



2009
Comprehensive Household Travel
Data Collection Program

MI Travel Counts II



Comparison Report
Executive Summary

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Executive Summary

MI Travel Counts II (MTC II) collected travel data in 2009 from a subset of households which responded to MI Travel Counts I (MTC I) in 2005. MTC II data provides opportunities to gauge how household travel has changed in Michigan since the completion of MTC I.

This comparison report provided both unweighted and weighted analysis of MTC II data and featured comparisons between MTC surveys. Comparisons were also made to the 2009 National Household Travel Survey (NHTS) where applicable. In addition, a set of preliminary statistical analyses were conducted to test the validity of the MTC II sample and to investigate effects of changes in key socioeconomic characteristics of the households on the observed differences in household level trip production across the MTC surveys.

The objectives of the comparative analysis of the two datasets include the following:

- Understand the changes in household travel behavior characteristics between the two surveys,
- Identify if the surveys provide evidence to support the observed reduction in travel as reflected in changes in traffic volumes in the recent years, and
- Examine the changes in household socioeconomic characteristics and their impacts on observed travel behavior.

The MTC I and MTC II surveys were conducted five years apart and had important differences in scale. MTC II sampled about one eighth the households who responded to MTC I.

The sample design for both surveys divided the State of Michigan into seven geographic sample areas. The seven sample areas were the following:

1. SEMCOG (Seven counties of Detroit Area)
2. Small Cities (Population of 5,000-50,000 outside small urban and Transportation Management Areas (TMA) areas)
3. Upper Peninsula Rural
4. Northern Lower Peninsula Rural
5. Southern Lower Peninsula Rural
6. Transportation Management Areas (TMAs) (Population over 200,000)
7. Small Urban Modeled Areas (SUMAs) (Population between 50,000-200,000)

MTC II used a sampling method adapted from the MTC I study. The sampling considered household size, number of vehicles available and number of workers in the household. The MTC II sampling plan was further revised based on a statistical review of MTC I data and additional expert reviews.

Expansion weights for MTC I data were revised using the 2000 Census (Census Transportation Planning Package) CTPP. A new set of weights was developed for the MTC II

survey using the 3-year 2006-2008 American Community Survey (ACS) data in conjunction with the Census Population Estimates and County Level Housing Unit Estimates datasets.

Socioeconomic Comparisons of Survey Data

Household socioeconomic characteristics estimated from MTC II were compared with MTC I and 2009 NHTS data and there were some modest levels of differences. In MTC II there was a slight increase in the shares of small households (one and two-member households) and the share of households with higher levels of vehicle ownership (two or more) compared to MTC I. There was also a slight reduction in three or more-worker households in MTC II. Finally, the MTC II and 2009 NHTS household profiles with respect to size, number of vehicles and workers were very similar.

The MTC II income distribution showed a higher share for the mid-to-high income group at the expense of the lowest and highest income groups when compared to the 2009 NHTS.

Distribution of age groups in MTC II showed higher shares for older age groups, while school age children and young adults were underrepresented when compared to MTC I.

The MTC II survey did not reflect the increase in unemployment that is currently experienced in Michigan. There was an increase of survey respondents reporting that they were not workers at the time of the survey. The percent of respondents working declined by about two percent and there was also an increase in non-workers looking for work.

Overall Trip Making

The household trip rate obtained in the MTC II survey was 8.63 trips per household compared to 9.17 trips per household reported in the MTC I survey. The 2009 NHTS estimate of 8.46 trips per household, was very close to the MTC II estimate. Both of the MTC surveys and the 2009 NHTS data showed a person trip rate of 3.65 trips/person.

The comparison of trip rates across the MTC surveys indicated that there had been a decrease of about six percent in household trip rates while person trip rates remained stable. The combined effect of these comparisons suggests that the decrease in household travel reflects a change in average household size of about five percent between the two studies.

Home-based work (HBW) and non-home based (NHB) trips declined at a higher rate than other trip purposes. This pattern can be linked to the oversampling of older respondents in the MTC II survey. Moreover, reduction in household size leads to fewer opportunities to link trips or activities to meet the needs of other members in the household resulting in the reduction of demand for NHB trips.

These results indicate that between the MTC surveys, person-trip making did not change while sizeable changes occurred in household structure. Based on the survey estimates,

changes in traffic volumes are more likely to be related to changes in household size and structure rather than changes in trip making or changes in activities.

Trip Making by Segment

The analysis of trip rates segmented by trip purpose and key socioeconomic parameters such as household size, vehicle ownership, and number of workers revealed that at an aggregate level there were no major differences. However, as the level of segmentation increased, there were a few segments with different trip patterns across the MTC surveys.

There were no major changes in trip rates by purpose at the statewide level between the two MTC surveys. A similar pattern of differences also existed when the travel market was segmented by geography.

The analysis of travel times showed that for urbanized areas the travel time distributions remained stable while for small urban areas there was a shift to very short trips (one to five minutes) from medium range trips (five to 20 minutes). In rural areas there was a similar shift to shorter trips from the medium range and from longer trips (30-45 minutes).

The analysis by mode indicated that mode shares were stable across the two MTC surveys. The analysis of travel times by mode suggests a shift towards shorter trips. The shift to shorter trips was higher for shared ride modes compared to drive alone.

Vehicle Utilization

Vehicle utilization by trip purpose, sample area, and auto sufficiency levels was also analyzed. Auto sufficiency gauges the level of availability of an auto for every worker in the household.

The auto utilization differences by trip purpose can be explained by the nature of trip. For example, home-based work purpose had a higher share of drive alone trips while home-based school trips had a higher share of shared ride. Home-based other and non-home based trips had comparable shares of drive alone and shared rides. Moreover, segmentation by trip purpose did not show any substantial changes in the auto modal shares across the MTC surveys.

Segmentation by sample area also showed consistent shares.

Households with a surplus of vehicles showed very similar patterns of auto modal share distributions. For households with vehicles equal to or less than the number of workers, there was a shift from shared ride to the drive alone mode during the MTC II survey potentially reflecting the aging of the households in the sample. This could reflect a reduction in the household size or the growing up of younger household members who used to share a ride. Households with vehicles equal to or greater than the number of workers exhibited very similar modal choices across the two surveys. Non-motorized modes and

transit were used by a substantial share of zero-vehicle households, while households with an insufficient supply of vehicles relied on non-motorized modes more than transit.

Time of Day and Activity Duration

The distributions of trips by time of day and trip purpose across MTC surveys were stable and had consistent patterns when compared with the 2009 NHTS.

Average time spent for various activities by the respondents of both MTC surveys were computed and contrasted to examine whether there were any changes in activities and activity durations. For most mandatory activities such as work or education, the MTC surveys provided consistent estimates of activity durations. Non-mandatory activities such as shopping or recreation were reduced substantially in MTC II. Most reductions came from non-commuters who are more likely to endure economic hardships at a higher level than commuters.

In order to examine whether trip patterns had changed over time, each person's travel diary was summarized into a sequence of trips by purpose. The frequency analysis of daily trip sequences across MTC surveys showed that simpler trip patterns made up the most common patterns for both surveys. Short and simple activity sequences with two to four trips as part of one or two tours accounted for nearly 37 and 41 percent of all activity sequences observed in the MTC I and MTC II data, respectively. There were no substantial changes in the daily activity compositions between the two surveys.

Long Distance Travel

The final descriptive analysis of MTC survey data was conducted for long-distance trips. The respondents were asked to report whether they have made a trip longer than 100 miles in the last three months and also to report how many such trips were made in the past three and 12 months. The analysis of the data summaries indicated that the rate of long distance trips per household in the MTC II survey was slightly higher than the MTC I survey but the difference in rates for total long-distance trips is not significant. The share of trips made within Michigan grew slightly at the expense of "Other States and International" trips.

Quarterly retrospective trip counts per household were consistent, while the annual rates decreased by about 15 percent for MTC II.

Detailed Comparisons of Trip Rates and Household Profiles

The set of statistical analysis presented in the final section of this report focused on the disaggregate characteristics of MTC II households. These analyses were conducted at three different levels of detail:

1. Comparison of trip rates. First, it is established that respondents in the MTC II survey represent the travel behavior of Michigan residents. To accomplish that, their trip rates during the MTC I survey were compared to the trip rates of the rest of the MTC I sample who were not interviewed during the MTC II survey.
2. Examination of key socioeconomic characteristics. Since the MTC II households have changed over time, the socioeconomics as reported in MTC I and MTC II surveys were compared to document key changes over time.
3. The presence of differences in household-specific trip rates over time was examined. Furthermore, the analysis examined whether differences in trip rates across the surveys can be explained by the changes in socioeconomic characteristics.

Based on the findings of the *first level* statistical tests, it was concluded that the MTC II sample respondents exhibited equivalent levels of total trip production rates, similar average travel distances, and equivalent distributions of trips by time of day and by trip purpose during MTC I survey. This confirmed the validity of the sample and pointed out that the travel data collected from MTC II participants would produce unbiased estimates for key travel characteristics.

The descriptive analysis of the key socioeconomic characteristics in the *second level* of analysis of MTC II participants indicated that the average household size was reduced by about 8.5 percent for the sample (MTC II households only) across the surveys. While one-third of the households had a change in vehicle ownership, there was no net gain or loss in the overall vehicle ownership of the sample. Moreover, the incidence of zero-worker households grew in 2009 substantially compared to 2005 in part reflecting the aging of the sample respondents and potentially reflecting a decrease in employment.

Based on these changes, it is reasonable to conclude that household trip rates may decrease due to the reduction in household size. On the other hand, the reduction of workers in a household may have mixed impacts on overall trip rates. Although home based work trips will be reduced, those trips may be replaced with additional home-based non-work trips and other non-home based trips.

To accomplish the *third level* of the analysis, the change in trip rates was examined. However, household structure had also changed over time. To isolate the effect of socioeconomic characteristics, the sample was divided into two groups.

The first group included households whose composition had changed between 2005 and 2009 because of a change in household size, number of vehicles or number of workers. The second group included only those households that had remained stable. These households had similar characteristics in 2005 and 2009 and belonged to the same sample cell in both surveys. By focusing on the trip rates of these households, the differences in the household composition over time were controlled.

The analysis indicated that 47 percent of the MTC II households changed their sampling cells across the surveys. These results showed a fairly dynamic sample with respect to socioeconomic characteristics.

The third level of statistical tests revealed the following:

- There were statistically significant differences in the unweighted trip rates for MTC II households between the two surveys. There was a reduction in trip rates from 9.17 trips per household in MTC I to 7.82 trips per household in MTC II.
- For households which remained in the same sampling cell in MTC II, the difference became much smaller at 0.5 trips per household.
- This implies that the households that had a change in socioeconomics and their sampling cell were responsible for most of the observed difference.
- For households that had moved to a different sampling cell, the change in household size was a significant contributor to the observed change in trip rates. The reduction in the number of workers was found to have only a marginal effect.
- Overall, changes in socioeconomics had statistically significant explanatory power to explain the observed changes in trip rates. However, more detailed study designs are needed to isolate the effects of the economic downturn on the trip rates more reliably.

The analysis of MTC II survey data along with MTC I survey and 2009 NHTS provided important insights about the change in travel behavior in Michigan. The experience gained throughout the study pointed out several recommendations for further analysis of the data and for future data collection efforts.

The response from zero-vehicle households with at least one worker or with two or more persons was very low in MTC II. For similar studies in the future, MDOT could consider a sampling approach that focuses on two dimensions such as household size and number of vehicles available. Moreover, incentives for participation may also help improve response from zero-vehicle or low-income households as was the case in MTC I.

It is proposed that MTC II weights be revised once a more comprehensive and reliable national data source such as Census 2010 or the five-year ACS become available. Current rates for MTC II data rely on the estimated number of households derived from the population estimates.

Based on the observed differences in age and income groups and the underrepresentation of unemployment, the addition of person-level adjustment factors is recommended. This adjustment would help account for these key socioeconomic parameters as they would be reflected in regional and statewide data.

The patterns observed for non-travel among participating households were somewhat higher in MTC II compared to MTC I. Although non-travel is a valid survey response, future studies should monitor and compare incidence of non-travel at the household level against other data sources such as NHTS to minimize any potential biases.

The effects of household characteristics on travel behavior are fairly complex and require an in-depth study to systematically gauge the effects of all possible parameters. Our descriptive analysis of MTC surveys in this report highlighted changes in specific types of trips and market segments. Similar analyses can be conducted for these segments to incorporate additional variables such as household and personal characteristics.

Moreover, a cohort study can also be designed for which certain household structure and life cycle groups can be treated as cohorts. In general terms, a cohort is a group of subjects who have shared a particular experience during a particular time span. In order to define a relevant set of cohorts, more disaggregate level comparisons are needed. Based on these comparisons and through a literature review, a reliable cohort study can be designed to account for impacts of socioeconomic and demographic factors and to isolate the effects of changes in the economic climate on travel behavior.