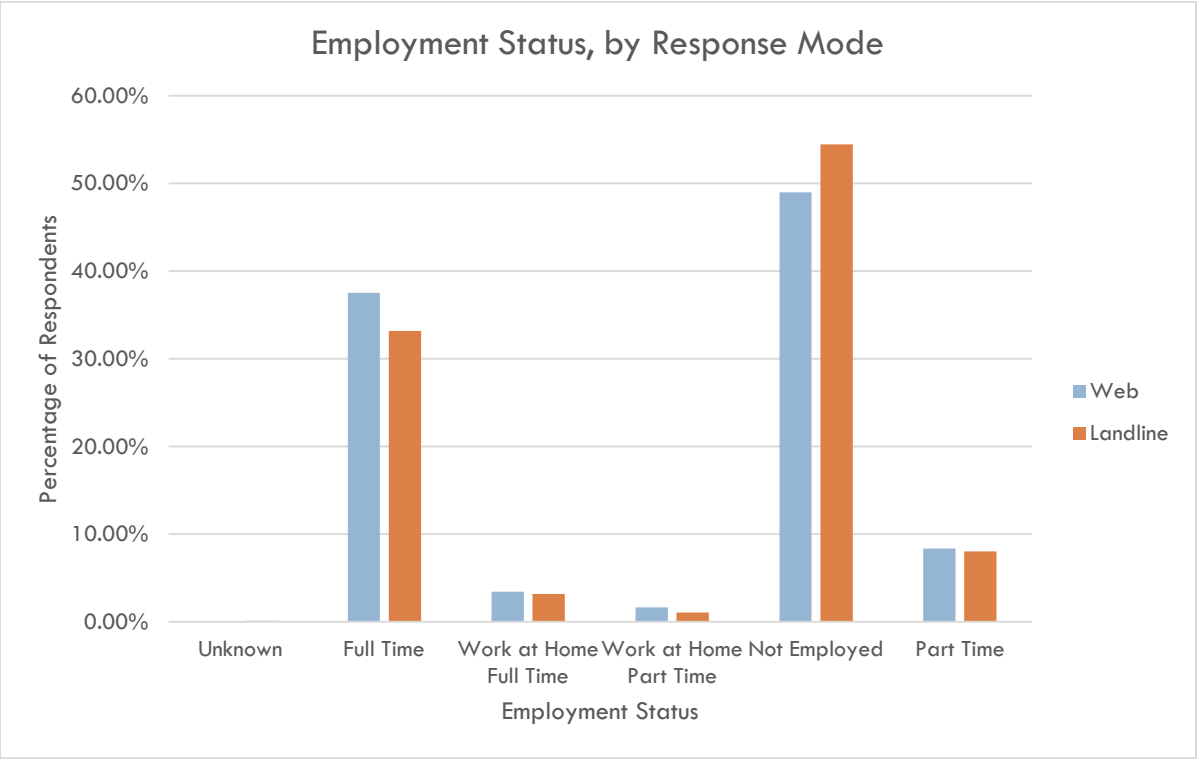
| | Number of Households | | |
|---|---|---|---|
| *Number of Household Trips* | Web | Landline | Total |
| *0* | 2525 | 17634 | 20159 |
| *1* | 119 | 688 | 807 |
| *2* | 4855 | 23611 | 28466 |
| *3* | 1232 | 6139 | 7371 |
| *4* | 5169 | 22526 | 27695 |
| *5* | 1415 | 6295 | 7710 |
| *6* | 3438 | 15538 | 18976 |
| *7* | 1150 | 5172 | 6322 |
| *8* | 2168 | 9934 | 12102 |
| *9* | 774 | 3920 | 4694 |
| *10* | 1173 | 5773 | 6946 |
| *11* | 501 | 2527 | 3028 |
| *12* | 640 | 3328 | 3968 |
| *13* | 329 | 1627 | 1956 |
| *14* | 355 | 1953 | 2308 |
| *15* | 194 | 1042 | 1236 |
| *16* | 209 | 1124 | 1333 |
| *17* | 124 | 643 | 767 |
| *18* | 126 | 680 | 806 |
| *19* | 82 | 375 | 457 |
| *20* | 85 | 403 | 488 |
| *21* | 28 | 277 | 305 |
| *22* | 44 | 261 | 305 |
| *23* | 25 | 176 | 201 |
| *24* | 23 | 143 | 166 |
| *25* | 18 | 105 | 123 |
| *26* | 19 | 103 | 122 |
| *27* | 9 | 54 | 63 |
| *28* | 4 | 57 | 61 |
| *29* | 4 | 46 | 50 |
| *30* | 7 | 18 | 25 |
| *31* | 2 | 26 | 28 |
| *32* | 4 | 20 | 24 |
| *33* | 2 | 17 | 19 |
| *34* | 3 | 18 | 21 |
| *35* | 0 | 8 | 8 |
| *36* | 0 | 9 | 9 |
| *37* | 2 | 6 | 8 |
| *38* | 1 | 3 | 4 |

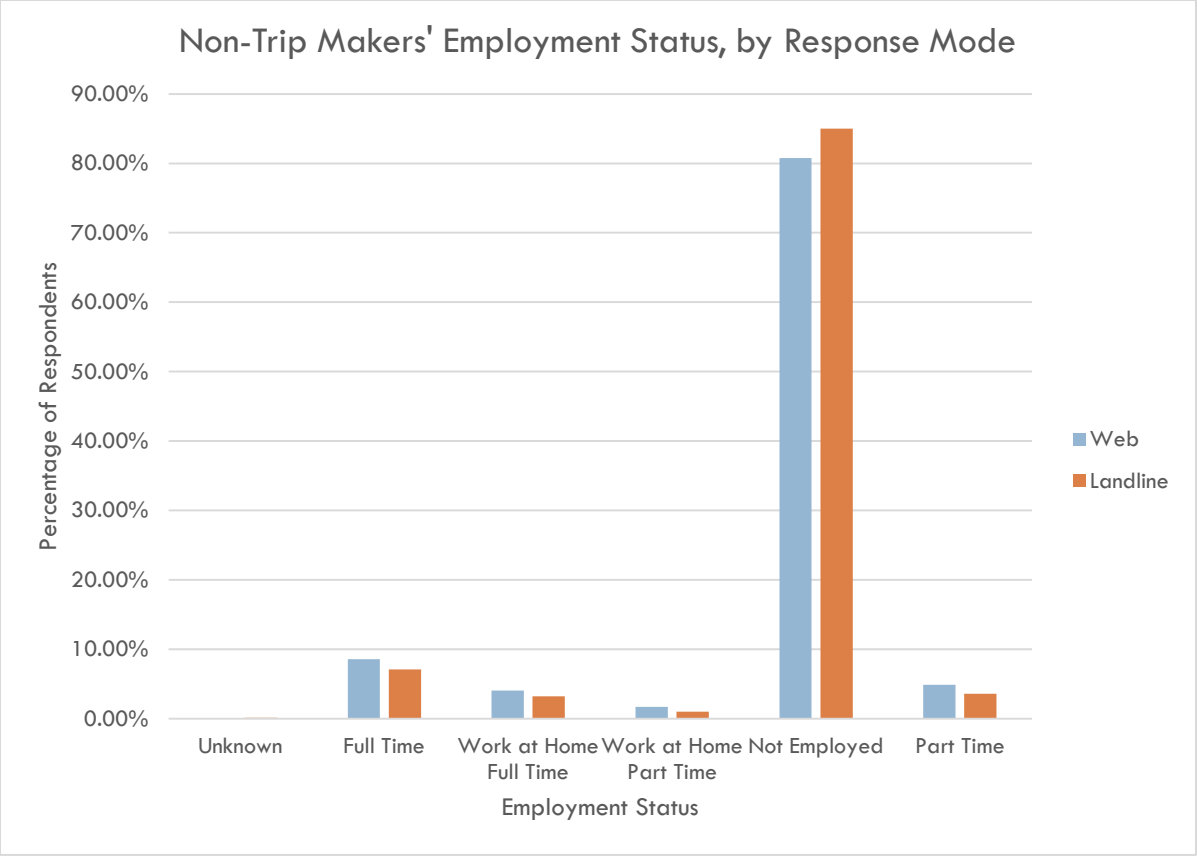
| | | | |
|---|---|---|---|
| *39* | 0 | 3 | 3 |
| *40* | 0 | 1 | 1 |
| *41* | 0 | 3 | 3 |
| *42* | 1 | 2 | 3 |
| *43* | 1 | 0 | 1 |
| *44* | 1 | 1 | 2 |
| *49* | 1 | 0 | 1 |
| *50* | 0 | 1 | 1 |
| *51* | 0 | 1 | 1 |
| *52* | 0 | 1 | 1 |
| *53* | 1 | 0 | 1 |
| *56* | 0 | 1 | 1 |
| *57* | 0 | 1 | 1 |
| *Total* | 26863 | 132294 | 159157 |

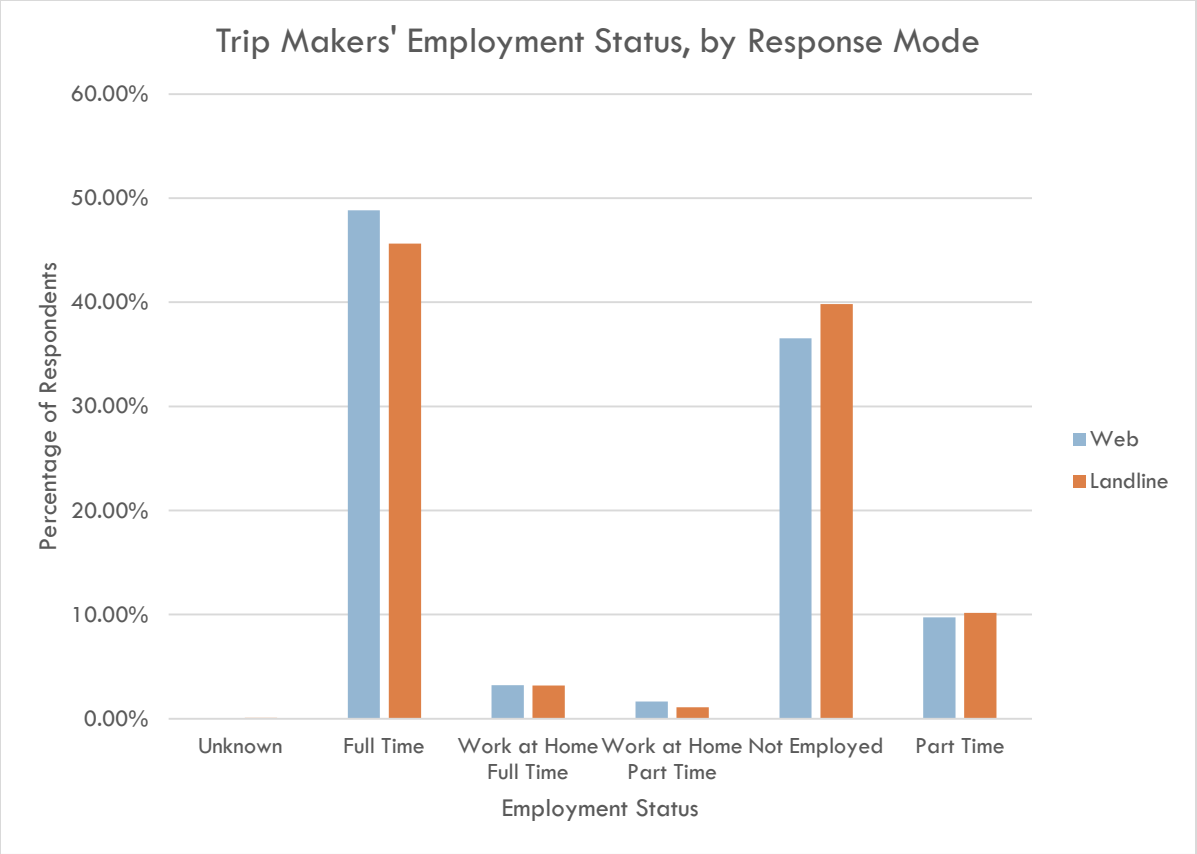


## EMPLOYMENT STATUS, BY MODE:

| | Overall | | Trip Makers | | Non-Trip Makers | |
|---|---|---|---|---|---|---|
| *Employment Type* | Web | Landline | Web | Landline | Web | Landline |
| *Unknown* | 40 | 358 | 25 | 219 | 15 | 139 |
| *Full Time* | 25561 | 113510 | 23917 | 105645 | 1644 | 7865 |
| *Work at Home Full Time* | 2348 | 10923 | 1570 | 7382 | 778 | 3541 |
| *Work at Home Part Time* | 1122 | 3627 | 801 | 2531 | 321 | 1096 |
| *Not Employed* | 33377 | 186382 | 17900 | 92162 | 15477 | 94220 |
| *Part Time* | 5701 | 27455 | 4771 | 23505 | 930 | 3950 |
| *Total* | 68149 | 342255 | 48984 | 231444 | 19165 | 110811 |
| *Category Total* | 410404 | | 280428 | | 129976 | |




Non-Trip Makers' Employment Status, by Response Mode
90.00%
80.00%
70.00%
60.00%
50.00%
40.00%
30.00%
20.00%
10.00%
0.00%
Percentage of Respondents
Unknown
Full Time
Work at Home Full Time
Work at Home Part Time
Not Employed
Part Time
Employment Status
Web
Landline


Trip Makers' Employment Status, by Response Mode
60.00%
50.00%
40.00%
30.00%
20.00%
10.00%
0.00%
Percentage of Respondents
Unknown
Full Time
Work at Home Full Time
Work at Home Part Time
Not Employed
Part Time
Employment Status
Web
Landline

## Distribution of Age, by Response Mode:

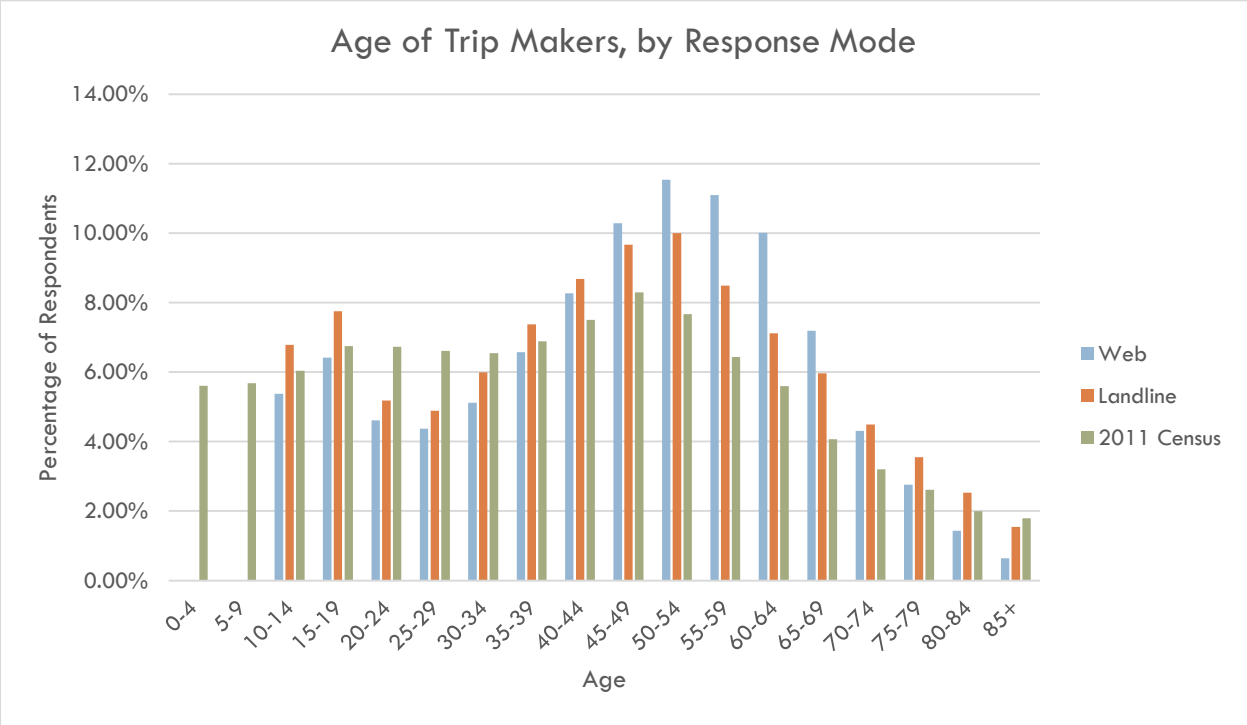
| | Overall | | Trip Makers | | Non-Trip Makers | |
|---|---|---|---|---|---|---|
| *Age* | Web | Landline | Web | Landline | Web | Landline |
| *0* | 452 | 2737 | 0 | 0 | 452 | 2737 |
| *1* | 473 | 3231 | 0 | 0 | 473 | 3231 |
| *2* | 563 | 3949 | 0 | 0 | 563 | 3949 |
| *3* | 548 | 3943 | 0 | 0 | 548 | 3943 |
| *4* | 582 | 3986 | 0 | 0 | 582 | 3986 |
| *5* | 589 | 4157 | 0 | 0 | 589 | 4157 |
| *6* | 587 | 4039 | 0 | 0 | 587 | 4039 |
| *7* | 596 | 3923 | 0 | 0 | 596 | 3923 |
| *8* | 611 | 4022 | 0 | 0 | 611 | 4022 |
| *9* | 596 | 3832 | 0 | 0 | 596 | 3832 |
| *10* | 660 | 4431 | 0 | 0 | 660 | 4431 |
| *11* | 641 | 3761 | 612 | 3618 | 29 | 143 |
| *12* | 661 | 4169 | 629 | 4025 | 32 | 144 |
| *13* | 719 | 4088 | 689 | 3942 | 30 | 146 |
| *14* | 732 | 4257 | 703 | 4110 | 29 | 147 |
| *15* | 807 | 4382 | 767 | 4236 | 40 | 146 |
| *16* | 818 | 4527 | 768 | 4343 | 50 | 184 |
| *17* | 792 | 4345 | 748 | 4104 | 44 | 241 |
| *18* | 539 | 3446 | 458 | 2870 | 81 | 576 |
| *19* | 498 | 3009 | 401 | 2384 | 97 | 625 |
| *20* | 576 | 3162 | 451 | 2461 | 125 | 701 |

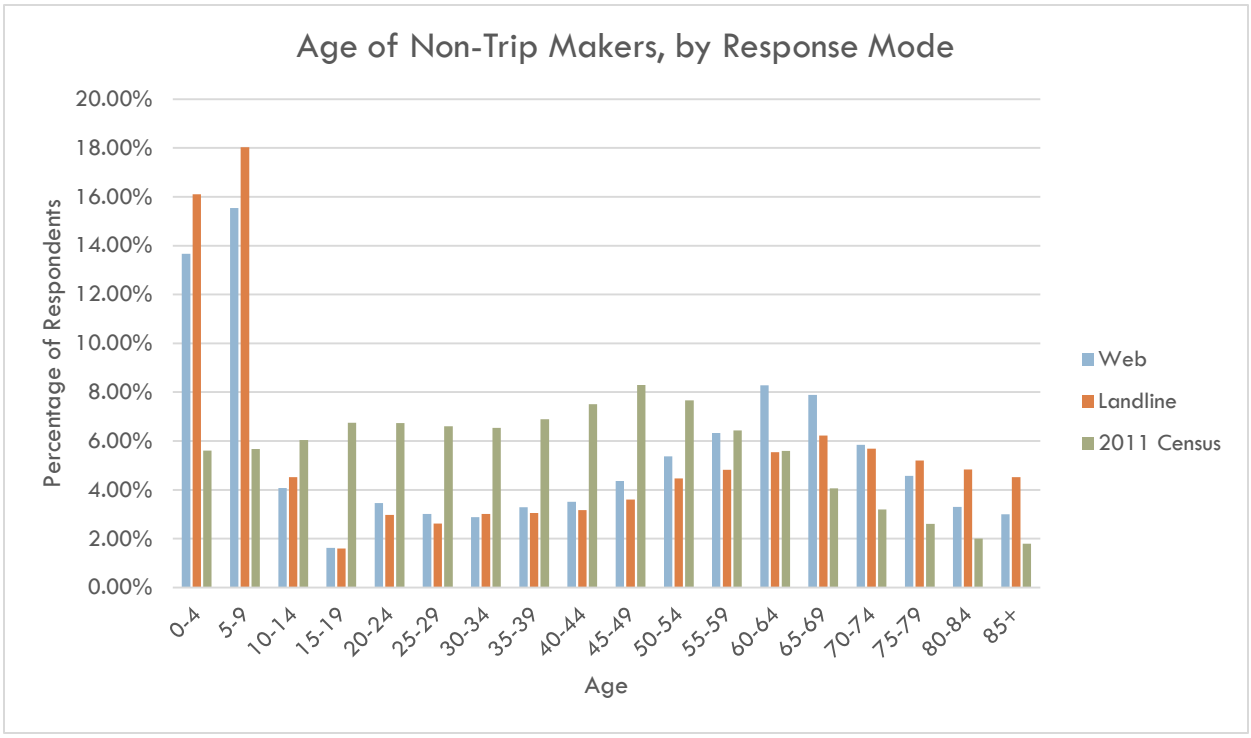
| | | | | | | |
|---|---|---|---|---|---|---|
| *21* | 519 | 3104 | 402 | 2432 | 117 | 672 |
| *22* | 645 | 3253 | 499 | 2563 | 146 | 690 |
| *23* | 616 | 2947 | 474 | 2288 | 142 | 659 |
| *24* | 566 | 2813 | 433 | 2246 | 133 | 567 |
| *25* | 602 | 3219 | 475 | 2554 | 127 | 665 |
| *26* | 540 | 2663 | 424 | 2101 | 116 | 562 |
| *27* | 519 | 2673 | 401 | 2134 | 118 | 539 |
| *28* | 553 | 2928 | 447 | 2306 | 106 | 622 |
| *29* | 507 | 2723 | 396 | 2208 | 111 | 515 |
| *30* | 601 | 4075 | 489 | 3218 | 112 | 857 |
| *31* | 555 | 2910 | 454 | 2350 | 101 | 560 |
| *32* | 618 | 3576 | 510 | 2891 | 108 | 685 |
| *33* | 616 | 3249 | 503 | 2642 | 113 | 607 |
| *34* | 668 | 3398 | 550 | 2765 | 118 | 633 |
| *35* | 765 | 4736 | 631 | 3836 | 134 | 900 |
| *36* | 706 | 3857 | 580 | 3207 | 126 | 650 |
| *37* | 828 | 4037 | 702 | 3397 | 126 | 640 |
| *38* | 750 | 4065 | 636 | 3441 | 114 | 624 |
| *39* | 802 | 3753 | 671 | 3180 | 131 | 573 |
| *40* | 973 | 6145 | 841 | 5151 | 132 | 994 |
| *41* | 861 | 3818 | 736 | 3283 | 125 | 535 |
| *42* | 1000 | 5073 | 852 | 4281 | 148 | 792 |
| *43* | 947 | 4452 | 811 | 3857 | 136 | 595 |
| *44* | 943 | 4120 | 811 | 3522 | 132 | 598 |

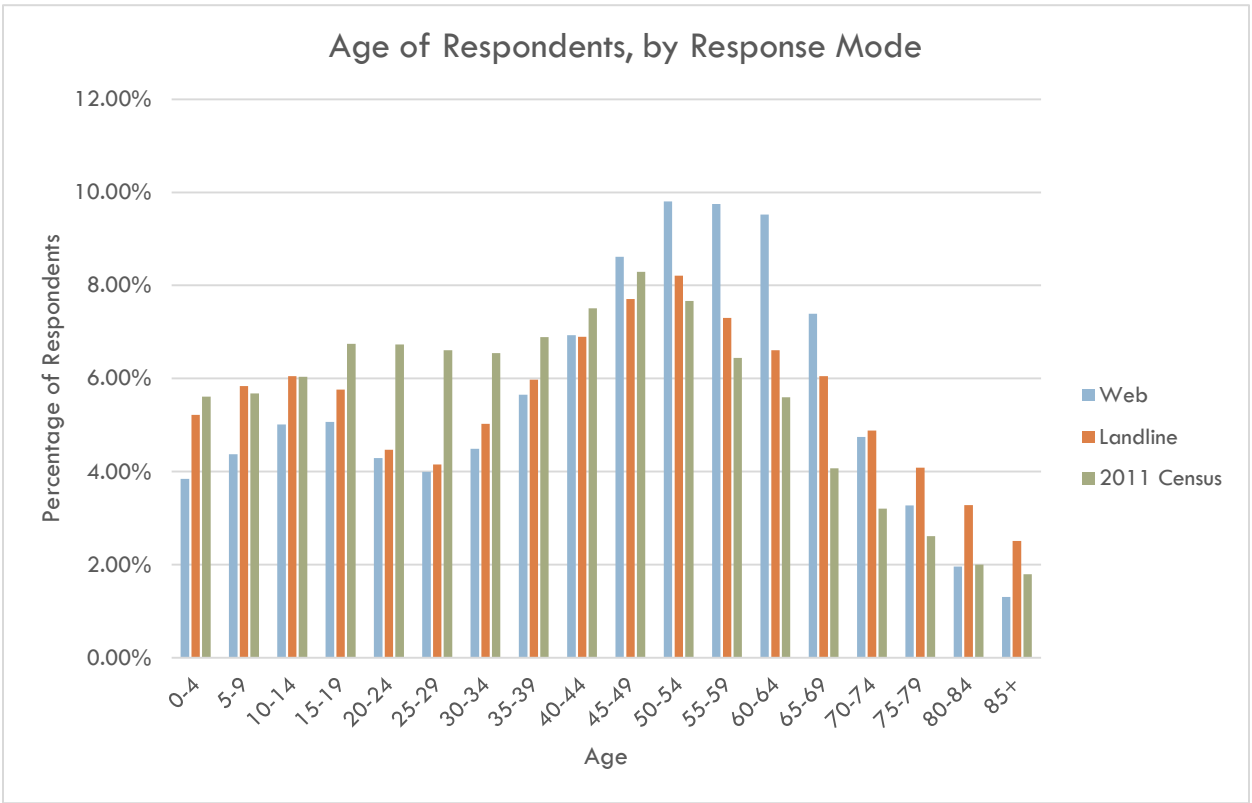
| | | | | | | |
|---|---|---|---|---|---|---|
| *45* | 1084 | 6364 | 934 | 5318 | 150 | 1046 |
| *46* | 1100 | 4838 | 931 | 4112 | 169 | 726 |
| *47* | 1131 | 5101 | 973 | 4340 | 158 | 761 |
| *48* | 1251 | 5218 | 1083 | 4448 | 168 | 770 |
| *49* | 1306 | 4850 | 1116 | 4167 | 190 | 683 |
| *50* | 1453 | 8209 | 1228 | 6727 | 225 | 1482 |
| *51* | 1294 | 4657 | 1109 | 3898 | 185 | 759 |
| *52* | 1339 | 5645 | 1133 | 4631 | 206 | 1014 |
| *53* | 1277 | 4878 | 1070 | 4000 | 207 | 878 |
| *54* | 1318 | 4713 | 1111 | 3891 | 207 | 822 |
| *55* | 1369 | 6773 | 1162 | 5361 | 207 | 1412 |
| *56* | 1328 | 5027 | 1071 | 3915 | 257 | 1112 |
| *57* | 1340 | 4648 | 1093 | 3619 | 247 | 1029 |
| *58* | 1325 | 4571 | 1074 | 3623 | 251 | 948 |
| *59* | 1284 | 3969 | 1034 | 3121 | 250 | 848 |
| *60* | 1395 | 6109 | 1079 | 4399 | 316 | 1710 |
| *61* | 1258 | 3710 | 967 | 2839 | 291 | 871 |
| *62* | 1301 | 4469 | 987 | 3232 | 314 | 1237 |
| *63* | 1240 | 4042 | 920 | 2920 | 320 | 1122 |
| *64* | 1297 | 4288 | 951 | 3091 | 346 | 1197 |
| *65* | 1346 | 6714 | 952 | 4416 | 394 | 2298 |
| *66* | 980 | 3589 | 690 | 2416 | 290 | 1173 |
| *67* | 975 | 3852 | 685 | 2566 | 290 | 1286 |
| *68* | 904 | 3441 | 627 | 2307 | 277 | 1134 |

| | | | | | | |
|---|---|---|---|---|---|---|
| *69* | 830 | 3116 | 569 | 2107 | 261 | 1009 |
| *70* | 813 | 4528 | 540 | 2750 | 273 | 1778 |
| *71* | 667 | 2961 | 437 | 1946 | 230 | 1015 |
| *72* | 660 | 3375 | 419 | 2060 | 241 | 1315 |
| *73* | 581 | 3019 | 401 | 1898 | 180 | 1121 |
| *74* | 511 | 2828 | 315 | 1751 | 196 | 1077 |
| *75* | 538 | 3898 | 311 | 2260 | 227 | 1638 |
| *76* | 517 | 2756 | 321 | 1615 | 196 | 1141 |
| *77* | 435 | 2513 | 291 | 1511 | 144 | 1002 |
| *78* | 378 | 2591 | 207 | 1513 | 171 | 1078 |
| *79* | 359 | 2219 | 221 | 1311 | 138 | 908 |
| *80* | 369 | 3314 | 213 | 1698 | 156 | 1616 |
| *81* | 268 | 2074 | 164 | 1176 | 104 | 898 |
| *82* | 292 | 2284 | 140 | 1190 | 152 | 1094 |
| *83* | 212 | 1833 | 106 | 943 | 106 | 890 |
| *84* | 195 | 1707 | 81 | 844 | 114 | 863 |
| *85* | 200 | 1815 | 92 | 839 | 108 | 976 |
| *86* | 160 | 1316 | 69 | 630 | 91 | 686 |
| *87* | 103 | 1098 | 39 | 451 | 64 | 647 |
| *88* | 90 | 917 | 31 | 394 | 59 | 523 |
| *89* | 88 | 708 | 23 | 264 | 65 | 444 |
| *90* | 64 | 761 | 23 | 274 | 41 | 487 |
| *91* | 51 | 418 | 11 | 137 | 40 | 281 |
| *92* | 33 | 360 | 6 | 106 | 27 | 254 |

| | | | | | | |
|---|---|---|---|---|---|---|
| *93* | 27 | 230 | 5 | 66 | 22 | 164 |
| *94* | 15 | 153 | 6 | 42 | 9 | 111 |
| *95* | 22 | 125 | 0 | 28 | 22 | 97 |
| *96* | 7 | 74 | 1 | 20 | 6 | 54 |
| *97* | 8 | 58 | 2 | 9 | 6 | 49 |
| *98* | 12 | 65 | 1 | 11 | 11 | 54 |
| *99* | 9 | 483 | 5 | 297 | 4 | 186 |
| *Total* | 68149 | 342255 | 48984 | 231444 | 19165 | 110811 |

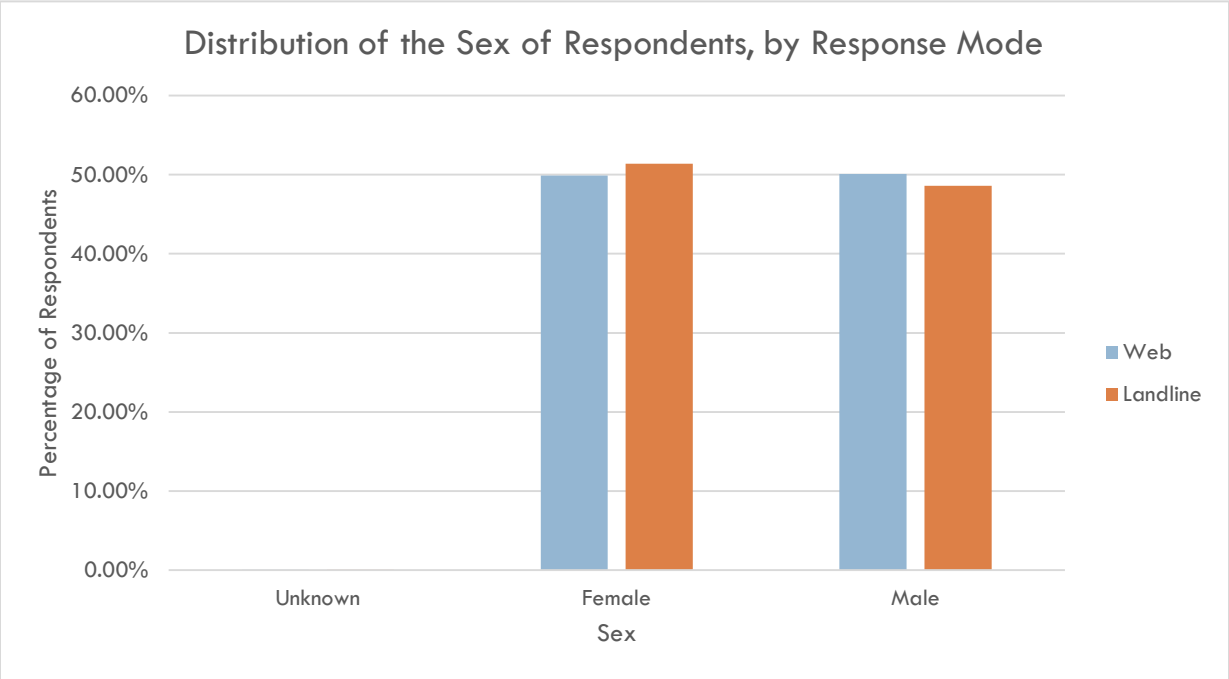


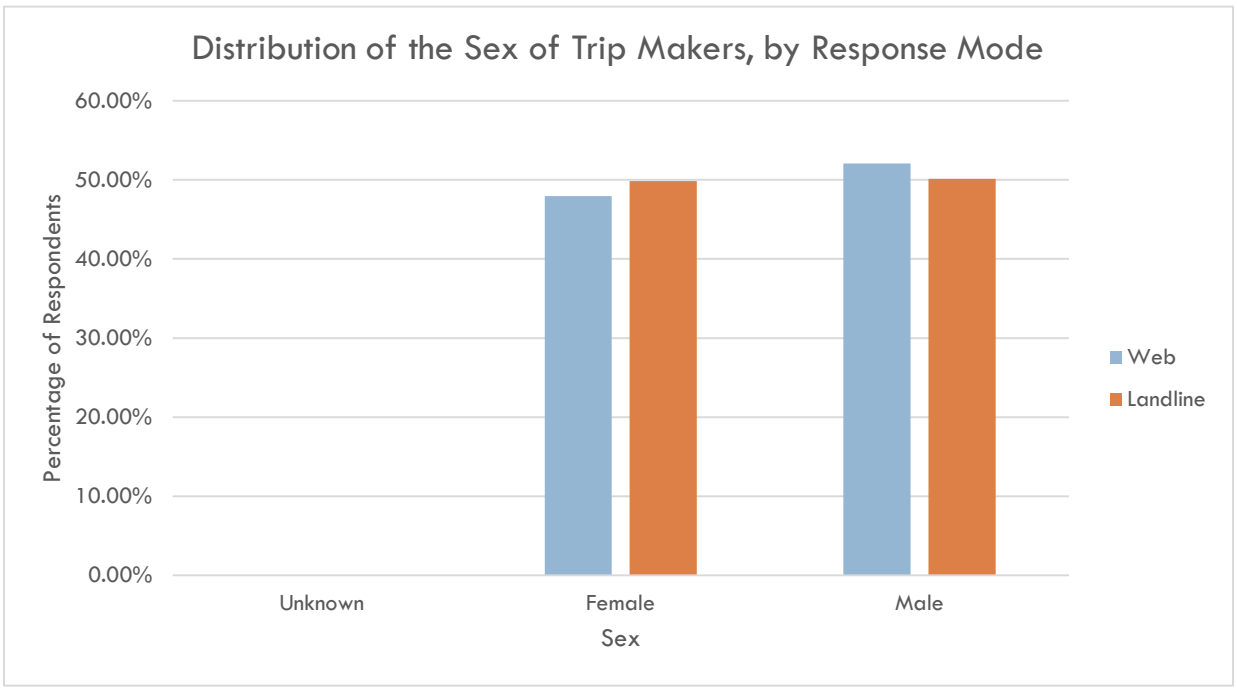

Age of Non-Trip Makers, by Response Mode
20.00%
18.00%
16.00%
14.00%
12.00%
10.00%
8.00%
6.00%
4.00%
2.00%
0.00%
Percentage of Respondents
0-4
5-9
10-14
15-19
20-24
25-29
30-34
35-39
40-44
45-49
50-54
55-59
60-64
65-69
70-74
75-79
80-84
85+
Age
Web
Landline
2011 Census

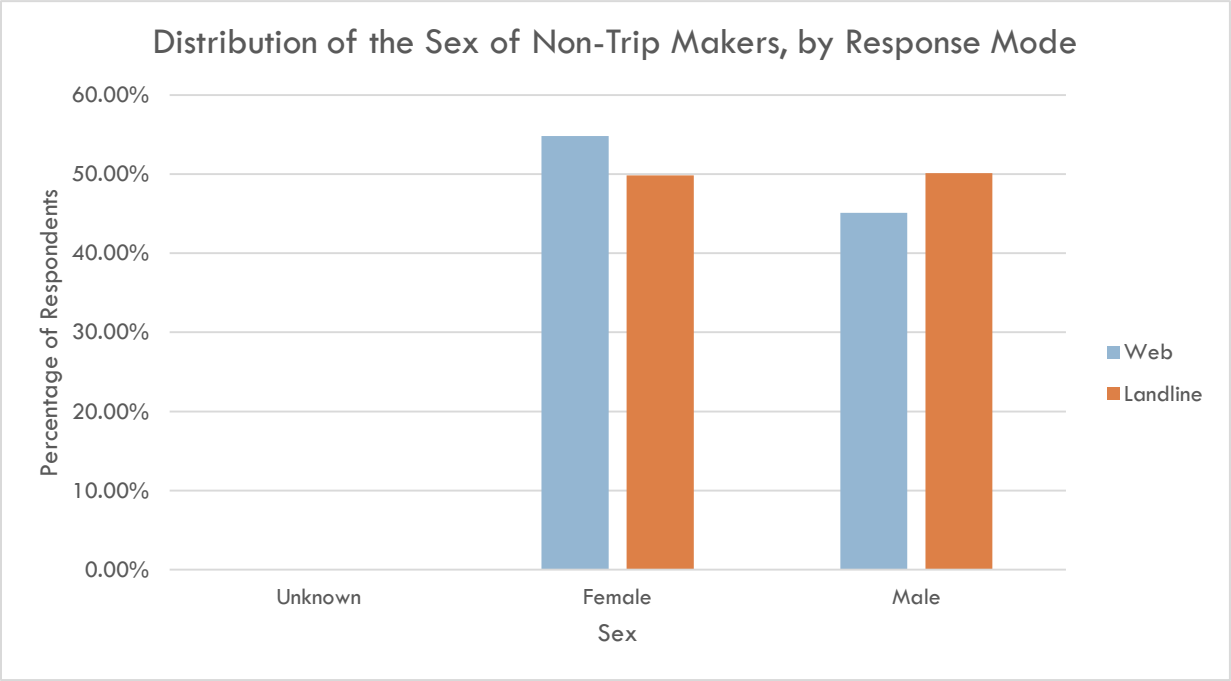

Age of Respondents, by Response Mode
12.00%
10.00%
8.00%
6.00%
4.00%
2.00%
0.00%
Percentage of Respondents
0-4
5-9
10-14
15-19
20-24
25-29
30-34
35-39
40-44
45-49
50-54
55-59
60-64
65-69
70-74
75-79
80-84
85+
Age
Web
Landline
2011 Census

## Distribution of Sex, by Response Mode

| | Overall | | Trip Makers | | Non-Trip Makers | |
|---|---|---|---|---|---|---|
| *Sex* | Web | Landline | Web | Landline | Web | Landline |
| *Unknown* | 19 | 112 | 5 | 22 | 14 | 90 |
| *Female* | 33990 | 175895 | 23486 | 115385 | 10504 | 60510 |
| *Male* | 34140 | 166248 | 25493 | 116037 | 8647 | 50211 |
| *Total* | 68149 | 342255 | 48984 | 231444 | 19165 | 110811 |

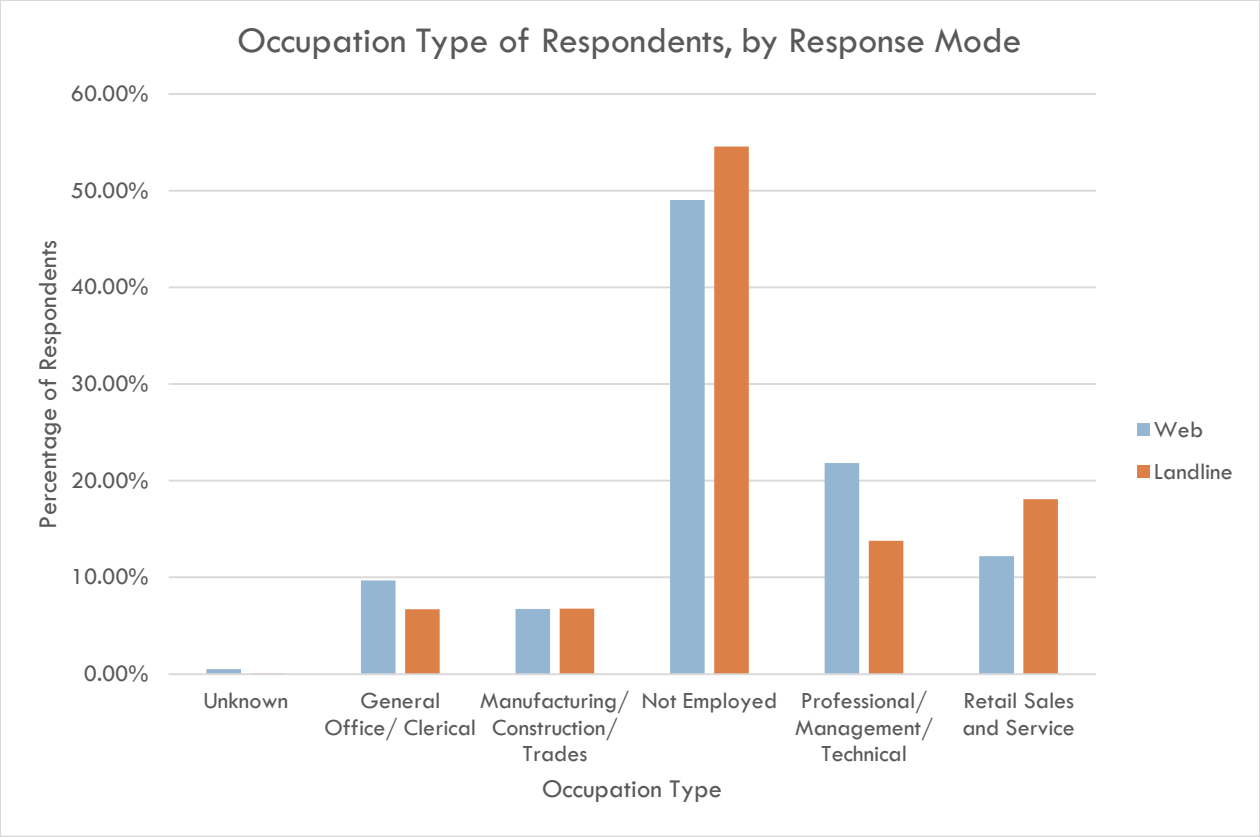


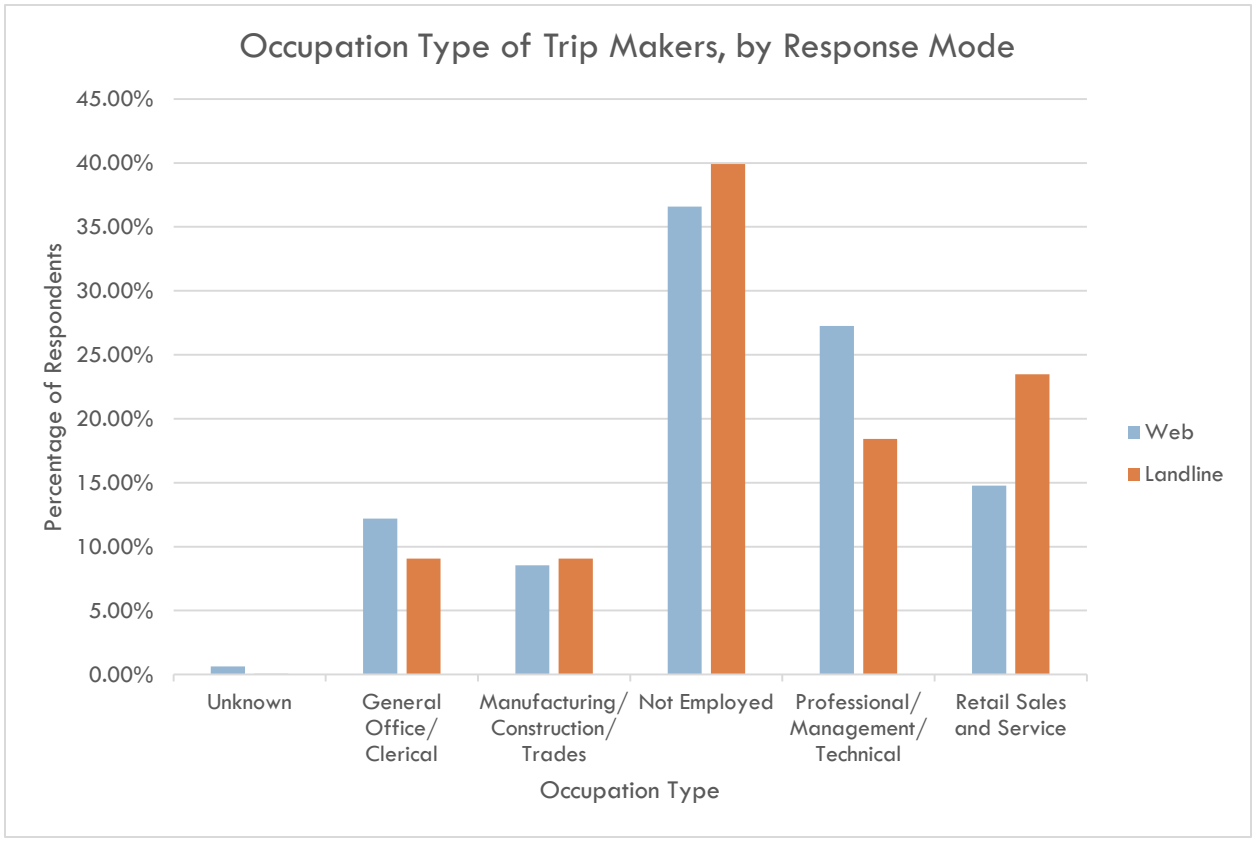

Distribution of the Sex of Trip Makers, by Response Mode
60.00%
50.00%
40.00%
30.00%
20.00%
10.00%
0.00%
Percentage of Respondents
Unknown
Female
Male
Sex
Web
Landline

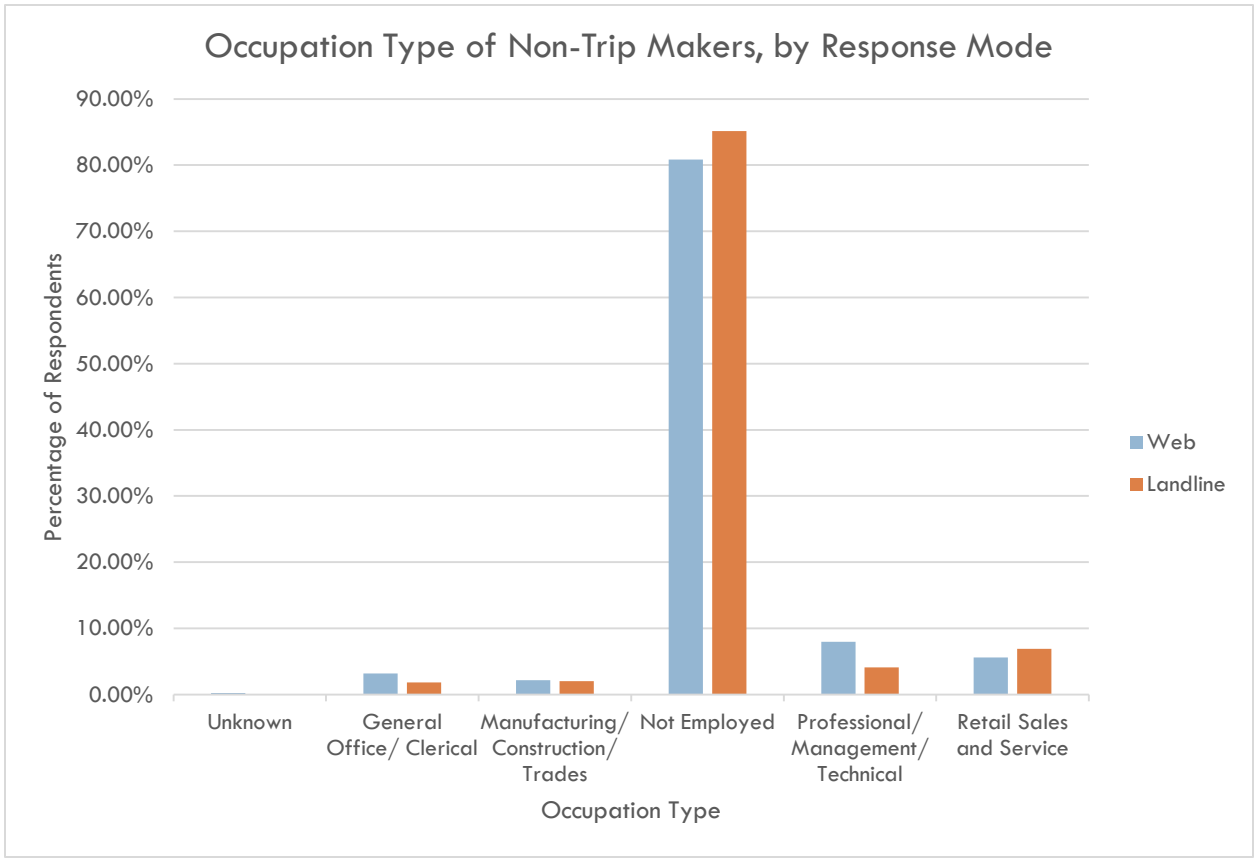



## Occupation Type, by Response Mode

| | Overall | | Trip Makers | | Non-Trip Makers | |
|---|---|---|---|---|---|---|
| *Occupation Type* | Web | Landline | Web | Landline | Web | Landline |
| *Unknown* | 350 | 194 | 306 | 158 | 44 | 36 |
| *General Office/ Clerical* | 6588 | 22995 | 5977 | 20982 | 611 | 2013 |
| *Manufacturing/ Construction/ Trades* | 4601 | 23187 | 4188 | 20972 | 413 | 2215 |
| *Not Employed* | 33417 | 186740 | 17925 | 92381 | 15492 | 94359 |
| *Professional/ Management/ Technical* | 14882 | 47175 | 13352 | 42616 | 1530 | 4559 |
| *Retail Sales and Service* | 8311 | 61964 | 7236 | 54335 | 1075 | 7629 |
| *Total* | 68149 | 342255 | 48984 | 231444 | 19165 | 110811 |

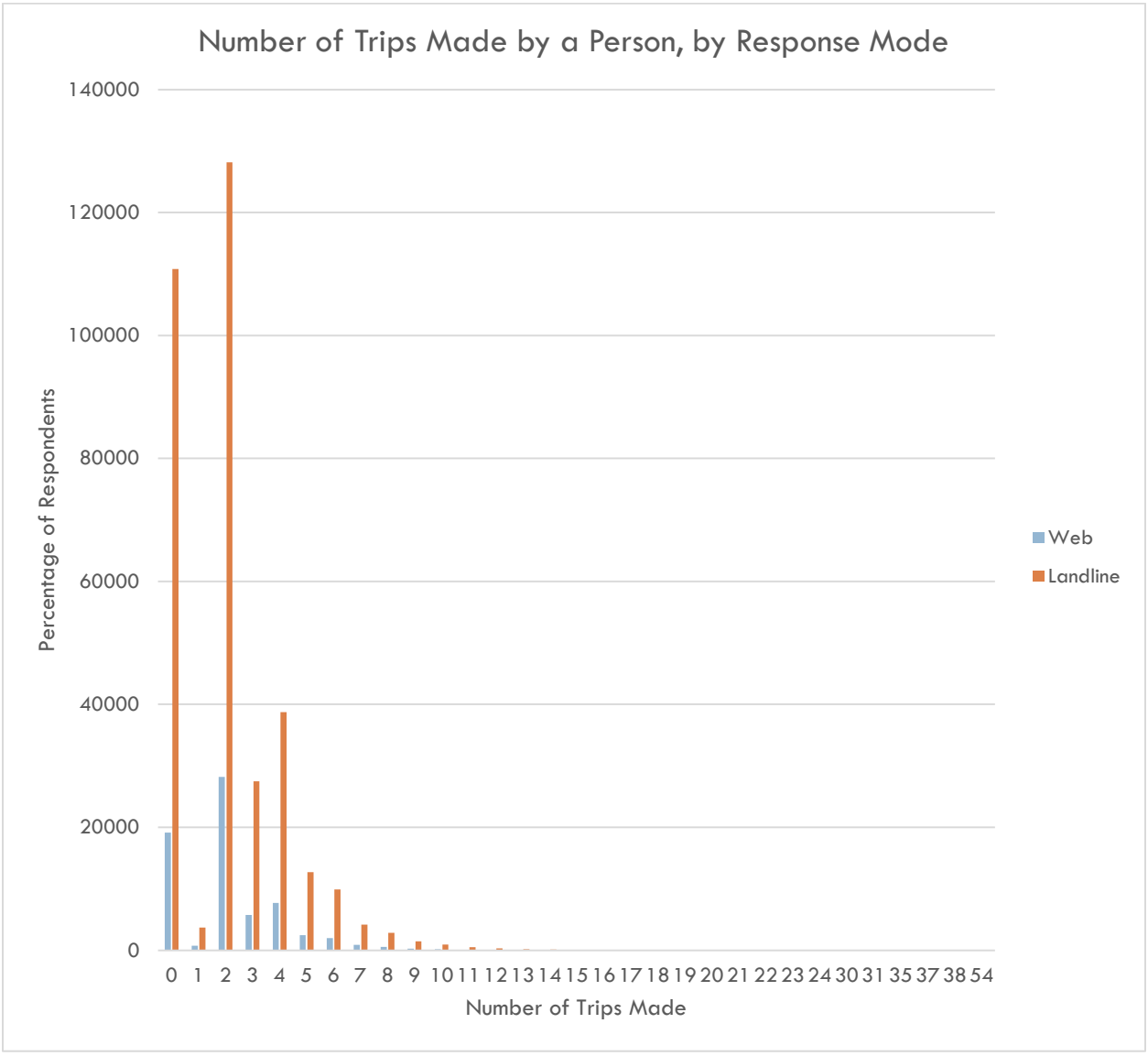

Occupation Type of Respondents, by Response Mode
60.00%
50.00%
40.00%
30.00%
20.00%
10.00%
0.00%
Percentage of Respondents
Unknown
General Office/ Clerical
Manufacturing/ Construction/ Trades
Not Employed
Professional/ Management/ Technical
Retail Sales and Service
Occupation Type
Web
Landline


Occupation Type of Trip Makers, by Response Mode
45.00%
40.00%
35.00%
30.00%
25.00%
20.00%
15.00%
10.00%
5.00%
0.00%
Percentage of Respondents
Unknown
General Office/ Clerical
Manufacturing/ Construction/ Trades
Not Employed
Professional/ Management/ Technical
Retail Sales and Service
Occupation Type
Web
Landline


Occupation Type of Non-Trip Makers, by Response Mode
90.00%
80.00%
70.00%
60.00%
50.00%
40.00%
30.00%
20.00%
10.00%
0.00%
Percentage of Respondents
Unknown
General Office/ Clerical
Manufacturing/ Construction/ Trades
Not Employed
Professional/ Management/ Technical
Retail Sales and Service
Occupation Type
Web
Landline

## Number of Trips Made by Respondents, by Response Mode:

| | Number of | |
|---|---|---|
| *Number of Trips made by* | Web | Landline |
| *1* | 763 | 3699 |
| *2* | 28198 | 128174 |
| *3* | 5752 | 27508 |
| *4* | 7696 | 38714 |
| *5* | 2466 | 12732 |
| *6* | 1973 | 9892 |
| *7* | 892 | 4192 |
| *8* | 566 | 2863 |
| *9* | 267 | 1456 |
| *10* | 170 | 916 |
| *11* | 89 | 488 |
| *12* | 64 | 317 |
| *13* | 25 | 175 |
| *14* | 24 | 116 |
| *15* | 13 | 67 |
| *16* | 10 | 53 |
| *17* | 6 | 30 |
| *18* | 3 | 12 |
| *19* | 2 | 8 |
| *20* | 0 | 9 |
| *21* | 1 | 9 |
| *22* | 0 | 5 |
| *23* | 1 | 2 |
| *24* | 2 | 1 |
| *30* | 0 | 2 |
| *31* | 0 | 1 |
| *35* | 0 | 1 |
| *37* | 0 | 1 |
| *38* | 1 | 0 |
| *54* | 0 | 1 |
| *Total* | 48984 | 231444 |

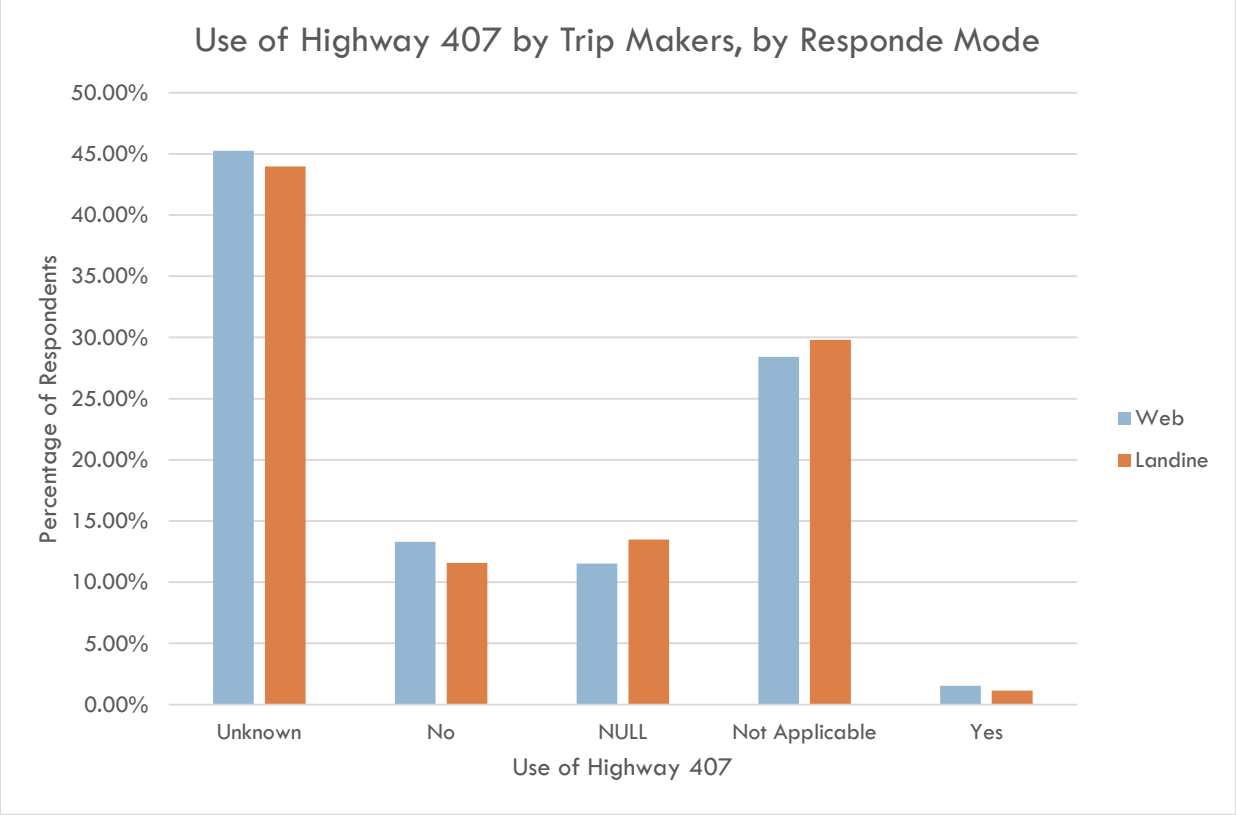

Number of Trips Made by a Person, by Response Mode
140000
120000
100000
80000
60000
40000
20000
0
Percentage of Respondents
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 30 31 35 37 38 54
Number of Trips Made
Web
Landline

## Number of Transit Trips:

| | Number of Respondents | | |
|---|---|---|---|
| **Number of Transit** | **Web** | **Landline** | **Total** |
| **0** | 60630 | 305773 | 366403 |
| **1** | 1214 | 5365 | 6579 |
| **2** | 5819 | 28032 | 33851 |
| **3** | 308 | 1863 | 2171 |
| **4** | 156 | 1025 | 1181 |
| **5** | 18 | 133 | 151 |
| **6** | 5 | 45 | 50 |
| **7** | 2 | 12 | 14 |
| **8** | 0 | 4 | 4 |
| **Total** | 68152 | 342252 | 410404 |

## Use of Highway 407, by Response Mode:

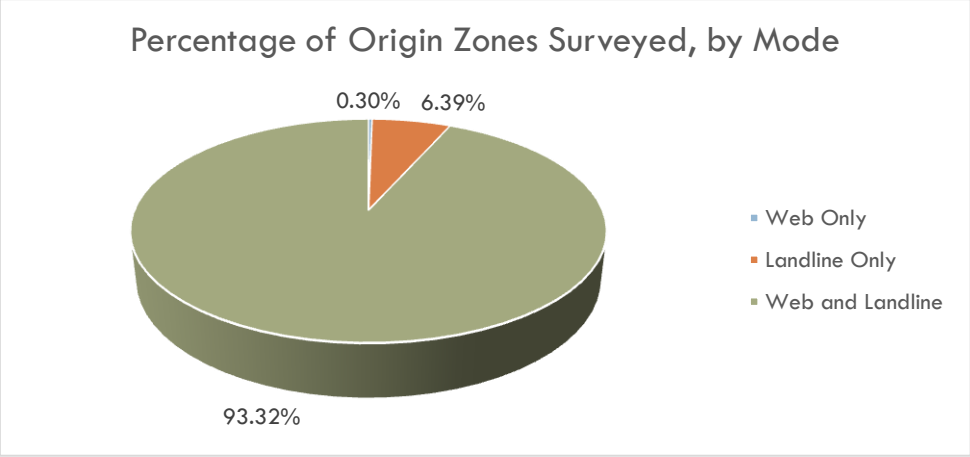
| Used Highway 407 | Web | Landline | Total |
|---|---|---|---|
| **Unknown** | 75347 | 361653 | 437000 |
| **No** | 22125 | 95268 | 117393 |
| **NULL** | 19165 | 110811 | 129976 |
| **Not Applicable** | 47325 | 245125 | 292450 |
| **Yes** | 2532 | 9473 | 12005 |
| **Total** | 166494 | 822330 | 988824 |



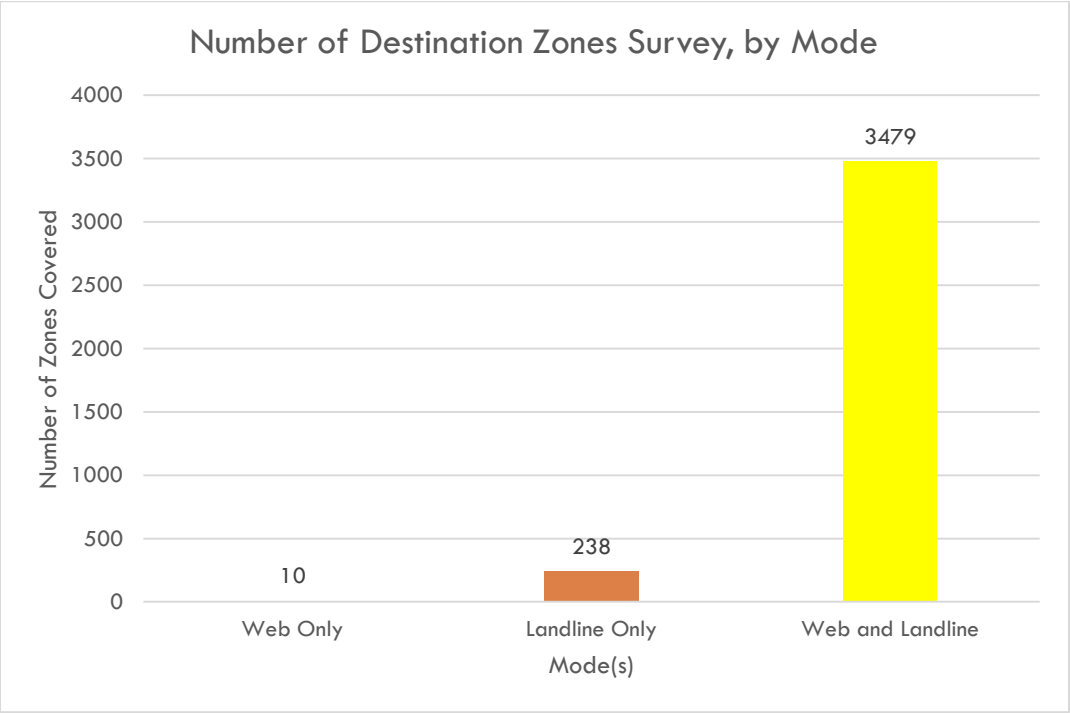
## Origin and Destination Zones:

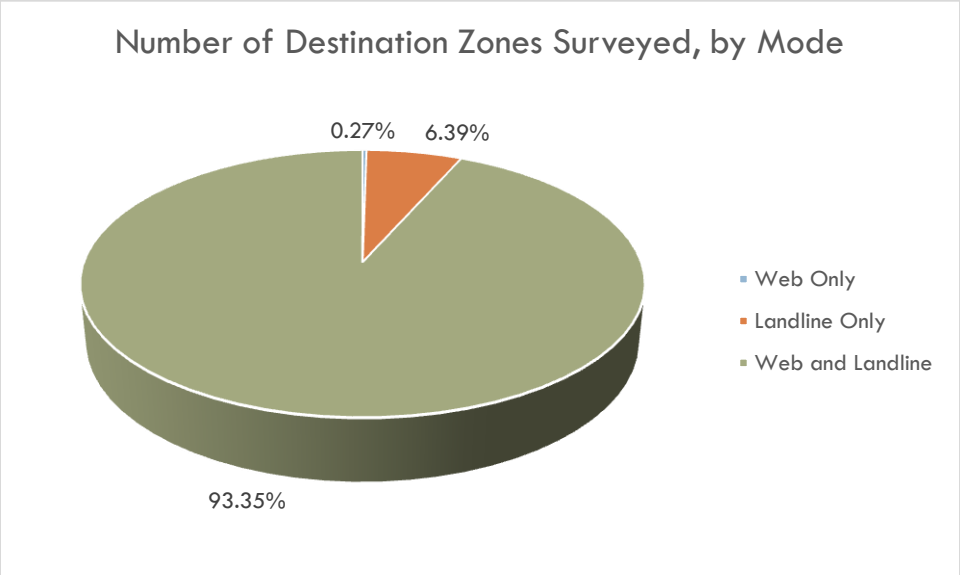
Origin Zones:

| Mode | Number of Zones Surveyed | Percentage |
|---|---|---|
| **Web Only** | 11 | 0.30% |
| **Landline Only** | 238 | 6.39% |
| **Web and Landline** | 3477 | 93.32% |
| **Total** | 3726 | 100.00% |



Destination Zones:



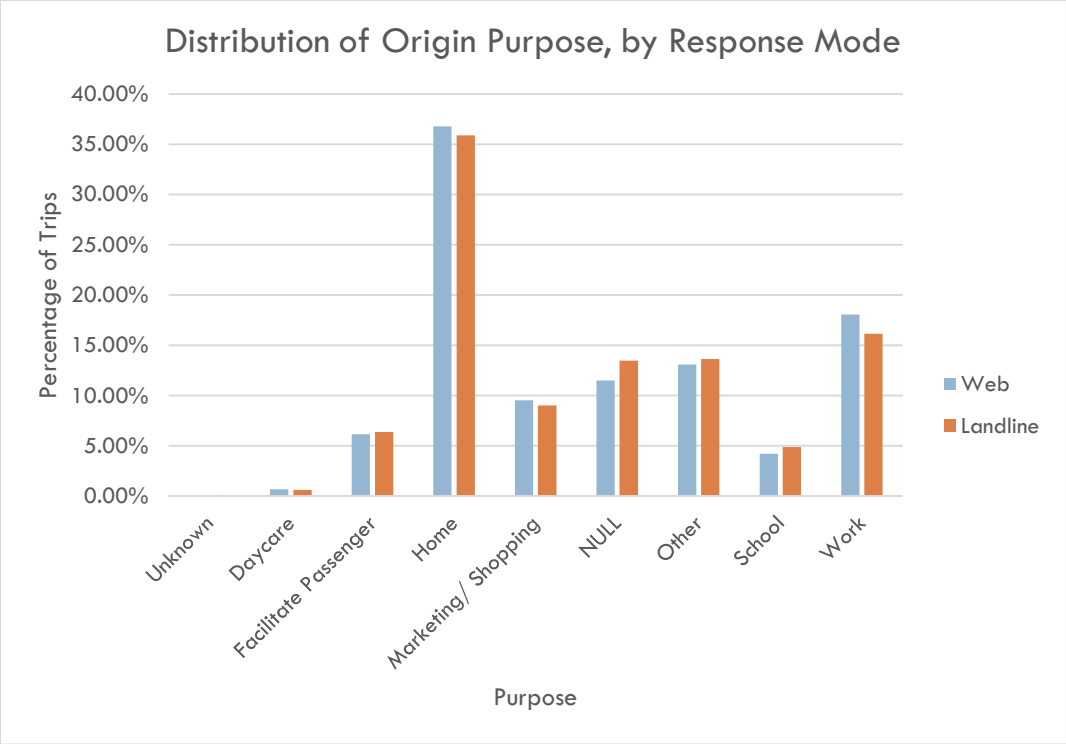



**Origin and Destination Purpose:**

Origin Purpose:

**Number of trips**

| *Origin Purpose* | Web | Landline | Total |
|---|---|---|---|
| *Unknown* | 18 | 15 | 33 |
| *Daycare* | 1146 | 4947 | 6093 |
| *Facilitate Passenger* | 10245 | 52451 | 62696 |
| *Home* | 61244 | 295131 | 356375 |
| *Marketing/ Shopping* | 15841 | 74236 | 90077 |
| *NULL* | 19165 | 110811 | 129976 |
| *Other* | 21773 | 111998 | 133771 |
| *School* | 7013 | 40077 | 47090 |
| *Work* | 30049 | 132664 | 162713 |
| *Total* | 166494 | 822330 | 988824 |

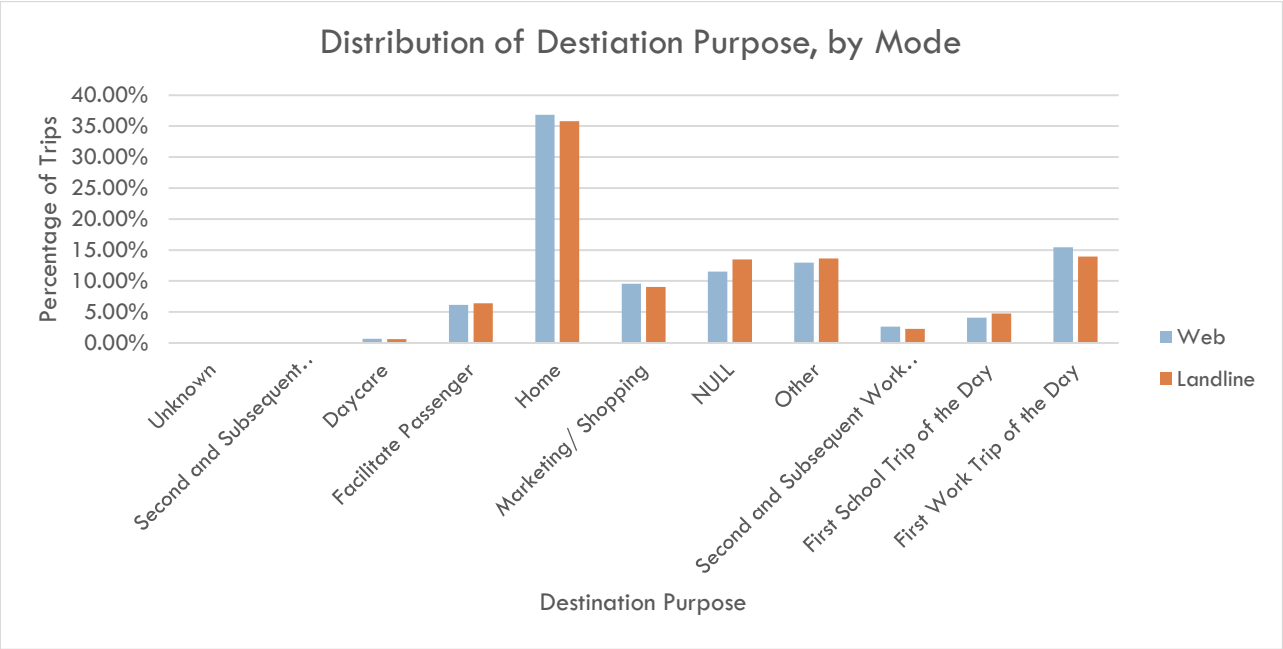



Destination Purpose:

**Number of Trips**

| *Destination Purpose* | Web | Landline | Total |
|---|---|---|---|
| *Unknown* | 20 | 15 | 35 |
| *Second and Subsequent School Trips* | 226 | 1184 | 1410 |
| *Daycare* | 1146 | 4951 | 6097 |
| *Facilitate Passenger* | 10257 | 52536 | 62793 |
| *Home* | 61302 | 294364 | 355666 |
| *Marketing/ Shopping* | 15868 | 74294 | 90162 |
| *NULL* | 19165 | 110811 | 129976 |
| *Other* | 21590 | 111984 | 133574 |
| *Second and Subsequent Work Trips* | 4375 | 18534 | 22909 |
| *First School Trip of the Day* | 6793 | 38918 | 45711 |
| *First Work Trip of the Day* | 25752 | 114739 | 140491 |

| | | | |
|---|---|---|---|
| *Total* | 166494 | 822330 | 988824 |

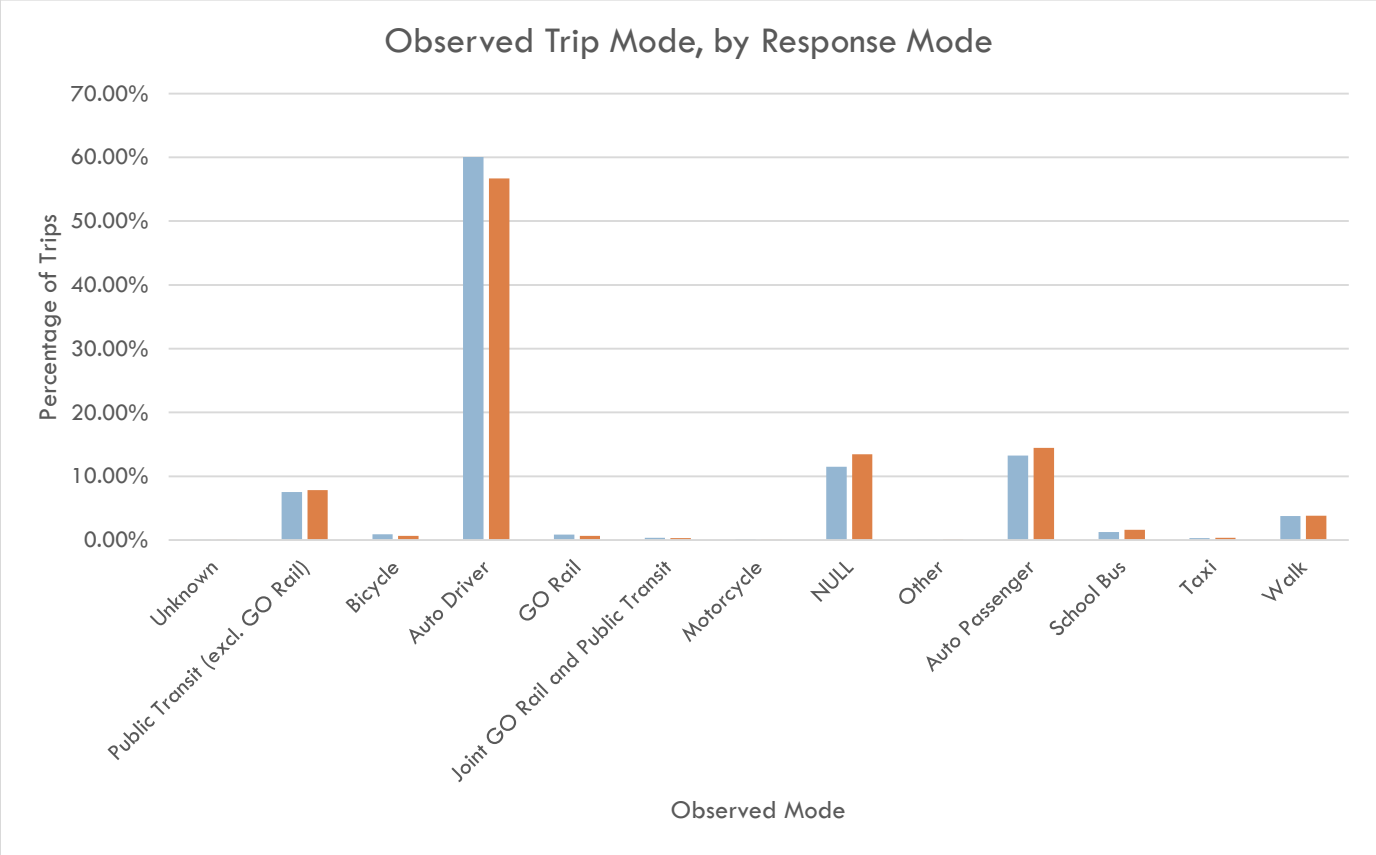



**Observed Mode:**

**Number of Trips**

| *Observed Mode* | Web | Landline | Total |
|---|---|---|---|
| *Unknown* | 19 | 4 | 23 |
| *Public Transit (excl. GO Rail)* | 12505 | 64432 | 76937 |
| *Bicycle* | 1548 | 5410 | 6958 |
| *Auto Driver* | 100004 | 466394 | 566398 |
| *GO Rail* | 1471 | 5355 | 6826 |
| *Joint GO Rail and Public Transit* | 558 | 2382 | 2940 |
| *Motorcycle* | 160 | 338 | 498 |
| *NULL* | 19165 | 110811 | 129976 |
| *Other* | 115 | 943 | 1058 |

| | | | |
|---|---|---|---|
| *Auto Passenger* | 22056 | 118730 | 140786 |
| *School Bus* | 2105 | 13301 | 15406 |
| *Taxi* | 515 | 2782 | 3297 |
| *Walk* | 6273 | 31448 | 37721 |
| *Total* | 166494 | 822330 | 988824 |



# APPENDIX C: DETAILS OF COMPARISON OF SAMPLE MEANS FROM 2011 TTS DATA

1. Number of Vehicles:

| Response Mode | Mean | Standard Deviation | Sample Size |
|---|---|---|---|
| **Web** | 1.7999 | 3.9394 | 24338 |
| **Landline** | 1.5706 | 1.2519 | 114660 |

$H_o$: μ(NVEH, web) - μ(NVEH, landline) = 0
$H_1$: μ(NVEH, web) - μ(NVEH, landline) > 0

$$\sigma(\text{web - landline}) = \sqrt{\frac{s_W^2}{n_W} + \frac{s_{LL}^2}{n_{LL}}} = 0.0255$$

For α = 5%, z-score = 1.6
For α = 1%, z-score = 1.7

μ(NVEH, web) - μ(NVEH, landline) = 0.229

For α = 5%, z-score * σ(web - landline) = 0.0408
For α = 1%, z-score * σ(web - landline) = 0.0434

Since μ(NVEH, web) - μ(NVEH, landline) > z-score * σ(web - landline), reject the null hypothesis with both a 95% and 99% confidence level

Therefore, households that responded by web tend to own more vehicles

2. Number of Persons in Household

| Response Mode | Mean | Standard Deviation | Sample Size |
|---|---|---|---|
| **Web** | 2.6154 | 1.2295 | 24338 |
| **Landline** | 2.7469 | 1.3697 | 114660 |

$H_o$: μ(NPERS, landline) - μ(NPERS, web) = 0
$H_1$: μ(NPERS, landline) - μ(NPERS, web) > 0

σ(landline - web) = $\sqrt{\frac{s_W^2}{n_w} + \frac{s_{LL}^2}{n_{LL}}}$ = 0.0089
For α = 5%, z-score = 1.6
For α = 1%, z-score = 1.7

μ(NPERS, landline) - μ(NPERS, web) = 0.1315

For α = 5%, z-score * σ(landline - web) = 0.0142
For α = 1%, z-score * σ(landline - web) = 0.0151
Since μ(NPERS, landline) - μ(NPERS, web) > z-score * σ(landline - web), reject the null hypothesis with both a 95% and 99% confidence level

Therefore, households that responded by landline tend to be larger than those who responded by web

3. Number of Students in Household

| Response Mode | Mean | Standard Deviation | Sample Size |
|---|---|---|---|
| **Web** | 0.4846 | 0.8377 | 24338 |
| **Landline** | 0.5951 | 0.9439 | 114660 |

$H_o$: μ(NSTUD, landline) - μ(NSTUD, web) = 0
$H_1$: μ(NSTUD, landline) - μ(NSTUD, web) > 0

σ(landline - web) = $\sqrt{\frac{s_W^2}{n_w} + \frac{s_{LL}^2}{n_{LL}}}$ = 0.0060
For α = 5%, z-score = 1.6
For α = 1%, z-score = 1.7

μ(NSTUD, landline) - μ(NSTUD, web) = 0.1105

For α = 5%, z-score * σ(web - landline) = 0.0097
For α = 1%, z-score * σ(web - landline) = 0.0103

Since μ(NSTUD, landline) - μ(NSTUD, web) > z-score * σ(landline - web), reject the null hypothesis with both a 95% and 99% confidence level

Therefore, households that responded by landline tend to contain more students than those who respond by web

4. Number of Household Trips

| Response Mode | Mean | Standard Deviation | Sample Size |
|---|---|---|---|
| **Web** | 6.0535 | 4.0606 | 24338 |
| **Landline** | 6.2055 | 4.2916 | 114660 |

$H_o$: μ(N_HH_TRIPS, landline) - μ(N_HH_TRIPS, web) = 0
$H_1$: μ(N_HH_TRIPS, landline) - μ(N_HH_TRIPS, web) > 0

σ(landline - web) = $\sqrt{\frac{s_W^2}{n_W} + \frac{s_{LL}^2}{n_{LL}}}$ = 0.0289
For α = 5%, z-score = 1.6
For α = 1%, z-score = 1.7
μ(N_HH_TRIPS, landline) - μ(N_HH_TRIPS, web) = 0.1520

For α = 5%, z-score * σ(web - landline) = 0.0463
For α = 1%, z-score * σ(web - landline) = 0.0492

Since μ(N_HH_TRIPS, landline) - μ(N_HH_TRIPS, web) < z-score * σ(landline - web), accept the null hypothesis with both a 95% and 99% confidence level

Therefore, households that responded by landline tend to make roughly the same number of trips as households that responded by web

5. Average Age of Respondents
    a. Web vs. Landline Respondents

| Response Mode | Mean | Standard Deviation | Sample Size |
|---|---|---|---|
| **Web** | 44.5142 | 21.8434 | 68149 |
| **Landline** | 42.6780 | 23.8426 | 342255 |

$H_o$: μ(AGE, web) - μ(AGE, landline) = 0
$H_1$: μ(AGE, web) - μ(AGE, landline) > 0

σ(web - landline) = $\sqrt{\frac{s_W^2}{n_W} + \frac{s_{LL}^2}{n_{LL}}}$ = 0.0931

For α = 5%, z-score = 1.6
For α = 1%, z-score = 1.7

μ(AGE, web) - μ(AGE, landline) = 1.8363

For α = 5%, z-score * σ(web - landline) = 0.1489
For α = 1%, z-score * σ(web - landline) = 0.1582

Since μ(AGE, web) - μ(AGE, landline) > z-score * σ(web - landline), reject the null hypothesis with both a 95% and 99% confidence level

The age of respondents whose information was collected via web survey tends to be greater than their counterparts who completed the landline survey

b. Web vs. Landline Trip Makers

| Response Mode | Mean | Standard Deviation | Sample Size |
|---|---|---|---|
| **Web** | 46.5898 | 18.2697 | 48984 |
| **Landline** | 45.1635 | 19.7735 | 231444 |

$H_o$: μ(AGE, web) - μ(AGE, landline) = 0
$H_1$: μ(AGE, web) - μ(AGE, landline) > 0

σ(web - landline) = $\sqrt{\frac{s_W^2}{n_W} + \frac{s_{LL}^2}{n_{LL}}}$ = 0.0922

For α = 5%, z-score = 1.6
For α = 1%, z-score = 1.7

μ(AGE, web) - μ(AGE, landline) = 1.4264

For α = 5%, z-score * σ(web - landline) = 0.1475
For α = 1%, z-score * σ(web - landline) = 0.1568

Since μ(AGE, web) - μ(AGE, landline) > z-score * σ(web - landline), reject the null hypothesis with both a 95% and 99% confidence level

The age of trip makers whose information was collected via web survey tends to be greater than their counterparts who completed the landline survey

c. Web Vs. Landline Non-Trip Makers

| Response Mode | Mean | Standard Deviation | Sample Size |
|---|---|---|---|
| **Web** | 39.2091 | 28.3621 | 19165 |
| **Landline** | 37.4866 | 29.9885 | 110811 |

$H_o$: μ(AGE, web) - μ(AGE, landline) = 0
$H_1$: μ(AGE, web) - μ(AGE, landline) > 0

σ(web - landline) = $\sqrt{\frac{s_W^2}{n_W} + \frac{s_{LL}^2}{n_{LL}}}$ = 0.2238

For α = 5%, z-score = 1.6
For α = 1%, z-score = 1.7

μ(AGE, web) - μ(AGE, landline) = 1.7226

For α = 5%, z-score * σ(web - landline) = 0.3581
For α = 1%, z-score * σ(web - landline) = 0.3805
Since μ(AGE, web) - μ(AGE, landline) > z-score * σ(web - landline), reject the null hypothesis with both a 95% and 99% confidence level

The age of non-trip makers whose information was collected via web survey tends to be greater than their counterparts who completed the landline survey

d. Trip Makers vs. Non-Trip Makers

| Response Mode | Mean | Standard Deviation | Sample Size |
|---|---|---|---|
| **Trip Makers** | 45.4126 | 19.5267 | 280428 |
| **Non-Trip Makers** | 37.7406 | 29.7605 | 129976 |

$H_o$:

μ(AGE, web) - μ(AGE, landline) = 0
$H_1$: μ(AGE, web) - μ(AGE, landline) > 0

$$\sigma(\text{web - landline}) = \sqrt{\frac{s_W^2}{n_W} + \frac{s_{LL}^2}{n_{LL}}} = 0.0904$$

For α = 5%, z-score = 1.6
For α = 1%, z-score = 1.7

μ(AGE, web) - μ(AGE, landline) = 7.6721

For α = 5%, z-score * σ(web - landline) = 0.1447
For α = 1%, z-score * σ(web - landline) = 0.1537
Since μ(AGE, web) - μ(AGE, landline) > z-score * σ(web - landline), reject the null hypothesis with both a 95% and 99% confidence level

The age of trip makers tends to be greater than their counterparts who did not report making any trips

e. Trip Makers vs. Non-Trip Makers, excluding people younger than 11

| Response Mode | Mean | Standard Deviation | Sample Size |
|---|---|---|---|
| **Trip Makers** | 45.4126 | 19.5267 | 280428 |
| **Non-Trip Makers** | 57.0763 | 20.1386 | 81469 |

$H_o$: μ(AGE, NTM) - μ(AGE, TM) = 0
$H_1$: μ(AGE, NTM) - μ(AGE, TM) > 0

$$\sigma(\text{NTM - TM}) = \sqrt{\frac{s_W^2}{n_W} + \frac{s_{LL}^2}{n_{LL}}} = 0.0796$$

For α = 5%, z-score = 1.6
For α = 1%, z-score = 1.7
μ(AGE, web) - μ(AGE, landline) = 11.6636

For α = 5%, z-score * σ(NTM - TM) = 0.1274
For α = 1%, z-score * σ(NTM - TM) = 0.1353
Since μ(AGE, NTM) - μ(AGE, TM) > z-score * σ(NTM - TM), reject the null hypothesis with both a 95% and 99% confidence level

The age of non-trip makers tends to be greater than their counterparts who reported making at least one trip

This increase in the average age of non-trip makers is due to the fact that trip information was only recorded for respondents who were aged 11 or older (see data guide); any respondent younger than 11 were assigned

6. Number of Trips Made by an Individual on the Trip Day

| Response Mode | Mean | Standard Deviation | Sample Size |
|---|---|---|---|
| **Web** | 2.1619 | 1.9629 | 68149 |
| **Landline** | 2.0789 | 2.0209 | 342255 |

$H_o$: μ(N_PERS_TRIPS, web) - μ(N_PERS_TRIPS, landline) = 0
$H_1$: μ(N_PERS_TRIPS, web) - μ(N_PERS_TRIPS, landline) > 0

$\sigma(\text{web - landline}) = \sqrt{\frac{s_W^2}{n_w} + \frac{s_{LL}^2}{n_{LL}}} = 0.0083$

For α = 5%, z-score = 1.6
For α = 1%, z-score = 1.7

μ(N_PERS_TRIPS, web) - μ(N_PERS_TRIPS, landline) = 0.0830

For α = 5%, z-score * σ(web - landline) = 0.0132
For α = 1%, z-score * σ(web - landline) = 0.0141

Since μ(N_PERS_TRIPS, web) - μ(N_PERS_TRIPS, landline) > z-score * σ(landline - web), reject the null hypothesis with both a 95% and 99% confidence level

Therefore, persons whose trip information was collected via web survey tend to make more trips than respondents landline survey respondents

7. Number of Transit Trips Made by an Individual

| Response Mode | Mean | Standard Deviation | Sample Size |
|---|---|---|---|
| **Web** | 0.2133 | 0.6339 | 68149 |
| **Landline** | 0.2109 | 0.6424 | 342255 |

$H_o$: μ(N_TRANS_TRIPS, web) - μ(N_TRANS_TRIPS, landline) = 0
$H_1$: μ(N_TRANS_TRIPS, web) - μ(N_TRANS_TRIPS, landline) > 0

$\sigma(\text{web - landline}) = \sqrt{\frac{s_W^2}{n_w} + \frac{s_{LL}^2}{n_{LL}}} = 0.0027$

For α = 5%, z-score = 1.6
For α = 1%, z-score = 1.7

μ(N_TRANS_TRIPS, web) - μ(N_TRANS_TRIPS, landline) = 0.0024

For α = 5%, z-score * σ(web - landline) = 0.0043
For α = 1%, z-score * σ(web - landline) = 0.0045

Since μ(N_TRANS_TRIPS, web) - μ(N_TRANS_TRIPS, landline) < z-score * σ(landline - web), accept the null hypothesis with both a 95% and 99% confidence level

Therefore, persons whose trip information was collected via web survey tend to make roughly the same number of transit trips as landline survey respondents

8. Number of TTC Trips Made by an Individual

| Response Mode | Mean | Standard Deviation | Sample Size |
|---|---|---|---|
| **Web** | 0.2133 | 0.6339 | 68149 |
| **Landline** | 0.2109 | 0.6424 | 342255 |

$H_o$: μ(N_TTC_TRIPS, web) - μ(N_TTC_TRIPS, landline) = 0
$H_1$: μ(N_TTC_TRIPS, web) - μ(N_TTC_TRIPS, landline) > 0

σ(web - landline) = $\sqrt{\frac{s_w^2}{n_w} + \frac{s_{LL}^2}{n_{LL}}}$ = 0.0047

For α = 5%, z-score = 1.6

For α = 1%, z-score = 1.7

μ(N_TTC_TRIPS, web) - μ(N_TTC_TRIPS, landline) = 0.0097

For α = 5%, z-score * σ(web - landline) = 0.0076

For α = 1%, z-score * σ(web - landline) = 0.0080

Since μ(N_TTC_TRIPS, web) - μ(N_TTC_TRIPS, landline) > z-score * σ(landline - web), reject the null hypothesis with both a 95% and 99% confidence level

Therefore, persons whose trip information was collected via web survey tend to make more trips using the TTC than landline survey respondents

9. Distance per Trip

| Response Mode | Mean | Standard Deviation | Sample Size |
|---|---|---|---|
| **Web** | 11056.6493 | 19263.9333 | 147329 |
| **Landline** | 10542.5640 | 18964.2630 | 711519 |

$H_o$: μ(SL_DISTANCE, web) - μ(SL_DISTANCE, landline) = 0

$H_1$: μ(SL_DISTANCE, web) - μ(SL_DISTANCE, landline) > 0

σ(web - landline) = $\sqrt{\frac{s_w^2}{n_w} + \frac{s_{LL}^2}{n_{LL}}}$ = 54.9937

For α = 5%, z-score = 1.6

For α = 1%, z-score = 1.7

μ(SL_DISTANCE, web) - μ(SL_DISTANCE, landline) = 514.0853

For α = 5%, z-score * σ(web - landline) = 87.9899

For α = 1%, z-score * σ(web - landline) = 93.4893

Since μ(SL_DISTANCE, web) - μ(SL_DISTANCE, landline) > z-score * σ(landline - web), reject the null hypothesis with both a 95% and 99% confidence level

Therefore, persons whose trip information was collected via web survey tend to make longer trips (in terms of straight-line distance) than landline survey respondents

# APPENDIX D: CANADA COMPLETE™ CONSUMER MASTERFILE

For more information or to order, contact us. Tel: 1-877-281-4137

Email: data.targetingsolutions@canadapost.ca

## Canada Complete™: Consumer Masterfile

This list helps you target your best potential customers, while allowing you to access more than 13 million Canadian residential addresses.

Sourced from Canada Post's mail delivery database, achieve outstanding coverage and complete market penetration in urban residential areas in Canada. For added personalization and to help boost open rates, this comprehensive list also includes a subset of over seven million consumer names from self-reported survey data and the telephone directory publishers. All address records are validated to ensure accuracy and completeness (including full apartment and suite information).

| General Details | |
|---|---|
| Type | General, Addresses |
| List universe | 13,467,720 |
| Minimum order | 5,000 |
| Base cost / thousand | $32.50 |
| List updated | Monthly |

| Complimentary Services | |
|---|---|
| Address Accuracy, including Statement of Accuracy | ✓ |
| National Change of Address (NCOA) | ✓ |
| Canadian Marketing Association 'Do Not Mail' suppression | ✓ |
| Deceased suppression | ✓ |
| Secure File Transfer | ✓ |

**List Terms**

- For one-time use only
- Cancellation fee: $500.00/F
- List valid for 90 days
- List orders greater than 100,000 records are eligible for additional savings
- Full terms and conditions are set out in the

| Property (Ontario) | Costs |
|---|---|
| Property features | $20.00/M |
| Year home built | $20.00/M |
| Home value | $25.00/M |

| Ecommerce | Costs |
|---|---|
| Ecommerce recipients | $10.00/M |
| Mass merchants | $40.00/M |
| Fashion | $40.00/M |
| Health and beauty | $40.00/M |
| Books, music, video | $40.00/M |

| Movers | Costs |
|---|---|
| New addresses | $17.50/M |
| New occupants | $17.50/M |
| 1-2 month recency | $25.00/M |
| 3-5 month recency | $20.00/M |
| 6-12 month recency | $15.00/M |

| Selects | Costs |
|---|---|
| Consumer names | $20.00/M |
| Geography | $10.00/M |
| Telephone numbers | $25.00/M |
| Residence type (houses / apt) | $20.00/M |
| Parcel lock box | $20.00/M |
| French language indicator (QC) | $10.00/M |

| Demographics | Costs |
|---|---|
| Gender | $10.00/M |
| Age | $20.00/M |
| Household income | $20.00/M |
| Marital status | $20.00/M |
| Ethnicity | $20.00/M |
| Mother tongue | $20.00/M |
| Education | $20.00/M |

| Interests | Costs |
|---|---|
| Charitable donors | $20.00/M |
| Travel frequency | $20.00/M |
| Reading preferences | $20.00/M |
| Mail order buyers | $20.00/M |
| Common ailments | $20.00/M |
| Nutrition and diet | $20.00/M |
| Loyalty card holders | $20.00/M |

| Automotive | Costs |
|---|---|
| Vehicle type | $60.00/M |
| Vehicle make | $60.00/M |
| Year | $60.00/M |
| Country of origin | $60.00/M |
| Parent model | $60.00/M |

| Additional services | Costs |
|---|---|
| Suppression of customer lists | $10.00/M |
| 'Do Not Call' suppression | $350.00/F |
| Key coding | $5.00/M |
| File split | $50.00/F |
| **Re-use (<100,000 records)** | **Costs** |
| Base cost | $22.50/M |
| Select(s) cost | 50% off |
| **Re-use (>100,000 records)** | **Costs** |
| Base cost | Waived |
| Select(s) cost | 50% off |

| Lifestyle | Costs |
|---|---|
| PRIZM5 | $15.00/M |
| PRIZM QC | $15.00/M |