# A Comparison of Internet and Mail-Based Transportation Surveys

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**ABSTRACT**
According to a recent National Cooperative Highway Research Program (NCHRP) report, internet surveys for collection of transportation data are in an experimental stage and "have yet to undergo extensive field testing." Comparative studies are recommended "to determine what consistent practice should be" for Internet-based data collection (*1*) . This paper compares a recent internet-based survey to a mail-based survey conducted of downtown employees in Buffalo, NY. Surprisingly, many of the demographic characteristics and journey to work patterns of respondents from these two approaches are similar, if not identical. In addition, the internet survey was significantly more cost and time efficient. These findings suggest that in certain circumstances, data from internet surveys may be reliable enough for use in decision making.

## INTRODUCTION

Federal, state, and local transportation agencies require personal travel data for use in planning models and other decision-making processes. Typically, Computer Assisted Telephone Interview (CATI) surveys using random lists of telephone numbers or mail out - mail back surveys using randomly selected addresses are performed to obtain information on who is traveling, as well as how, when, and why they are traveling. These surveys may be quite large in scope. A review by Travel Model Improvement Program (TMIP) of 65 Metropolitan Planning Organizations found that household surveys totaled 200,000 respondents based on more than 500,000 contacts, and cost up to $12 million to conduct (*2*). Prohibitive cost and time constraints restrict the frequency of transportation data collection. Recently, the internet has been used as a means of quickly and inexpensively obtaining transportation data for specialized studies either as the primary method or in combination with other survey approaches *(3)(4)(5)(6)(7)*.

According to a recent NCHRP report, internet surveys for collection of transportation data are in an experimental stage and "have yet to undergo extensive field testing." Comparative studies are recommended "to determine what consistent practice should be" for internet-based data collection (*1*). This paper compares a recent internet-based survey to a mail-based survey conducted of downtown employees in Buffalo, NY. First, a brief background on web-based surveys focuses on advantages and criticisms of this methodology. Next an overview of the two surveys used in this study is presented followed by a comparison of the results. Surprisingly, many of the demographic characteristics and journey to work patterns of respondents from these two approaches are similar, if not identical. In addition, the internet survey was significantly more cost and time efficient. These findings suggest that in certain circumstances, transportation data from internet surveys may be reliable enough for use in decision making.

## BACKGROUND ON INTERNET SURVEYS

The internet has experienced exponential growth worldwide in users and uses. In the United States, three of every four adults use the Internet (*8*) Recently, several software vendors have developed on-line survey tools that allow users to design their own questions and question type (open-ended, rating scale, single or multiple choice, etc.) Many companies and agencies, including the Census Bureau, use internet surveys to gather information from those who use their web site, mostly addressing customer satisfaction with web site content and design. Researchers now view the internet as an efficient and effective means to collect data. Advantages of this approach include:

- Access to a large portion of the general public,
- Convenience for respondents (24-7 availability, no appointments necessary for re-contact),
- Improved data quality – reduced errors in data entry, illegible responses, and spelling,
- Reduced logical errors (responses that are inconsistent with previous responses) using error-trapping,
- Reduced item non-response (either by forced or prompted response),
- Low administrative overhead costs, and
- Flexibility and customization – the ability to adapt questions based on user responses and to incorporate graphics and multi-media to enhance the survey.

Archer (*9*) provides an excellent summary of the advantages and disadvantages of web-based surveys based on Dillman's (*10*) book. In addition, Archer (*9*) presents design guidelines, implementation tips, and a cost comparison of a traditional mail survey and a web-based survey.

Criticisms of the use of the internet to collect data center on sample selection and bias. Some approaches to implementing internet surveys do not guarantee a random sample. Respondents are self-selected. Ways to achieve a random sample include recruiting participants from randomly selected households through the mail using an introductory letter listing a secure survey web-site address or generating a list of email addresses from which to randomly solicit respondents. The latter approach works extremely well for specific institutions like universities where all students, faculty and staff are

assigned email addresses but can be difficult to implement for a regional study. Potoglou and Kanaroglou (*5*) initially used email address lists provided by major employers in the city of Hamilton, Ontario, Canada. However, they do not document the time and cost associated with obtaining email address lists. Also, their research faced the problem of determining non-response because in addition to using these lists, they posted invitations to participate in the survey on local intranets and news programs and invited recipients to recommend survey participation to others.

Another concern with internet surveys is that demographic biases may occur. At the beginning of this decade, wealthier, more highly educated, and younger persons were more likely to be Internet users, particularly at home (*11*)(*12*). More recently, African Americans, less-educated, and elderly people still tend to be underrepresented as internet users and therefore, as respondents. Recent statistics indicate over three-fourths of white, non-Hispanic and English-speaking Hispanics use the internet compared to slightly over half of the Black, non-Hispanic adult population. Just over a third of adults with less than a high school education use the internet compared to nearly 95% of adults with a college education or advanced degrees. Finally, slightly over one third of the elderly population uses the internet compared to three fourths and higher of adults under 65 years old (*8*). de Blaeij et al (*13*) found that males and persons with higher incomes were more likely to prefer an internet response mode compared to mail-back surveys. Others suggest that internet response is effective at capturing more affluent, mobile professionals who elude telephone interviewing (*2*). Recent data from the National Center for Health Statistics indicate that 18.1% (16.7%-19.5%) of households have no landline, are wireless only, or are phoneless. These households would not be in the sample frame for a CATI survey. "Among households with both landline and cellular telephones, 22.3% received all or almost all calls on the cellular telephones…" In addition, over a third of young adult households are wireless only, over half of unrelated adults, no children households are wireless only, and nearly 30% of all households below the poverty level are wireless only. Between 2004 and 2007, the percentage of adults with wireless only service increased from 4.4% to 14.5% (*14*). So, as internet access increases, landline telephone access is decreasing which may refocus bias arguments back on telephone based surveys. In general, hybrid approaches offering web-based and mail or phone based responses are recommended when demographic bias is a potential concern, especially since response rates increase with hybrid approaches (*15*).

**DOWNTOWN BUFFALO EMPLOYEE SURVEYS**

Two surveys were conducted focusing on workers in downtown Buffalo, NY. The earlier survey, completed in 1998, was a modified version of mail-out mail-back approach while the 2008 survey was a very basic web-based approach. The earlier survey focused on amenities needed to improve residential, retail, and entertainment attractiveness in the downtown area while the latter survey focused on downtown parking issues. Both surveys collected journey to work and demographic data.

The 1998 survey was distributed based on a stratified sample; Buffalo Place, Inc. (BPI) identified downtown employers, contact people and number of employees per company during the previous year, a time intensive project. Staff at BPI and the Greater Buffalo-Niagara Regional Transportation Committee (GBNRTC) developed the sampling plan. GBNRTC staff selected the sample group. All employers of a certain size were surveyed and then proportions of the smaller employers were contacted based on size. Employers distributed survey forms to their employees. Contact people were sent letters of request with instructions to improve survey distribution. Incentives included a few "Thursday at the Square" concert refreshment tickets for the person at each large company who helped distribute the survey forms to employees. Employees mailed completed survey forms back to BPI, postage prepaid. The 1998 survey form was based on a similar survey conducted as part of the Regional Center Plan Update around 1980. That survey was developed by Robert J Harmon and Associates and distributed only through the large downtown employers. The response rate for the 1998 survey was high; 6,200 surveys were distributed and 2,130 employees responded. The response rate was 34% and the error $\pm$3%. Item non-response is not available at this time.

GBNRTC staff performed data entry, validation, initial analyses, presentation of the results, and the production of the final report. BPI, with the assistance of the City of Buffalo Planning Analysis

Division, followed up with more detailed analysis on demand for housing, shopping, and entertainment and developed marketing packages for use by prospective businesses, property owners and realtors in marketing downtown. The budget for the 1998 survey was $30,000 with the City of Buffalo and BPI contributing $7,500 each. The GBNRTC staff logged nearly 1,900 person hours on this project. With 2,130 valid records the cost was roughly $14.00 per usable survey.

More recently, BPI explored the possibility of conducting a hybrid email/mail downtown employee survey at less cost. This investigation revealed that part of the problem with conducting these surveys is that the universe of downtown companies is now harder to identify. Phone number directories, such as the CrissCross Directory, are not as good an identifier anymore due to internet and cell phone use. New York employment data are not yet accessible from the Local Employment Dynamics (LED) program at the Census Bureau so researchers must struggle to create a sample frame of downtown employers and estimate total employees by occupation.

The 2008 survey was strictly a web-based survey. The questionnaire was modeled after the 1998 survey. The 1998 employee survey covered a broader range of topics than the 2008 survey, the focus of which was downtown parking issues. The 2008 survey was created using Opinio™ survey software licensed by the State University of New York. It contained 55 total questions: 7 yes/no, 2 open-ended, 3 map reading, 27 single choice, 1 multiple select, 6 rating scale 1-5, and 9 agree/disagree. Survey structure is shown in Figure 1.

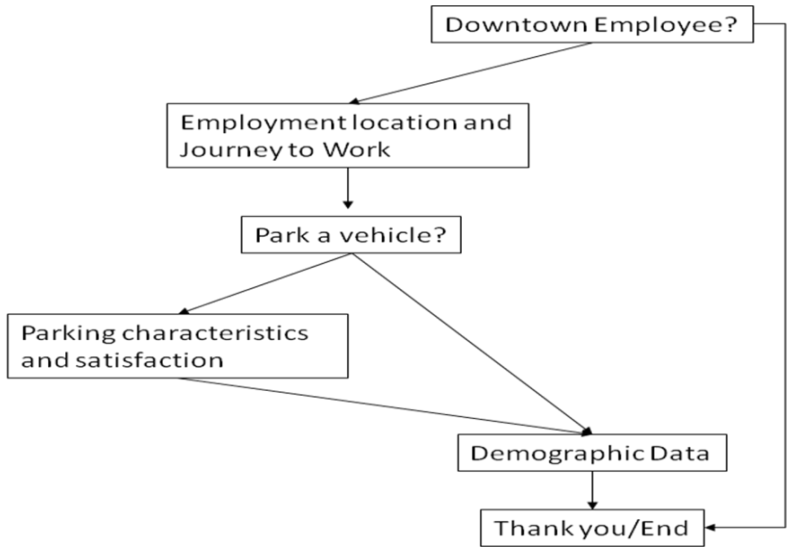


**FIGURE 1 Web-based survey structure.**

The survey was accessible on the internet between March 12 and April 28, 2008. BPI included an announcement for employers listing the survey site in their weekly e-newsletters distributed to downtown companies, some of which forward the newsletter to individual employees. The survey link was sent via email to GBNRTC, the Office of Strategic Planning in City Hall, and local politician's offices to encourage their constituents to respond. Popular local web sites, like Buffalo Rising, were contacted to post and circulate the link. The Buffalo News ran an announcement in the HomeFinder section of the Saturday paper. However, this announcement did not appear until April 19th. The software uses cookies to block responses from the same computer, which does not prevent someone from responding multiple times from different computers. In addition, employees who share computers at work would have to respond from home or some other computer. No estimate is available of the number of employees who do not have internet access from work, such as servers in restaurants, maintenance and landscape workers. People in these positions may be less likely to respond to a web-based only survey. 290 persons accessed the survey, 279 of whom identified themselves as downtown employees. 229 persons (82%) completed all relevant questions in the survey. Response would have been improved with

a hybrid approach but cost and time would definitely increase. Response rates would also have increased if the downtown employer contacts were specifically requested to forward the survey to individual employee email addresses. 88% of the respondents took 10 minutes or less to complete the survey. 80% of the employees who completed the survey answered the parking questions. 83% of the employees answered demographic questions except the last question on family income where the response dropped to 77%. This research was conducted as part of a student's senior research requirements and no fees were charged. However, with respect to cost, estimated person hours to develop, test, and analyze/report on the survey is 16 hours, 4 hours, and 4 hours respectively. Results were exported to Excel™ compatible files and the software produces summary reports with statistics and charts. Since no weighting was done, analysis time was minimal.

**RESULTS**

Despite the fact that the surveys are ten years apart, little has changed in downtown Buffalo with respect to general employment. Very recently a few companies have established headquarters in downtown in existing facilities, such as New Era Caps and Labatt Breweries. In addition, Blue Cross Blue Shield of Western New York built their headquarters on the edge of downtown in a previously vacant lot. The facility includes a large staff and visitor parking ramp. Downtown continues to house a substantial number of city, county, state, and federal government employees, banking and business service industries. A new county family court building with an adjacent parking ramp and a new office building housing mostly federal employees were built during this period. The most notable change however is a slight increase in residential (owner occupied and rental) opportunities within downtown Buffalo which may increase slightly walk and bike commutes. Changes to the transportation system that may affect commuting patterns during this period include removal of two toll plazas on the inbound lanes of I-190. Without toll delays, commute times may be shorter for downtown workers. There were also several one-way streets in the downtown area that were converted to two-way traffic enabling easier access in the CBD. No significant changes to the transit system have occurred however, fuel prices have significantly increased which may result in a shift away from single occupant vehicles.

For both surveys 66% of the respondents were female and 33% were male. Age classifications from the two surveys did not exactly match, however, the distribution of respondents by age are very similar. Not surprisingly, the majority of the respondents were between 26 and 55 years old. In 1998, significantly fewer respondents were between 26 and 34 years old (22%) than between 35 and 44 (31%) and 45 and 54 (29%). In 2008, the 46-55 age group had the highest proportion (30%) followed by the 26-35 age group at 28%.

In 1998, 88% of the respondents identified themselves as Caucasian compared to 96% in 2008. In 1998, 6% of the respondents identified themselves as African American compared to 1% in 2008 which may possibly reflect limited access to the internet by African Americans. In 1998, 3% did not respond to the race question.

In both surveys 95% of the respondents were full-time workers. In both surveys, the greatest proportion of respondents identified their occupation as professional; 40% in 1998 and 60% in 2008. The high proportion of professional responses in 2008 is consistent with other survey research using web-based response. In 1998, 29% indicated the job was clerical and 21% indicated the job was managerial. In 2008, these figures were 17% and 18% respectively. The majority of respondents in both surveys indicated that they worked downtown for 5 or more years; 68% in 1998 and 57% in 2008.

With respect to income, in 1998 the highest proportion of respondents indicated a household income of $75,000 or more. In 2008, the highest proportion of respondents indicated a family income between $60,000 and $99,999. In both surveys nearly equal proportions of respondents classified their income as $30,000-$44,999 and $45,000 - $59,999.

In the web-based survey, respondents were asked the zip code of their home location. To compare responses to the 1998 survey, zip code counts were allocated to cities and towns. Figure 2 shows the comparison. Buffalo was home to most of the respondents in both 1998 and 2008, followed by Amherst, Tonawanda and Cheektowaga.

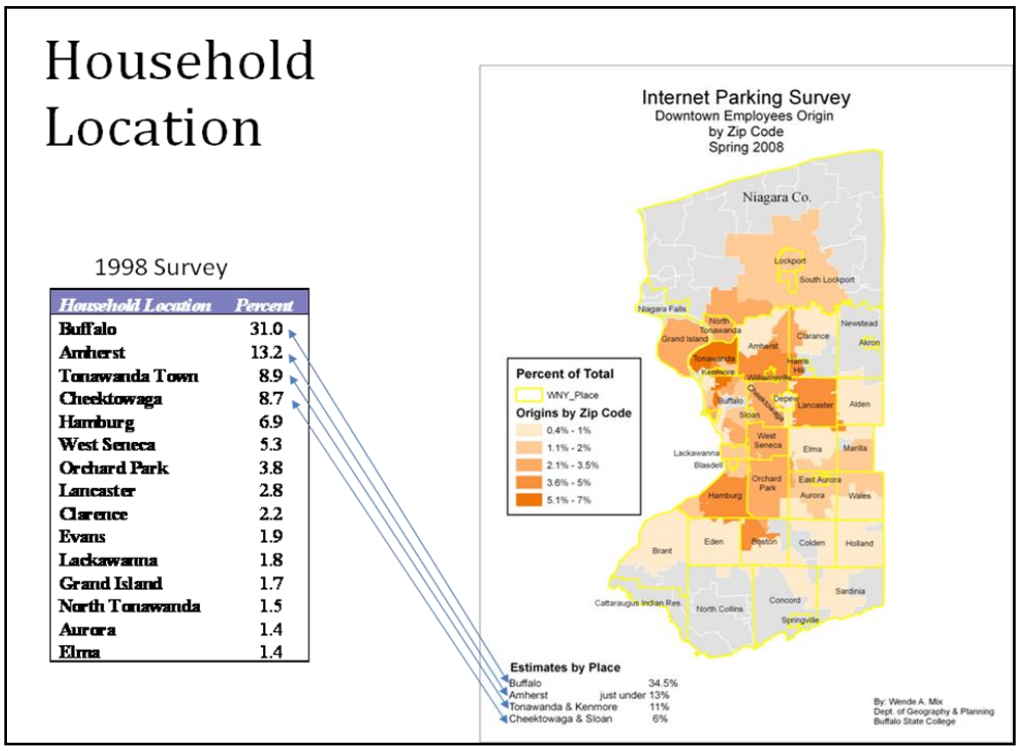


**FIGURE 2 House location comparison.**

Although the frequency distributions for travel time to work appear quite different in Figure 3, the cumulative distributions clearly show that in both survey years half of the respondents travel 20 minutes or less and three-fourths travel 30 minutes or less to work.

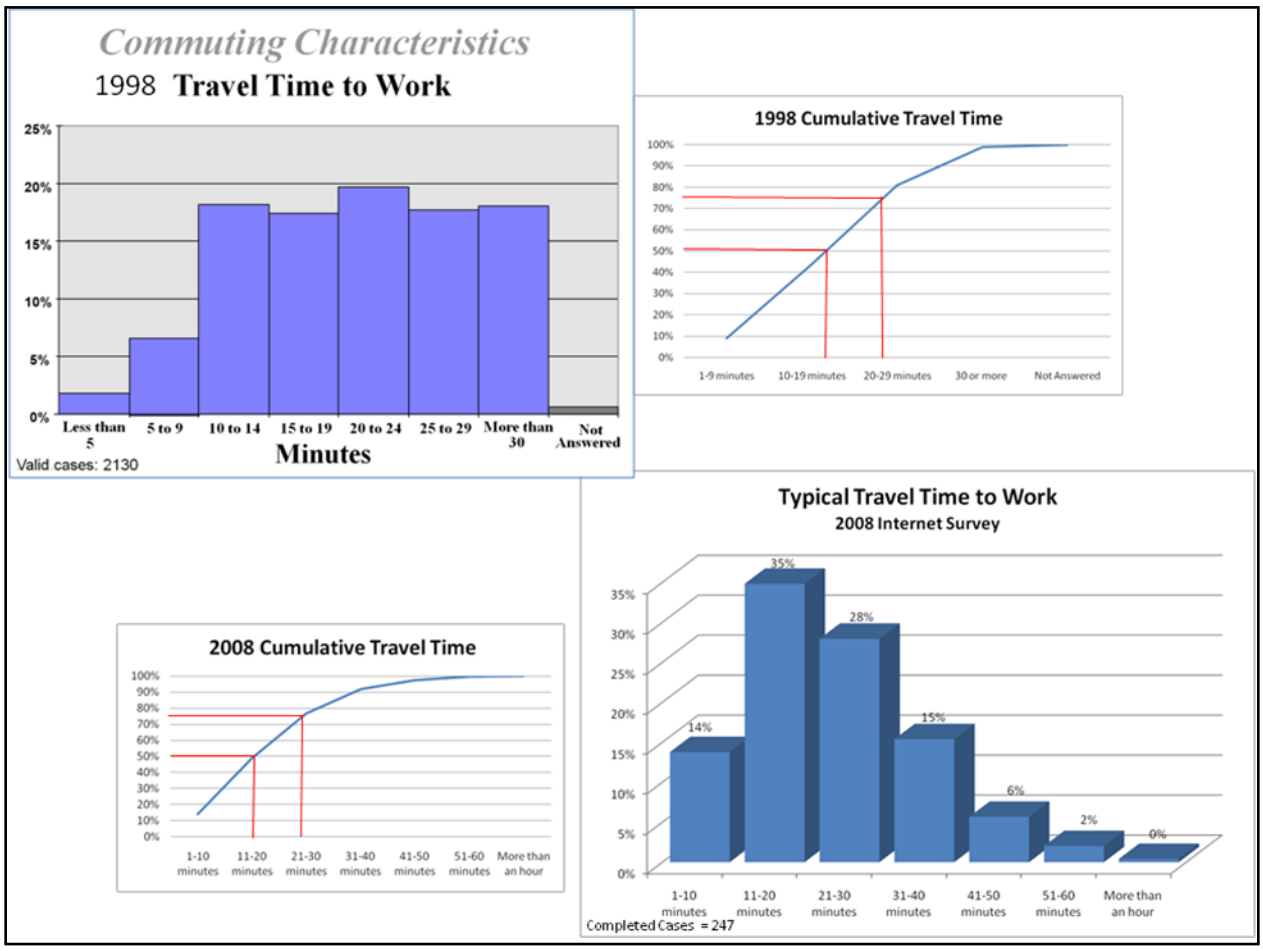


**FIGURE 3 Travel time to work distributions.**

With respect to distance traveled to work, in both surveys half of the respondents travel 10 miles or less and three-fourths travel 15 miles or less to work (Figure 4).

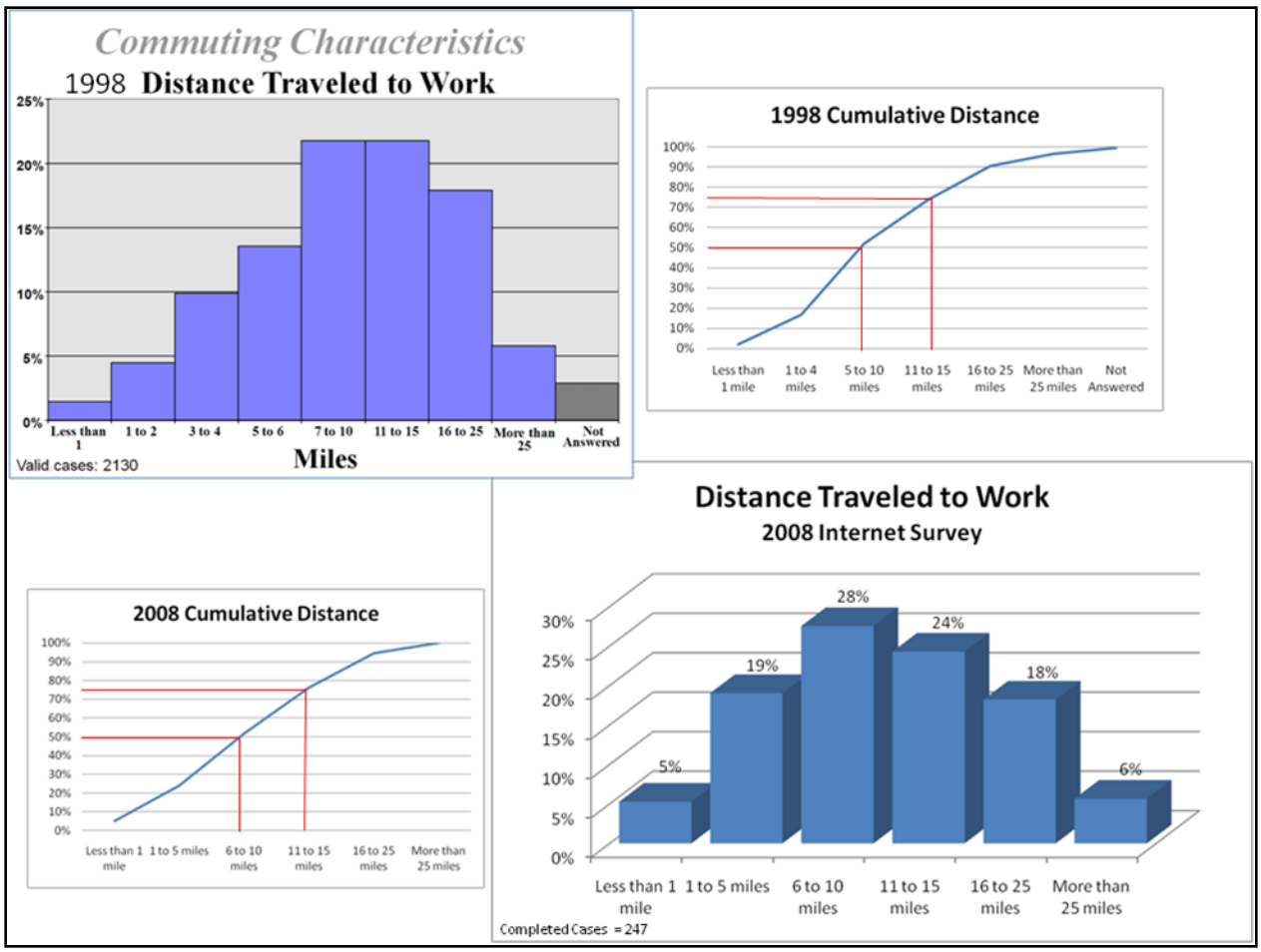


**FIGURE 4 Distance traveled to work distributions.**

Mode traveled to work is virtually identical in both surveys (Figure 5), dominated by personal vehicles. As expected, the proportion of walk/bike trips increased slightly in 2008 possibly due to increased residential opportunities downtown. The transit share remained the same. In both years, over 60% of those who drove to work indicated that they could have used transit and nearly 30% indicated they could not use transit.

Although both surveys contained much more information, this study focuses on comparable questions only. As noted earlier, the 1998 survey asked questions about residential, retail, and entertainment desires and the 2008 survey focused on parking issues.

## SUMMARY AND CONCLUSION

The 2008 web-based survey, despite having lower response, yielded results quite comparable to a traditional mail-based survey. In addition, the cost and time to implement the web-based survey was significantly less than the mail-based approach. Cost and time would increase if a hybrid approach was implemented to achieve a random sample and a higher response. A hybrid approach might increase the proportion of responses from African Americans and non-professionals, too.

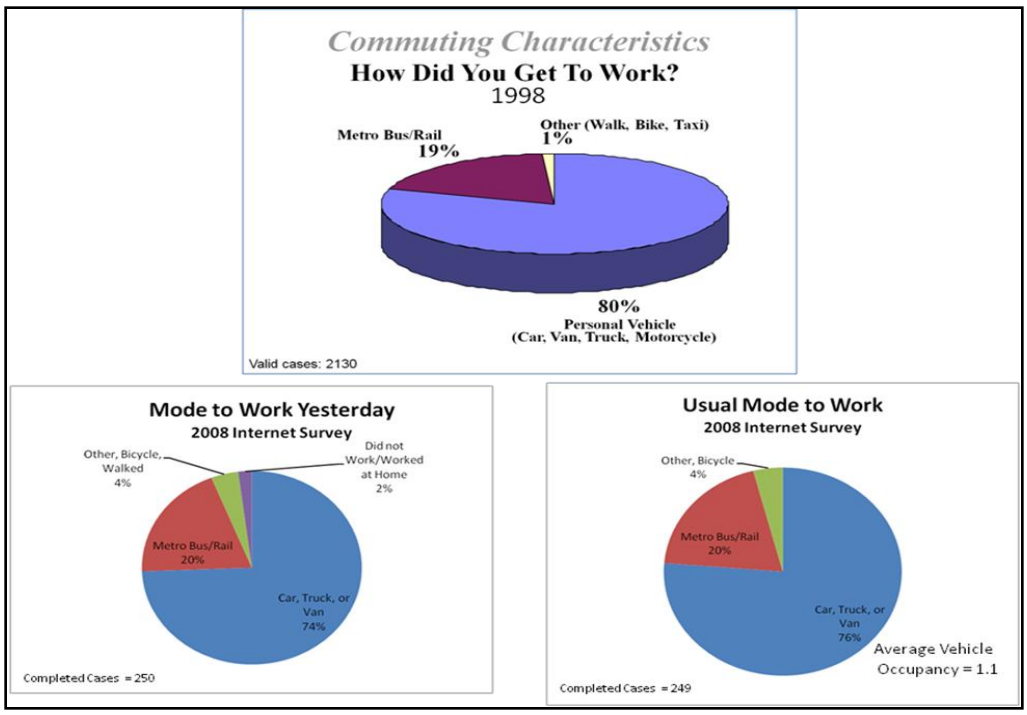


**FIGURE 5: Mode to work comparison.**

The internet has become an integral part on many peoples' lives both at work and at home. Internet surveys offer a terrific opportunity for data hungry but financially constrained transportation agencies.

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