MDOT's Statewide Household Travel Survey – Design, Implementation, and Lessons Learned

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Karen M. Faussett
Michigan Department of Transportation
Statewide and Urban Travel Demand Analysis Section
425 W. Ottawa, P.O. Box 30050, Lansing, MI 48933
Phone: 517-335-2956
Fax: 517-373-9255
faussettk@michigan.gov

Abstract

The Michigan Department of Transportation (MDOT) recently completed a statewide household travel survey of 14,315 households. The data collected will be used to update urban and statewide travel demand models with area-specific travel characteristics. Surveys of this magnitude and geographic scope are not commonly conducted and require a significant amount of planning and development of procedures and instruments. The knowledge gained and lessons learned by MDOT staff through the experience can be helpful to other agencies considering a similar undertaking.

This paper will discuss several of the survey elements developed including sample design, travel diary, public relations program and Web site, geocoding procedures, and data deliveries and data checking. Along with a description of the elements, there will be a discussion of the development decisions and issues, implementation, and lessons learned.

Introduction

The Michigan Department of Transportation (MDOT) recently completed a statewide household travel survey with a sample target of 14, 315 households. In all, data was collected from 16,750 households. The data collected will be used to update small urban, Transportation Management Area (TMA), and the statewide travel demand models.

This travel survey is part of MDOT's three phase model improvement program. During Phase I, a consultant developed specifications for a new tour/activity based model and identified the data that was necessary to support it. In Phase II, the statewide household travel survey was conducted, which supports both the improvement of the department's existing 4-step models and the development of tour/activity models. Phase III will utilize the data collected in Phase II to improve the state's 4-step travel demand models as well as to research, develop, and evaluate tour/activity based models.

Surveys of this magnitude and geographic scope are not commonly conducted and require a significant amount of planning and development of procedures and instruments. The knowledge gained and lessons learned by MDOT staff through the experience can be helpful to other agencies considering a similar undertaking.

This paper will provide background on travel demand models in Michigan, details of the statewide household travel survey, and a discussion of several of the survey elements developed including: Sampling, the Travel Diary, the Public Relations Program, Geocoding, and Interim Data Deliveries and Data Checking. Along with a description of the elements there will be a discussion of the development issues and decisions, implementation, and lessons learned.

Travel Demand Models in Michigan
MDOT develops, maintains, and operates a statewide travel demand model for both passenger and truck movements. MDOT maintains overall responsibility for the development, maintenance, and operation of the models used for the nine small Metropolitan Planning Organizations (MPOs), urbanized areas having populations of 50,000 to 200,000, and one additional area (Traverse City). Michigan also has five TMAs (urban areas having 200,000+ population): Detroit, Ann Arbor, Lansing, Flint, and Grand Rapids each with their own travel demand model. The TMA models are housed at each TMA with their staff having primary responsibility for the development, maintenance, and operation of their respective models. Currently, both the statewide and urban area models utilize the traditional four-step modeling process.

MDOT completed several home interview travel surveys in the 1960s and 1970s. The last urban travel survey completed by MDOT was in 1976. The Detroit area, however, completed a household travel survey in 1994. As no recent local travel characteristics are available for model inputs, national default values are employed. For trip generation MDOT uses the national default trip generation rates from the National Cooperative Highway Research Program (NCHRP) Report 187 and NCHRP 8-29 for urban models. The MDOT statewide model uses rates developed from:

- NCHRP 187
- Nationwide Personal Transportation Survey (NPTS)
- The 1990 Census Transportation Planning Package (CTPP)
- Trip generation rates from the Southeast Michigan Council of Governments (SEMCOG) travel demand model. SEMCOG has responsibility for travel demand modeling in the seven-county Detroit area.

Travel Survey Details
The MDOT household travel survey was designed to collect 48 hours of travel data from approximately 2,040 households in each of seven geographic regions statewide. Travel diaries were sent to each member of a household for completion, regardless of age, and to any overnight visitors the household may have during the assigned travel period. In addition to collecting travel information for the assigned period, respondents were also asked to recall any trips greater than 100 miles one-way from home made in the last three months.

Randomly selected households were sent a pre-notification letter letting them know that they would be receiving a telephone call within the next week. Once a household agreed to participate during the recruitment call, they were assigned a two-day travel period. Travel diaries were mailed and each household received a reminder call the day before the assigned travel days. Households were called for retrieval of their travel information the day following their travel period. If a household did not respond via telephone, travel diaries could be mailed in or data could be entered via the internet.

The design of survey instruments, procedures, and manuals began in November, 2003. A pilot study was conducted in late January, 2004 and the full survey began in March, 2004. Spring surveying ran until June 10, 2004 with Fall surveying commencing the week after Labor Day. Interviewing was complete in February, 2005. The final project report was completed in August, 2005.

Sampling

Sample design
To support model development for small urban areas, TMAs, and the statewide model, MDOT staff developed seven geographic regions for the household travel survey. The goal was to gather enough data to account for the variance in travel patterns across the State. Data from 2,040 households was to be collected from each region for a total of 14,280 households. The seven regions are:

1. SEMCOG (Seven Counties of Detroit Area)
2. TMAs (Areas outside Detroit/Ann Arbor with population over 200,000 – Flint, Lansing, and Grand Rapids)
3. Small Urban Modeled Areas (Population between 50,000-200,000 – nine MPO areas)
4. Small Cities (Population of 5,000-50,000 outside Small Urban Modeled Areas, TMAs, and SEMCOG)
5. Upper Peninsula Rural (15 upper peninsula counties excluding Small Cities)

6. Northern Lower Peninsula Rural (27 counties in the northern lower peninsula excluding Small Cities and a Small Urban Area)
7. Southern Lower Peninsula Rural (portions of 24 counties in the southern lower peninsula excluding Small Cities, Small Urban Modeled Areas, TMAs, and SEMCOG)

In the request for proposals MDOT staff requested a three-way household sample stratification based on household size (1-4+), number of workers (0-3+), and autos available (0-3+), rather than the more typical two-way stratification. A three-way stratification results in a four-fold increase in combinations of attributes (from 16 to 64) compared to the "typical" design. Each possible combination of attributes is stored in a cell of a table. Therefore, the sample sizes in the cells of this design are smaller than those obtained in designs that are stratified using only household size and number of autos. MDOT requested that the consultant design a statistically valid method for combining cells that were < 0.5% of a region's total households, and that the consultant explain the method and provide a discussion on the strengths and potential weaknesses of the methodology.

The selected consultant proposed an "auto sufficiency" design to combine cells. MDOT staff had no experience with the auto sufficiency concept or of its statistical validity. A one-day sample workshop was conducted by the consultant that explained the rationale behind auto sufficiency. The defining characteristic of auto sufficiency is that the relationship between the number of autos available to a household and the number of workers is highly correlated to travel behavior.

For the development of activity and tour models, especially when considering joint household travel behavior, the availability of an auto to every worker changes the dynamics of travel behavior for all persons within a household. If there are fewer autos than workers and the workers have priority for use of the vehicle, then the other people in the household have to share rides or find alternative modes of travel. Likewise, if non-workers in the household have priority over autos available, and if there are fewer autos than workers, the workers will have to find other means for traveling to work outside the home other than by driving an auto alone.

Sample Development

A proportional allocation of households to the cells of the sample design was made within each region. This allocation was based on U.S. Census 2000 Public Use Microdata Sample Area (PUMA) 5% data. For each PUMA the number of households was broken out by size, auto ownership, and the number of workers. Then the percentage of households by region was determined for each PUMA. With the percentages of households by region for each PUMA determined the number of households per cell for each region within each PUMA was calculated. Finally, the number of households per cell for each region by PUMA was added together.

A goal of 30 completed households was established for each cell. (A sample size of 30 provides a sampling margin of error of $\pm$ 15% at the 90% confidence level). A sampling design was required that allowed cells to be aggregated, yet maintain distinctive characteristics of travel behavior.

Initially, cells were removed from the tables where the number of workers was greater than household size. Then the first aggregation was to combine the cells where auto ownership was greater than the household size. This is a logical collapse of cells, as each household member can use only one vehicle at a time, and any increase in auto ownership will not affect their travel behavior.

The next aggregation was to combine cells, having fewer than 30 households, within auto sufficiency categories. There are four levels of auto sufficiency: no autos, autos less than workers, autos greater than workers, and autos equal to workers.

In general, if any aggregation was required, the first pass was to aggregate within auto sufficiency categories and household size. This was sufficient except for the zero auto households, which needed to be aggregated across household size. This is due to the rarity of zero-auto households outside of one-person households.

Aggregation occurred only as much as necessary to achieve the required 30 households per cell. Where a combined total was less than 30, a minimum target cell size of 30 was established. No collapsing occurred either across auto sufficiency categories or within the autos equal workers category.

Sample Monitoring

The sampling process was monitored for key household attributes of interest by geographic region throughout the survey. The key attributes by region were household size, number of autos, number of workers, and income category. In addition to data cell monitoring within the region, attention was given to monitoring the representation of recruited and completed households by sub-geographic areas within each region. The sub-geographic areas are defined as counties, cities, and/or townships. The goal was to approximate actual sub-geographic representation. *See attached Figure 1: MI Travel Counts Household Locations*

The first stage of the survey was from March thru the beginning of June, 2004. No monetary incentives were offered. At the outset the number of households to be recruited was set to be double that of the number of households required. During July 2004, recruitment and retrieval rates from the spring collection period were evaluated. Some household types experienced much higher than expected recruitment and retrieval rates (especially household size two, no workers, and one or two autos), whereas other household types experienced very low rates (zero auto households of any household size).

In order to address this, the consultant implemented responsive design techniques.

Responsive designs use sample monitoring, measures of interviewer effort, and cost to guide changes in the surveying methods in order to reach the goal of achieving a representative sample of key population variables at a reasonable cost. (See Steven Heeringa and Robert Groves, *"Responsive Design for Household Surveys"* in the 2004 Proceedings of the American Statistical Association, Survey Research Methods for a full description of Responsive Design)

Interviewing resumed in September 2004. Recruitment rates were adjusted to compensate for the unequal participation rates of different household types during the spring collection. Also, a small amount of targeted income samples were added to the random sample to help fill the zero auto and autos less than workers (typically lower income) cells.

As the project progressed thru October 2004, the hard-to-fill cells were still not being filled as quickly as other cells. The consultant with MDOT's approval implemented a monetary incentive for zero auto households ($20 for one-person households and $30 for two-plus person households).

Through the remainder of the fall and into early winter, some zero-auto cells and those with household size four-plus, and autos less than workers were not being filled. The consultant expanded the incentives to cover all of the remaining hard-to-find household types, added to the targeted income sample, and finally used a listed sample, which identified specific households by size and income. Even with these measures in place the hard-to-fill cells were not filled. The final step was for the consultant to attempt a non-response conversion by re-contacting households in hard-to-fill cells that had been recruited but had not completed the retrieval.

At the end of the data collection period 94.1% of 169 data cells had reached the completed household target. Only one cell was under 50% complete (Small Urban Areas, household size three with autos less than workers, at 48%). All of the targets not completed were rare population households (generally less than 2.5% of households in the region).

Lessons Learned – Sampling

For auto sufficiency sample designs aggregation of cells should be allowed so that data cell representation does not fall below a minimum of 5%. The study illustrates that even with the use of responsive design techniques the cost required to recruit rare populations below this level of incidence return diminishing benefits. Data cells may need to be further collapsed and recruiting strategies other than random digit dialing (RDD) might need to be added.

Responsive design techniques as used in the Michigan statewide household travel survey can be very effective in recruiting rare population households. However, responsive design strategies need further analysis and research to determine more precise timing for implementation along with the proper combination of modified strategies, such as incentives and targeted RDD samples.

Travel Diary

Diary Development

The travel diary was developed through a cooperative process between the consultant and MDOT. Several items were considered in diary design and development. First, since 48-hours of travel information was to be collected, the diary had to be clear and respondent burden reduced as much as possible. Also, the diary had to flow with the Computerized Assisted Telephone Interviewing (CATI), taking the respondents through their activities/locations and travel in chronological order. And finally, the diary had to include as much information as possible so participants were not surprised with additional questions during retrieval and to ensure that complete information would be obtained from those households that chose to mail their diaries in.

The first step was to determine the type of diary: activity based, trip based, or hybrid (location based). After much discussion between MDOT, the consultant, and sub-consultants a hybrid place-based or location-based diary format was selected. This type was chosen because the respondent would be carefully taken chronologically through their travel days from location to location, recording both their activities at locations and their detailed travel information between locations.

Included in the mailing with the diary was a Person Information Sheet for each member of the household. The Person Information Sheet was personalized for each household member. It collected information on school, work, and long distance retrospective travel. This data was not gathered when the households were recruited because the information requested for each household member was extensive.

During the spring 2004 data collection period an interim review of the diary and person information sheet was conducted. The review found that many households that chose to mail back diaries were not including their Person Information Sheets, or were including them for only some household members. Also, many households mailed back diaries reporting only 24 hours of travel. These problems were not apparent during the pilot because only eight households mailed in their pilot diaries. They became noticeable as more than 500 households mailed in their diaries during the spring data collection period.

Since the diaries were already printed for the entire spring data collection, the following interim corrective actions were taken:

- A label was placed on the “START HERE” page of the diary as a reminder that travel is to be recorded for 48-hours.
- A label was also placed on the back of the postage-paid return envelope to advise respondent households not to mail back their diaries until they have spoken with a consultant representative.
- The label on the back of the return envelope also reminded respondents to complete and include the Person Information Sheets for each household member before mailing.

These actions reduced the number of incomplete diaries being mailed in, but project staff was still spending significant time on callbacks to collect missing information.

Prior to the restart of the interviewing in the fall of 2004, changes were made to the diary and it was reprinted. The alterations included:

- Incorporating the Person Information Sheet into the diary
- Shortening the example

- The Day 1 and Day 2 check boxes were moved next to the arrive and leave times rather than at the top of the page.
- The Personalized Diary Label was changed to say Day 1 and Day 2, with the travel dates, along with the optional Internet retrieval password.
- The postage-paid return envelope was changed to remind respondents to fill in the person information within the Diary.

The interim and fall diary modifications did help to improve the completeness of the data retrieval, particularly for the person information. There did, however, still seem to be some confusion with the differentiation between Day 1 and Day 2.

Lessons Learned – Travel Diary
Travel diary development can be a very involved process. It is important to choose the format that best fits the project and the data needs. It is often difficult to use diaries from other projects for reference as their data collection objectives may have been different and consequently will not directly meet the needs of the current project.

For a 48-hour travel diary adding Day 1 and Day 2 checkboxes by the arrive and leave time questions in the diary helped the respondents record accurate travel information. The checkboxes were added to the diary before the fall 2004 travel periods. This also helped the interviewers in the phone room more clearly enter mailed-in diary information. However, there were still problems with respondents not making a clear distinction as to when Day 1 stopped and Day 2 began. A more distinctive way of marking the break between days in a 48-hour travel inventory is needed, perhaps by having the respondent place a sticker at the beginning of Day 2.

Before the Person Information Sheet was combined with the diary, many respondents did not fill out the sheet, or did not include it when mailing in the diary. Separate return sheets included with a diary tend to be ignored.

Public Relations Program, Name and Logo, and Website

Public Relations Program
MDOT had never undertaken a survey effort of this type or magnitude, and it was important to the department that there be a positive public perception of the program. A full public awareness plan was developed and implemented by a public relations firm and MDOT. The public information campaign was necessary to secure the public's confidence that the study was valid and necessary and to increase the ease with which interviewers could secure study participants. Because of the complexity of the study and the number of households that were to be reached statewide, a comprehensive public information program was necessary.

The public information campaign began prior to the pilot data collection program and was an ongoing effort to inform potential interview candidates of the program. The objectives of the public information campaign included the following:

- Addressing any public concerns about the program or how the data would be collected, processed, and handled by informing and soliciting the support of government officials and public information departments at the city, county, regional, and state level.
- Gaining the public's confidence that the study was legitimate, valid, and critical.
- Informing the public that the information collected would be used to update statewide and urban travel demand models, which are used to estimate where future travel will occur over the next 20 years.
- Educating the target audiences about the long-range, consumer-level benefits of the study such as: easier and safer travel, less congestion, and a better-integrated transportation system.

Media outlets across the state (including: wire services, newspapers (daily, weekly, and community), radio, television, and trade publications) were instrumental in spreading the word of the pending study and confirming its legitimacy along with the benefits of participation. In addition, the chair of the House Transportation Committee volunteered to film two public service announcements encouraging participation in the study. This coverage was particularly important in the post 9/11 environment given the nature of the activity and travel information that was collected from respondents. Along with demographic questions like income, more sensitive information such as when people are away from home, and where their children go to school, etc. was requested.

Name and Logo

Along with the development of the public relations program, MDOT and the public relations consultant developed a name and logo for the project. The original in-house project name, "MDOT Comprehensive Household Travel Data Collection Program", was considered bureaucratic, boring, long, and vague. Concern was that no one would remember it, understand what it was, or why they should participate in the study. The goal in developing a new name and logo for the project was to create "a buzz" about the travel study and its benefits. The objective was to give residents the idea that this was a positive thing for their local communities, and to link positive aspects and a sense of the legitimacy with the travel study pre-recruitment letter and the recruitment phone call that followed.

The public relations consultant developed several suggestions for the project name and "MI Travel Counts" was selected by MDOT. The name can be interpreted as "<u>Michigan</u> Travel Counts" or "<u>My</u> Travel Counts" both of which portray the importance of the study, whether it be to the individual or to the State.

Once the name was chosen, a logo and a tagline were developed. The logo and tagline (Figure 2), "Your participation means better Michigan transportation," were included on the travel diary, diary cover letter, and on the Web site.

Figure 2: MI Travel Counts Logo and Tagline

Web site
A Web site was developed as a communications tool for the project. Also, the Web site provided participants with more information on the project than the pre-notification or diary cover letter could provide. The Web site also provided additional information for the press.

To increase the credibility of the project, it was important for the Web site address to be under the michigan.gov domain, rather than under the consultant's domain. The project Web site was located at www.michigan.gov/mitravelcounts. It consisted of a homepage with six main sub-pages including: Please Participate, Program Benefits, Media FAQ's, Contact Us, Program Privacy, and Results.

The Web site had an average of 718 hits per month. The most frequently visited page was the home page with an average of 270 hits per month. The page entitled "Please Participate" was the second most visited site with an average of 71 hits per month.

Lessons Learned – Public Awareness, Name and Logo, and Web site
The public awareness program including: the name, logo, and Web site was considered very successful as there were no concerns reported about MI Travel Counts by legislative, regional, and local government officials and agencies. Also, all media articles and attention were positive and enhanced MDOT's image. The time spent and costs involved in implementing the public relations program were worthwhile and very helpful in validating the study.

Geocoding

Geocoding Standards
MDOT staff wanted to ensure that the geocoding of the household travel data was of the best quality possible. After having read about the time other agencies spent correcting and finalizing geocoding following the completion of their travel surveys, MDOT had concerns about how to minimize the time spent, while assuring a quality outcome.

MDOT and the consultant developed a geocoding manual that outlined the geocoding process and targets to longitude/latitude based on type of location at the beginning of the project. Targets were established for geocoding to latitude/longitude (the street address or street intersection level) at 99% for home addresses, 95% or better for work and school addresses, and 90% for all other trip locations.

In addition, all households with 25% or more of their origin or destination travel points not geocoded were thoroughly reviewed for correction and, if not corrected, were candidates for deletion from the data set based on MDOT review.

Geocoding Process

The geocoding process for MDOT's household travel survey was quite complex. This stemmed from the need to use the Michigan Geographic Framework (MGF) for the address layer. The MGF is Michigan's "official" state base map for state business needs. Two issues arose from the use of this line layer. The MGF did not integrate easily into the geocoding software used by the consultant, and also the MGF address ranges in portions of the state were not sufficient. This led to a hierarchical geocoding process that involved two software packages and two line layers to improve the address range availability. Geocoding was first attempted to the MGF using one software package, and then to the consultant's line layer using another software package. The consultant geocoded household travel locations continuously throughout the data collection phase.

Following consultant geocoding and as part of the Interim Data Deliveries (see next section), a sub-consultant performed an audit of geocoded locations. The auditor re-geocoded 5% of the household file to check for point accuracy and verified that the geocoding levels could not be improved (from intersection to address, for example). Additionally, the trip file was reviewed for geocoding accuracy by checking respondent city as compared to the city of the geocoded point. The sub-consultant submitted a report of findings for each Interim Data Delivery to MDOT and the consultant.

MDOT reviewed the geocoding report from the sub-consultant along with the data submitted for each data delivery. MDOT staff checked household geocoded locations for assignment to the proper region, researched any non-geocoded home locations, and reviewed point locations in areas where there were known address range problems. Staff also located most of the non-geocoded trip locations.

Geocoding Results

Upon project completion the geocoding targets were surpassed. Table 1 lists the number of all non-geocodable locations, the total number of locations, the percentage of the locations that were geocodable, the targeted geocoding percentage, and the difference between the percentages (achieved – target). The table illustrates that the achieved percentage exceeds the target percentage for each type of location.

Table 1: Geocoding Results for MI Travel Counts

Location Type	Locations				
	Non-Geocodable	Total	Achieved	Targeted	Difference
Household	6	16,753	100%	99%	1%
School	90	10,722	99%	95%	4%
Primary Work	453	18,927	98%	95%	3%
Secondary Work	34	898	96%	95%	1%
School/Work Combined	577	30,547	98%	95%	3%
Trip Origin	8,315	299,830	97%	90%	7%
Trip Destination	8,076	295,924	97%	90%	7%

For all trip origins and destinations from the accepted households, only 1.7% were non-geocodable to latitude/longitude, and only 15.7% were geocoded to the nearest street intersection rather than to street address.

Lessons Learned - Geocoding
Prior to determining the line layer to use for geocoding, it is important to check address ranges and determine if the number of segments with ranges is acceptable and will enable the geocoding goals to be met. Address ranges in urban areas were sufficient in the MGF, but were lacking in rural areas of the State. This would have been fine for an urban travel survey, but was unacceptable for a statewide survey.

The amount of staff time spent reviewing geocoded points and locating non-geocodable records far exceeded expectations. The same was true for the consultant. Following the geocoding hierarchy established by MDOT and using two line layers significantly increased the time necessary for geocoding.

Interim Data Deliveries and Data Checking

Process
The consultant proposed a system of interim data deliveries with sub-consultant audits of each data set. Interim data deliveries were generated for each 2,000 households collected.

The consultant performed several data checks, both in the CATI and through post-processing prior to submitting the data to the sub-consultant. The sub-consultant audited each interim dataset for problems with time and distance testing of trips to identify outliers for further review. This auditing process involved checking the distance and time between origin and destination points by using the MDOT statewide model network (taking into account average speeds and the distance between points) to calculate reasonable trip duration times. These calculated times were then compared with respondent reported trip time duration and checked for significant differences. All identified trip time/distance discrepancies were flagged in the data set for callbacks to respondents, further review, correction, or eventual designation as incompletes.

Trip records were flagged if:

- The statewide model travel time had more than a 60-minute difference from the reported respondent travel time.
- A trip was made within the same city/township and was greater than 60 minutes, or 90 minutes for the city of Detroit.
- The average travel speed was less than 5 miles per hour (mph). If the trip was greater than 30 miles in length, the trip was flagged if the average travel speed was greater than 80 mph; otherwise it was flagged if the average travel speed was greater than 65 mph. Trips less than 2 miles in length and also 30 minutes in time were considered acceptable due to short distance and time.

Trips that were flagged had 10 minutes either added or subtracted from the trip length and had a new speed computed. If the new speed was outside of the acceptable ranges, the record was flagged and reviewed again. All flagged trip records were examined individually to determine the cause of the error. Trips were flagged primarily for possible geocoding errors or time reporting errors.

Trips flagged for geocoding errors were examined in the context of the other trips made by the same household. This process yielded the cities most likely to contain the address originally listed by the respondent. Using the description of the location and the cities most frequented by the household, a new candidate address was chosen. The new address was then checked to be certain it fell within the time and distance parameters set by the audit.

Records with time reporting problems were far more difficult to correct than records with geocoding errors. If a trip with a time reporting problem had no obvious mistakes in the reported travel day, or could not be easily explained otherwise, there was little that could be done. Any change to the arrival or departure time listed by a respondent would be not much more than a guess. In these cases no respondent information was changed, but columns were added to the dataset and filled with computed start or end times. This process retained the integrity of the originally reported data yet allowed for realistic travel times to be calculated for use in model development.

Upon review of each interim data set and audit report MDOT staff determined acceptable and unacceptable households. These were forwarded to the consultant to determine if additional corrections would be made to the unacceptable households, or if they would be replaced by newly recruited households.

Lessons Learned – Interim Data Deliveries and Data Checking

The interim data deliveries provided an excellent method for identifying data problems prior to the end of the project. The time and distance checks revealed incorrect geocoding that could have been unknowingly accepted. By identifying acceptable and unacceptable households throughout the process MDOT staff and the consultant were aware of the progress toward meeting the sampling goals at any time.

Conclusion

The MDOT statewide household survey was a significant undertaking for both MDOT staff and the consultant. Several innovative processes were developed throughout the project which ensured that the data collected would be of excellent quality. MI Travel Counts was a worthwhile investment that will assure an accurate representation of Michigan household travel characteristics.

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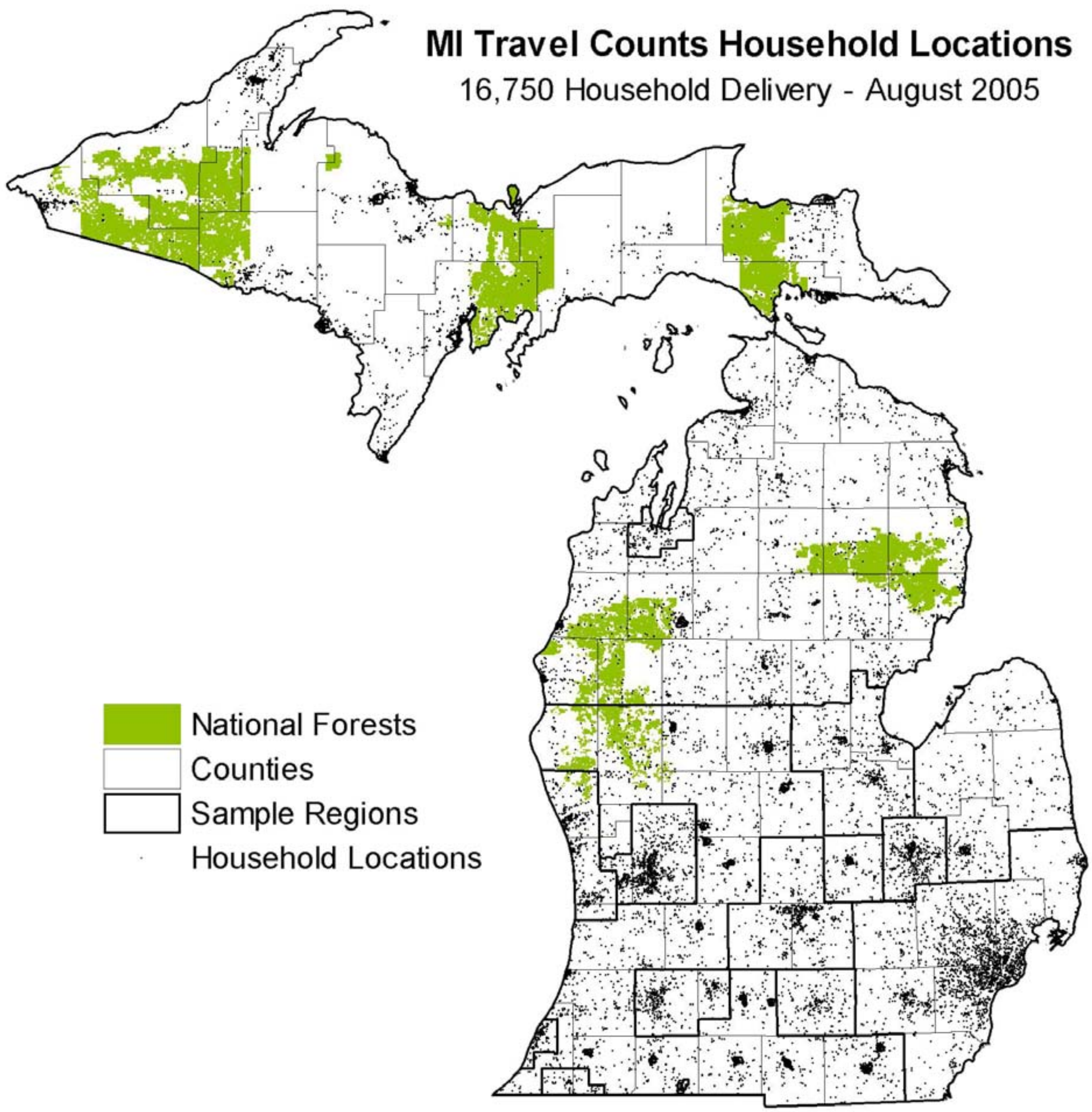

Figure 1: MI Travel Counts Household Locations