UMTRI-2004-04

An Evaluation of the “Buckle Up or Pay Up: Click It or Ticket” *November Safety Belt Mobilization*

Jonathon M. Vivoda
David W. Eby
Helen K. Spradlin

February 2004

Technical Report Documentation Page

1. Report No.	2. Government Accession No.	3. Recipient's Catalog No.
UMTRI-2004-04		

4. Title and Subtitle	5. Report Date
An Evaluation of the "Buckle Up or Pay Up: Click It Or Ticket" November Safety Belt Mobilization	February 2004
	6. Performing Organization Code
7. Author(s) Jonathon M. Vivoda, David W. Eby, Helen K. Spradlin	8. Performing Organization Report No. UMTRI-2004-04
9. Performing Organization Name and Address The University of Michigan Transportation Research Institute 2901 Baxter Road Ann Arbor, MI 48109	10. Work Unit No. (TRAIS) 11. Contract or Grant No. OP-03-27
12. Sponsoring Agency Name and Address Michigan Office of Highway Safety Planning 400 Collins Road, PO Box 30633 Lansing, MI 48909-8133	13. Type of Report and Period Covered Final 3/10/03 - 4/30/04 14. Sponsoring Agency Code
15. Supplementary Notes	

16. Abstract

The study reports the results of an evaluation of the "Buckle Up or Pay Up: Click It or Ticket" mobilization campaign in Michigan centered around Thanksgiving, 2003. The study consisted of two survey waves: one "mini" survey conducted as a baseline before the campaign, and one full statewide survey conducted after the campaign ended, to assess its effects. Both survey waves were conducted statewide on front-outboard occupants traveling in four vehicle types (passenger cars, sport-utility vehicles, vans/minivans, and pickup trucks). Belt use was estimated for all commercial/noncommercial vehicle types combined (the statewide safety belt use rate) for each survey wave. Additional analyses were conducted on the full statewide survey (post) because of the larger sample size. Statewide safety belt use was approximately 84 percent prior to the mobilization campaign and this rate did not significantly change during the campaign. Comparison of the rates between the baseline and post surveys showed that belt use also remained the same within strata and seating positions. The additional analyses conducted on the post survey revealed the usual low belt use groups that have been observed in the past: pickup truck occupants, males, and young motorists. The study results suggest that safety belt campaigns conducted in Michigan should continue to focus on these traditional low belt use groups. The lack of belt use change during the campaigns suggests that perhaps a message more tailored to the target groups or additional enforcement in the target areas should be implemented in the future.

17. Key Words	18. Distribution Statement
Motor vehicle occupant restraint use, safety belt use, seat belt survey, direct observation survey, occupant protection	Unlimited

19. Security Classif. (of this report)	20. Security Classif. (of this page)	21. No. of Pages	22. Price
Unclassified	Unclassified	55	

Reproduction of completed page authorized

This report was prepared in cooperation with the
Michigan Office of Highway Safety Planning
and
US Department of Transportation
National Highway Traffic Safety Administration
through Highway Safety Project #OP-03-27

CONTENTS

LIST OF FIGURES

LIST OF TABLES

ACKNOWLEDGMENTS

We express our thanks to several individuals who were essential to the completion of this project. Richard Baker, Jay Fischer, Steven Guerriero, David Wallace Johnson, David Szilagyi, Michael Walton, and Brandon Zwagerman conducted field observations. Judy Settles and Mary Chico coordinated administrative procedures for the field observers. Jennifer Zakrajsek provided valuable comments on a previous version of this report. Special thanks to the Michigan Office of Highway Safety Planning for its support.

Jonathon M. Vivoda, B.A.
David W. Eby, Ph.D.
Helen K. Spradlin, B.S.

February 2004

INTRODUCTION

In its continuing effort to increase safety belt use nationwide, NHTSA sponsors a number of activities and grant programs (see NHTSA, 2002 for a review). One of these activities is the Click It or Ticket (CIOT) program. This program is based on a successful program known as a Selective Traffic Enforcement Program (STEP) that was first implemented in Canada (Haseltine, 2001). STEP programs typically begin with an initial survey to assess the level of safety belt use before any media or enforcement activities begin. Next, law enforcement officers are educated on the importance of wearing safety belts as well as enforcing the safety belt law. The public is then informed of the upcoming campaign through media messages that focus on the benefits of safety belt use, and the fact that tickets will be issued during the campaign. Next, highly visible police enforcement begins with an emphasis on issuing tickets. This is designed to increase motorists' perception that they will be stopped and cited for failing to buckle up. As a final step, two surveys are typically conducted to assess the effects of the campaign, one immediately following the end of the enforcement period, and another several months later to examine the lasting effects of the program (Haseltine, 2001). A nationwide implementation of this STEP program in Canada, along with several other features, such as more expensive fines and adding driver license points for safety belt non-use, resulted in dramatic increases throughout that country. In 2000, the belt use rate for Canada was 90 percent (Haseltine, 2001), compared to only 71 percent in the United States (NHTSA, 2000).

Based upon initial success observed in Canada, the STEP model was introduced in the US on a smaller scale. One of these original programs, implemented in Elmira, New York, resulted in an increase of belt use from 49 percent to 77 percent during the three week campaign (Parrish & Keith, 2003). The first statewide implementation of a STEP model was the "Click It or Ticket" program developed in North Carolina in 1993 (Parrish & Keith, 2003). CIOT was implemented as a multi-year enforcement program combined with media and evaluation surveys (O'Neill, 2001). The continued success of the CIOT program over the last 10 years in North Carolina has led to an estimated savings of $4.9 billion in medical care and 1,600 lives saved, along with the prevention of more than 50,000 nonfatal injuries in that state alone (University of North Carolina Highway Safety Research Center, 2004).

Based on the success of CIOT in North Carolina in the mid to late 1990s, NHTSA, through Section 157 funding, began sponsoring individual states to implement this program in coordinated efforts, usually surrounding holidays (see Solomon, Ulmer, & Preusser, 2002). The CIOT campaign was adopted in Michigan following the upgrade of the safety belt law to primary enforcement in March 2000 (Michigan Office of Highway Safety Planning, OHSP, 2002). In 2003, Michigan received funding to participate in two CIOT campaigns centered around the Memorial Day and Thanksgiving holidays. Based on the results of focus group and expert input, OHSP revised the campaign this year. Information gathered from the focus groups made it clear that the monetary fine associated with lack of safety belt use was a strong incentive to buckle up. To take advantage of this information, OHSP added the slogan "Buckle Up or Pay Up" to the well known "Click It or Ticket" message. The campaign also began to advertise the fact that the fine for safety belt non-use was increased from $50 to $65. This new message was disseminated to the public via radio and television ads. For the November mobilization, about $400,000 was spent on advertising to alert motorists that the enforcement was taking place (OHSP, 2003a).

The way some police enforcement was implemented during the 2003 mobilization also underwent a change, with the introduction of "safety belt enforcement zones." During the mobilization that was conducted in May, these enforcement zones were developed and pilot tested in eight counties. Within an enforcement zone, there was a concentration of at least four officers on a defined stretch of roadway. A spotter placed at the beginning of the zone identified vehicles for the remaining officers to stop and ticket. Each zone lasted at least four hours, including briefing, set-up, and clean up. The locations of these zones were determined based on traffic volumes, location within counties of participating agencies, ability to place zone signage, officer safety, and a documented crash risk. An increase of 3.8 percentage points in safety belt use was observed during the May Mobilization (Eby, Vivoda, & Spradlin, 2003). Given the success of the earlier mobilization, this same model was implemented and expanded for the November mobilization. During the November mobilization, nearly 500 law enforcement agencies in Michigan participated in 207 enforcement zones (OHSP, 2003a), scheduled in 20 counties across the state (OHSP, 2003b).

To fully understand the effects of such a large effort to increase safety belt use statewide, it is essential that the campaign be evaluated. An evaluation provides important information regarding different aspects of the program, to assess which parts have been effective and which parts might need to be changed in future campaigns. It is particularly important to evaluate a new program to ensure that the current mobilization model is effective. An integral component of any safety belt evaluation should include direct observation surveys to estimate safety belt use rates. The purpose of the current study was to conduct two direct observation survey waves of safety belt use in Michigan. The first survey provided baseline safety belt use rates before the mobilization began, and the second provided use rates after program completion.

4

METHODS

Sample Design

The current study consisted of two survey waves: one "mini" statewide survey conducted as a baseline before the campaign, and one full statewide survey conducted directly after the safety belt mobilization. The sample design for the full statewide survey was closely based upon the one used by Streff, Eby, Molnar, Joksch, and Wallace (1993), while the mini survey consisted of a subsample of the full survey. The entire sampling procedure is presented here for completeness, with modifications noted. Procedures for selecting the subsample are detailed at the end of this section.

The goal of this sample design was to select observation sites in Michigan that accurately represented front-outboard vehicle occupants in eligible commercial and noncommercial vehicles (i.e., passenger cars, vans/minivans, sport-utility vehicles, and pickup trucks), while following federal guidelines for safety belt survey design (NHTSA, 1992, 1998). An ideal sample minimizes total survey error while providing sites that can be surveyed efficiently and economically. To achieve this goal, the following sampling procedure was used.

To reduce costs associated with direct observation of remote sites, NHTSA guidelines allow states to omit from their sample space the lowest population counties, provided these counties collectively account for 15 percent or less of the state's total population. Therefore, all 83 Michigan counties were rank ordered by population (US Bureau of the Census, 1992) and the low population counties were eliminated from the sample space. This step reduced the sample space to 28 counties. In order to account for shifts in the populations among counties (US Bureau of the Census, 2003), three additional counties were added to the present design, bringing the total number of counties in the sample space to 31.

The original 28 counties were then separated into four strata. The strata were constructed by obtaining historical belt use rates and vehicle miles of travel (VMT) for each county. Historical belt use rates were determined by averaging results from three previous University of Michigan Transportation Research Institute (UMTRI) surveys (Wagenaar &

Molnar, 1989; Wagenaar, Molnar, & Businski, 1987b, 1988). Since no historical data were available for six of the counties, belt use rates for those counties were estimated using multiple regression analysis based on per capita income and education in the other 22 counties (r^2 = .56; US Bureau of the Census, 1992).[1] Those factors have been shown previously to correlate positively with belt use (e.g., Shinar, 1993; Wagenaar, Molnar, & Businski, 1987a). Wayne County was chosen as a separate stratum because of its disproportionately high VMT, and to ensure that observation sites were selected within this county. The other three strata were constructed by rank ordering each county by historical belt use rates and then adjusting the stratum boundaries until the total VMT was roughly equal within each stratum. The stratum boundaries were high belt use (stratum 1), medium belt use (stratum 2), low belt use (stratum 3), and Wayne County. The additional counties for the present survey became part of stratum 3 and all sites in this stratum were reselected and rescheduled following the procedures described below. The counties comprising each stratum can be found in Table 1.

Table 1. Listing of Michigan Counties by Stratum

Stratum Number	Counties
1	Ingham, Kalamazoo, Oakland, Washtenaw
2	Allegan, Bay, Eaton, Grand Traverse, Jackson, Kent, Livingston, Macomb, Midland, Ottawa
3	Berrien, Calhoun, Clinton, Genesee, Ionia, Isabella, Lapeer, Lenawee, Marquette, Monroe, Muskegon, Saginaw, Shiawassee, St. Clair, St. Joseph, Van Buren
4	Wayne

To achieve the NHTSA required precision of less than 5 percent relative error, a minimum number of observation sites for the survey (N = 56) was determined based on within- and between-county variances from previous belt use surveys and on an estimated 50 vehicles per observation period in the current survey. This minimum number was then increased (N = 168) to get an adequate representation of belt use for each day of the week and for all daylight hours.

[1] Education was defined as the proportion of population in the county over 25 years of age with a professional or graduate degree.

Because total VMT within each stratum was roughly equal, observation sites were evenly divided among the strata (42 each). In addition, since an estimated 23 percent of all traffic in Michigan occurs on limited-access roadways (Federal Highway Administration, 1982), 10 of the sites (24 percent) within each stratum were freeway exit ramps, while the remaining 32 were roadway intersections.

Within each stratum, observation sites were randomly assigned to a location using different methods for intersections and freeway exit ramps. The intersection sites were chosen using a method that ensured each intersection within a stratum an equal probability of selection. Detailed, equal-scale road maps for each county were obtained and a grid pattern was overlaid on each county map. The grid dimensions were 62 lines horizontally and 42 lines vertically. The lines of the grid were separated by 1/4 inch. With the *3/8 inch:mile* scale of the maps, this created grid squares that were .67 miles per side. (Because Marquette County is so large, it was divided into four maps and each part was treated as a separate county.) Each grid square was uniquely identified by two numbers, a horizontal (x) coordinate and a vertical (y) coordinate.

The 42 sites for each stratum were sampled sequentially. The 32 local intersection sites were chosen by first randomly selecting a grid number containing a county within a stratum.[2] This was achieved by generating a random number between 1 and the number of grids within the stratum. For example, since the high belt use stratum had four grid patterns overlaying four counties, a random number between 1 and 4 was generated to determine which grid would be selected. Thus, each grid had an equal probability of selection at this step. Once the grid was selected, a random x and a random y coordinate were chosen and the corresponding grid square identified. Thus, each intersection had an equal probability of selection. If a single intersection was contained within the square, that intersection was chosen as an observation site. If the square did not fall within the county, there was no intersection within the square, or there was an intersection but it was located one road link from an already selected intersection, then a new grid number and x, y coordinate were randomly selected. If more than one intersection was within the grid

[2] It is important to note that grids were selected during this step rather than counties. This was necessary only because it was impractical to construct a single grid that was large enough to cover all of the counties in the largest stratum when they were laid side by side.

square, the grid square was subdivided into four equal sections and a random number between 1 and 4 was selected until one of the intersections was chosen. This happened for only two of the sites.

Once a site was chosen, the following procedure was used to determine the particular street and direction of traffic flow that would be observed. For each intersection, all possible combinations of street and traffic flow were determined. From this set of observer locations, one location was randomly selected with a probability equal to 1/number of locations. For example, if the intersection, was a "+" intersection, as shown in Figure 1, there would then be four possible combinations of street and direction of traffic flow to be observed (observers watched traffic only on the side of the street on which they were standing). In Figure 1, observer location number one indicates that the observer would watch southbound traffic and stand next to Main Street. For observer location number two, the observer would watch eastbound traffic and stand next to Second Street, and so on. In this example, a random number between 1 and 4 would be selected to determine the observer location for this specific site. The probability of selecting a specific standing location at an intersection is dependent upon the intersection type. Four-legged intersections like that shown in Figure 1 have four possible observer locations, while three-legged intersections like "T" and "Y" intersections have only three possible observer locations. The effect of this slight difference in probability accounts for .01 percent or less of the standard error in the belt use estimate.

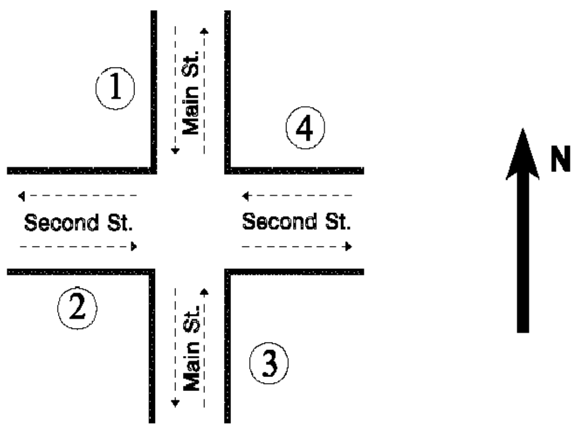

Figure 1. An Example "+" Intersection Showing 4 Possible Observer Locations.

For each primary intersection site, an alternate site was also selected. The alternate sites were chosen within a 20 x 20 square unit area around the grid square containing the original intersection, corresponding to a 13.4 square mile area around the site. This was achieved by randomly picking an *x*, *y* grid coordinate within the alternate site area. Grid coordinates were selected until a grid square containing an intersection was found. No grid squares were found that contained more than one intersection. The observer location at the alternate intersection was determined in the same way as at the primary site.[3]

The 10 freeway exit ramp sites within each stratum were also selected so that each exit ramp had an equal probability of selection.[4] This was done by enumerating all of the exit ramps within a stratum and randomly selecting without replacement 10 numbers between 1 and the number of exit ramps in the stratum. For example, in the high belt use stratum there were a total of 109 exit ramps. To select an exit ramp, a random number between 1 and 109 was generated. This number corresponded to a specific exit ramp. To select the next exit ramp, another random number between 1 and 109 was selected with the restriction that no previously selected numbers could be chosen. Once the exit ramps were determined, the observer location for the actual observation was determined by enumerating all possible combinations of direction of traffic flow and sides of the ramp on which to stand. As in the determination of the observer locations at the roadway intersections, the possibilities were then randomly sampled with equal probability. The alternate exit ramp sites were selected by taking the first interchange encountered after randomly selecting a direction of travel along the freeway from the primary site. If this alternate site was outside of the county or if it was already selected as a primary site, then the other direction of travel along the freeway was used. If the exit ramp had no traffic control device on the selected direction of travel, then a researcher visited the site and randomly picked a travel direction and lane that had such a device.

---

[3] For those interested in designing a safety belt survey for their county or region, a guidebook and software for selecting and surveying sites for safety belt use is available (Eby, 2000) by contacting UMTRI-SBA, 2901 Baxter Rd., Ann Arbor, MI 48109-2150, or accessing http://www-personal.umich.edu/~eby/sbs.html/.

[4] An exit ramp is defined here as egress from a limited-access freeway, irrespective of the direction of travel. Thus, on a north-south freeway corridor, the north and south bound exit ramps at a particular cross street are considered a single exit ramp location.

The day of week and time of day for site observations were quasi-randomly assigned to sites in such a way that all days of the week and all daylight hours (7:00 am - 7:00 pm) had essentially equal probability of selection. The sites were observed using a clustering procedure. That is, sites that were located spatially adjacent to each other were considered to be a cluster. Within each cluster, a shortest route between all of the sites was decided (essentially a loop) and each site was numbered. An observer watched traffic at all sites within the cluster during a single day. The day a particular cluster was to be observed was randomly determined. After taking into consideration the time required to finish all sites before dark, a random starting time for the day was selected. In addition, a random number between 1 and the number of sites in the cluster was selected. This number determined the site within the cluster where the first observation would take place. The observer then visited sites following the loop in either a clockwise or counterclockwise direction (whichever direction left them closest to UMTRI at the end of the day). This direction was determined by the project manager prior to sending the observer into the field. Because of various scheduling limitations (e.g., observer availability, number of hours worked per week) certain days and/or times were identified that could not be observed. When this occurred, a new day and/or time was randomly selected until a usable one was found. The important issue about the randomization is that the day and time assignments for observations at the sites were not correlated with belt use at a site. This quasi-random method is random with respect to this issue.

The sample design was constructed so that each observation site was self-weighted by VMT within each stratum. This was accomplished by selecting sites with equal probability and by setting the observation interval to a constant duration (50 minutes) for each site.[5] Thus, the number of vehicles observed at an observation site reflected safety belt use by VMT; that is, the higher the VMT at a site, the greater the number of vehicles that would pass during the 50-minute observation period. However, since all vehicles passing an observer could not be surveyed, a vehicle count of all eligible vehicles (i.e., passenger cars, vans/minivans, sport-utility vehicles, and pickup trucks) on the traffic leg

[5] Because of safety considerations, sites in the city of Detroit were observed for a different duration. See data collection section for more information.

under observation was conducted for a set duration (5 minutes) immediately prior to and immediately following the observation period (10 minutes total).

Mini Survey Subsample Selection

The purpose of the mini survey was to quickly and economically determine the overall statewide safety belt use rate using a limited number of sites without the requirements of providing safety belt rates by day of week, time of day, or demographics of occupants. As described earlier, to achieve the required precision of less than 5 percent relative error, the minimum number of observation sites for the survey was determined to be 56 sites, 14 in each stratum. To begin the subsample selection, all of the freeway sites within each stratum of the full statewide survey were assigned a number between 1 and 10. Since 24 percent of the sites within each stratum of the full sample were freeway exit ramps (to match the freeway travel in Michigan), it was necessary for two of the subsample strata to have 3 freeway sites and the other two strata to have 4. To randomly determine which strata would have 3 freeway sites, two random numbers between 1 and 4 were generated to correspond with the stratum numbers. Random numbers corresponding to the freeway sites were then generated until the proper number had been chosen for each stratum. The remaining intersection sites within each stratum were assigned a number 1-32, and then a random number was generated between 1 and 32 for Stratum 1. The site corresponding to that number was chosen as a site for the subsample. Random numbers continued to be generated, without replacement, until all 14 sites had been chosen within the stratum. This site selection process was repeated for each of the remaining 3 strata until 56 sites had been sampled from the original 168. The scheduling of the sites for the mini survey was completed using the same clustering procedure described above.

Table 2 shows descriptive statistics for the 56 observation sites of the mini baseline survey conducted between 10/27/03 - 11/02/03. As stated earlier, the purpose of this phase of the study was to provide only an overall estimate of statewide safety belt use in Michigan, along with belt use by stratum and seating position. Given the compressed schedule necessary to complete this survey, and the small number of sites relative to the full statewide survey, an even distribution of observations over day of week and time of day was not possible. As expected, observations were not well distributed over day of week or time of day (see Table 2). An observation session was included in the time slot that represented the majority of the observation period. If the observation period was evenly distributed between two time slots, then it was included in the later time slot. This table also shows that nearly every site observed was the primary site and that observations were mostly conducted during cloudy and rainy weather conditions. A few observations were conducted during sunny conditions, and none during snow.

Table 2. Descriptive Statistics for the 56 Observation Sites in the Baseline Mini Survey

Day of Week		**Observation Period**		**Site Choice**		**Weather**	
Monday	19.6%	7-9 a.m.	12.5%	Primary	98.2%	Sunny	10.7%
Tuesday	19.6%	9-11 a.m.	28.5%	Alternate	1.8%	Cloudy	58.9%
Wednesday	7.2%	11-1 p.m.	16.1%			Rain	30.4%
Thursday	8.9%	1-3 p.m.	25.0%			Snow	0.0%
Friday	14.3%	3-5 p.m.	16.1%				
Saturday	12.5%	5-7 p.m.	1.8%				
Sunday	17.9%						
TOTALS	100%		100%		100%		100%

Table 3 contains descriptive statistics for the 168 observation sites of the full statewide survey conducted between 12/04/03 - 12/17/03. As shown in this table, observations were fairly well distributed over day of week. Observations were also well distributed by time of day except for the earliest and latest time period. This was primarily due to the lack of daylight before 8 a.m. and after 5 p.m. during December. Nearly every site observed was the primary site and most observations were conducted during cloudy weather conditions. A smaller percentage of observations were conducted during sunny and snowy weather, with relatively few conducted during rain.

Table 3. Descriptive Statistics for the 168 Observation Sites in the Post Mobilization Full Statewide Survey

Day of Week		Observation Period		Site Choice		Weather	
Monday	14.3%	7-9 a.m.	8.9%	Primary	99.4%	Sunny	14.9%
Tuesday	13.7%	9-11 a.m.	23.8%	Alternate	0.6%	Cloudy	61.9%
Wednesday	10.7%	11-1 p.m.	20.3%			Rain	7.7%
Thursday	16.1%	1-3 p.m.	22.6%			Snow	15.5%
Friday	17.8%	3-5 p.m.	22.4%				
Saturday	13.7%	5-7 p.m.	2.0%				
Sunday	13.7%						
TOTALS	100%		100%		100%		100%

Data Collection

Trained field staff observed shoulder belt use, sex, age, vehicle type, and vehicle purpose (commercial or noncommercial) of drivers and front-right passengers during daylight hours only. Motorists traveling in passenger cars, sport-utility vehicles, vans/minivans, and pickup trucks were included. Observations were conducted when a vehicle came to a stop at a traffic light or stop sign.

Data Collection Forms

Data were collected during the mobilization using personal digital assistants (PDAs). For a more detailed description of the PDA data collection process, see Appendix C. Two electronic forms were developed for data collection: a site description form and an observation form. For each site surveyed, separate electronic copies of the site description form and observation form were created in advance. The site description form allowed observers to provide descriptive information including the site location, site type (freeway exit ramp or intersection), site choice (primary or alternate), observer name, date, day of week, time of day, weather, and a count of eligible vehicles traveling on the proper traffic leg. A place on the form was also furnished for observers to electronically sketch the intersection and to identify observation location. Finally, a comments section was available to identify landmarks that might be helpful in characterizing the site (e.g., school, shopping mall) and to discuss problems or issues relevant to the site or study.

A second electronic form, the observation form, was used to record safety belt use, passenger information, and vehicle information. For each vehicle surveyed, shoulder belt use, sex, and estimated age of the driver and the front-outboard passenger were recorded along with vehicle type. Children riding in child restraint devices (CRDs) were recorded but not included in any part of the analysis. Occupants observed with their shoulder belt worn under the arm or behind the back were noted but considered belted in the analysis. Based upon NHTSA (1999) guidelines, the observer also recorded whether the vehicle was commercial or noncommercial. A commercial vehicle is defined as a vehicle that is used for business purposes and may or may not contain company logos. This classification includes vehicles marked with commercial lettering or logos, or vehicles with ladders or other tools on them.

Procedures at Each Site

All sites in the sample were visited by one observer for a period of 1 hour, with the exception of sites in the city of Detroit. To address potential security concerns, these sites were visited by two-person observer teams for 30 minutes. Observations at other Wayne/Oakland County sites scheduled to be observed on the same day as Detroit sites were also completed by two observers. Because each team member at these sites recorded data for different lanes of traffic, the total amount of data collection time was equivalent to that at single-observer sites.

Upon arriving at a site, observers determined whether observations were possible at the site. If observations were not possible (e.g., due to construction), observers proceeded to the alternate site. Otherwise, observers completed the site description form and then moved to their observation position near the traffic control device.

Observers were instructed to observe only the lane immediately adjacent to the curb for safety belt use, regardless of the number of lanes present. At sites visited by two-person teams, team members observed different lanes of the same traffic leg with one observer on the curb and one observer on the median (if there was more than one traffic lane and a median). If no median was present, observers were instructed to stand on diagonally opposite corners of the intersection.

At each site, observers conducted a 5-minute count of all eligible vehicles in the designated traffic leg before beginning safety belt observations. Observations began immediately after completion of the count and continued for 50 minutes at sites with one observer, and 25 minutes at sites with two observers. During the observation period, observers recorded data for as many eligible vehicles as possible. If traffic flow was heavy, observers were instructed to record data for the first eligible vehicle they saw, then look up and record data for the next eligible vehicle they saw, continuing this process for the remainder of the observation period. At the end of the observation period, a second 5-minute vehicle count was conducted at one-observer sites.

Observer Training

Prior to data collection, field observers participated in 5 days of intensive training, including both classroom review of data collection procedures and practice field observations. Each observer received a training manual containing detailed information on field procedures for observations, PDA use, and administrative policies and procedures. A site schedule identifying the location, date, time, and traffic leg to be observed for each site was included in the manual (see Appendix A for a listing of the sites).

After intensive review of the manual, observers conducted practice observations at several sites chosen to represent the types of sites and situations that would actually be encountered in the field. None of the locations of the practice sites were the same as sites observed during the study. Training at practice sites focused on PDA use, completing the electronic forms, determining where to stand and which lanes to observe, conducting the vehicle count, recording safety belt use, and estimating age and sex. Observers worked in teams of two, observing the same vehicles, but recording data independently on their own PDA. The data were then compared for accuracy. Teams were rotated throughout the training to ensure that each observer was paired with every other observer. Each observer pair practiced recording safety belt use, sex, age, and vehicle type until there was an inter-observer reliability of at least 85 percent for all measures on drivers and front-right passengers for each pair of observers.

Observers were provided an atlas of Michigan county maps and all necessary field supplies. They were also given time to locate their assigned sites on the appropriate maps and plan travel routes to the sites. After marking the sites on their maps, the marked locations were compared to a master map of locations to ensure that the correct sites had been pinpointed. Field procedures were reviewed for the final time and observers were informed that unannounced site visits would be made by the field supervisor during data collection to ensure adherence to study protocols.

Observer Supervision and Monitoring

During data collection, each observer was spot checked in the field on at least two occasions by the field supervisor. Contact between the field supervisor and field staff was also maintained on a regular basis through telephone calls to report progress and discuss problems encountered in the field, e-mails to the field supervisor from each observer's PDA containing data from the preceding day, text messages to the observer's PDAs to alert them to any important information, and visits to the UMTRI office to deliver expense forms and timesheets. Field staff were instructed to call the field supervisor's home or cellular phone if problems arose during evening hours or on weekends.

Incoming data files were examined by the field supervisor and problems (e.g., missing data, discrepancies between the site description form and site listing or schedule) were noted and discussed with field staff. Comments on the site description form about site-specific characteristics that might affect future surveys (e.g., traffic flow patterns, traffic control devices, site access) were noted.

Data Processing and Estimation Procedures

The accuracy of electronic data was verified by checking for inconsistent codes (e.g., the observation end time occurring before the start time; "no passenger" marked, when passenger data was present) and missing data. Any errors noted during this process were corrected.

For each site in both survey waves, a computer analysis program determined the number of observed vehicles, belted and unbelted drivers, and belted and unbelted passengers. Separate counts were calculated for each independent variable in the survey (i.e., site type, time of day, day of week, weather, sex, age, seating position, and vehicle type). This information was combined with site information to create one file for each survey wave used for generating study results.

As mentioned earlier, our goal in this safety belt survey was to estimate belt use for the state of Michigan based on VMT. As also discussed, the self-weighting-by-VMT scheme employed is limited by the number of vehicles for which an observer can accurately record information. To correct for this limitation, the vehicle count information was used to weight the observed traffic volumes so they would more accurately reflect VMT.

This weighting was done by first adding each of the two 5-minute counts, and then multiplying this number by five so that it would represent a 50-minute duration.[6] The resulting number was the estimated number of vehicles passing through the site if all eligible vehicles had been included in the survey during the observation period at that site. The estimated count for each site is divided by the actual number of vehicles observed there, to obtain a volume weighting factor for that site. These weights are then applied to the number of actual vehicles of each type observed at each site to yield the weighted N for the total number of drivers and passengers, and total number of belted drivers and passengers for each vehicle type. Unless otherwise indicated, all analyses reported are based upon the weighted values.

The overall estimate of belt use per VMT in Michigan was determined by first calculating the belt use rate within each stratum for observed vehicle occupants in all vehicle types using the following formula:

$$r_i \bullet \frac{\text{Total Number of Belted Occupants, weighted}}{\text{Total Number of Occupants, weighted}}$$

where r_i refers to the belt use rate within any of the four strata. The totals are the sums across all 42 sites within the stratum after weighting, and occupants refers to only front-outboard occupants. The overall estimate of belt use was computed by averaging the belt use rates for each stratum. However, comparing total VMT among the strata, one finds that the Wayne County stratum is only 83 percent as large as the total VMT for the other three strata. In order to represent accurately safety belt use for Michigan by VMT, the

[6] As mentioned previously, the Detroit sites were visited by pairs of observers for half as long. For these sites, the single 5-minute count was multiplied by five to represent the 25-minute observation period.

Wayne County stratum was multiplied by 0.83 during the averaging to correct for its lower total VMT. The overall belt use rate was determined by the following formula:

$$r_{all} = \frac{r_1 + r_2 + r_3 + (0.83 \cdot r_4)}{3.83}$$

where r_i is the belt use rate for a certain vehicle type within each stratum and r_4 is the Wayne County stratum.

The estimates of variance and the calculation of the confidence bands for the belt use estimates are complex. See Appendix B for a detailed description of the formulae and procedures. The same use rate and variance equations were utilized for the calculation of use rates for each vehicle type separately.

RESULTS

As discussed previously, the current study of safety belt use in Michigan reports results from two direct observation survey waves. The first survey wave consisted of a mini survey conducted to determine baseline use rates prior to the mobilization campaign. The second wave was a full statewide survey conducted immediately following the end of the campaign to assess its effects. As described earlier, the mini survey was designed to allow only for an examination of the overall statewide safety belt use rate, along with belt use by stratum and seating position, while the full statewide survey allows for an analysis of belt use by several other categories. The following section will discuss only the three common belt use categories that can be analyzed in both the mini and full survey. An extraction from the full survey was also conducted to compare belt use rates from the same sites that were observed during the mini survey. However, it should be noted that these sites were conducted at different times of the day, and days of the week during these survey waves. A section will follow to include the additional categories that can be analyzed with the full post survey.

Baseline and Post Comparison

Overall Safety Belt Use

Table 4 shows the statewide safety belt use rates and unweighted number of front-outboard occupants (N) for both survey waves as well as the mini extraction from the full survey. The "±" value following the use rate indicates a 95 percent confidence band around the percentage. This value should be interpreted to mean that we are 95 percent sure that the actual safety belt use rate falls somewhere inside the band created by these percentages. As shown in this table, statewide safety belt use was about 84 percent both prior to, and following the mobilization campaign.

Table 4. Overall Safety Belt Use and Unweighted N by Survey Wave			
Survey	**Statewide Use Rate**	**Unweighted N**	**Relative Error**
Baseline (mini)	83.8 ± 2.4%	5,172	1.44%
Post (mini extraction)	83.2 ± 2.2%	4,308	1.36%
Post (full)	83.6 ± 1.4%	12,221	0.85%

Safety Belt Use by Stratum

Estimated safety belt use by stratum and survey wave is shown in Table 5. This table shows that belt use varied slightly within each stratum, but did not significantly change between the baseline survey and the follow-up. During the baseline survey, belt use was highest for Strata 1 and 2, and slightly lower for Strata 3 and 4. In the post survey, Stratum 1 remained the highest and was unchanged, while a slight increase was noted in Stratum 4. Stratum 2 decreased, and Stratum 3 remained the same when compared to the post extraction, but decreased when compared to the full post survey. However, it is important to note that none of these changes was statistically significant.

Table 5. Safety Belt Use and Unweighted N by Stratum and Survey Wave			
	Baseline (mini)	**Post (mini extraction)**	**Post (full)**
Stratum 1	86.6% (1,530)	86.3% (1,398)	87.9% (4,366)
Stratum 2	85.8% (892)	82.5% (733)	83.5% (2,134)
Stratum 3	82.3% (932)	82.6% (656)	80.8% (1,258)
Stratum 4	79.7% (1,818)	81.1% (1,521)	82.1% (4,463)

Safety Belt Use by Seating Position

Estimated safety belt use by position in vehicle and survey wave is shown in Table 6. This table shows that safety belt use for drivers was slightly higher than use by front-right passengers for all survey waves, including the mini extraction. Belt use by seating position essentially remained unchanged from the baseline survey to the post survey.

Table 6. Safety Belt Use and Unweighted N by Seating Position and Survey Wave			
	Baseline (mini)	**Post (mini extraction)**	**Post (full)**
Driver	84.4% (4,146)	83.8% (3,433)	84.3% (9,813)
Passenger	81.3% (1,026)	80.6% (875)	80.7% (2,408)

Full Post Survey - Additional Analyses

As mentioned earlier, several other categories of safety belt use can be analyzed in the full survey conducted after the mobilization ended. The following pages discuss safety belt use by vehicle type, site type, time of day, day of week, weather, sex, age group, and seating position.

Estimated belt use rates and unweighted numbers of occupants by stratum and vehicle type are shown in Tables 7a through 7d. Within each vehicle type, belt use is generally highest in Stratum 1, with no systematic differences in safety belt use noted within the other strata. Within each stratum, belt use is lowest among motorists traveling in pickup trucks. This finding is consistent with results from previous studies (e.g., Eby, Molnar, & Olk, 2000; Eby, Vivoda, & Fordyce, 2002). Observed differences in safety belt use by the other three vehicles types were not statistically significant. However, within Stratum 3, safety belt use for occupants of sport-utility vehicles and vans/minivans was unusually low. There is no obvious explanation for this difference. Based upon these results, enforcement and PI&E programs should continue to target pickup truck occupants.

Table 7a. Percent Shoulder Belt Use by Stratum (Passenger Cars)		
	Percent Use	Unweighted N
Stratum 1	89.5	2,083
Stratum 2	87.2	922
Stratum 3	86.3	580
Stratum 4	83.1	2,503
STATE OF MICHIGAN	**86.7 ± 1.5 %**	6,088

Table 7b. Percent Shoulder Belt Use by Stratum (Sport-Utility Vehicles)		
	Percent Use	Unweighted N
Stratum 1	86.8	843
Stratum 2	84.5	412
Stratum 3	76.8	206
Stratum 4	81.9	730
STATE OF MICHIGAN	**82.5 ± 3.0 %**	2,191

Table 7c. Percent Shoulder Belt Use by Stratum (Vans/Minivans)		
	Percent Use	Unweighted N
Stratum 1	89.6	634
Stratum 2	80.3	331
Stratum 3	79.6	192
Stratum 4	84.2	670
STATE OF MICHIGAN	**83.4 ± 2.9 %**	1,827

Table 7d. Percent Shoulder Belt Use by Stratum (Pickup Trucks)		
	Percent Use	Unweighted N
Stratum 1	83.1	806
Stratum 2	76.0	469
Stratum 3	72.3	280
Stratum 4	76.7	560
STATE OF MICHIGAN	**77.0 ± 2.5 %**	2,115

Safety Belt Use by Subgroup

Statewide safety belt use rates by site type, time of day, day of week, weather, occupant sex, age group, and vehicle type are shown in Table 8. Recall that use rates for these subgroups could only be calculated for the full statewide survey (post).

Site Type

As is typically found (Eby, Molnar, & Olk, 2000; Eby, Vivoda, & Fordyce, 2002), safety belt use was slightly higher for vehicles leaving limited access roadways (exit ramps) than for non-limited access intersections. This effect was consistent across all vehicle types with the exception of vans/minivans.

Time of Day

Estimated safety belt use by time of day, vehicle type, and all vehicles combined is shown in Table 8. Note that these data were collected only during daylight hours. For all vehicles combined, belt use was generally highest during the morning commute. There appears to be a wide variation in belt use between different vehicle types during the evening rush hour. However, due to the limited amount of daylight hours in December, when this survey was conducted, there are relatively fewer observations between the hours of 7 - 9 a.m. and 5 - 7 p.m. Therefore these results should be interpreted with caution.

Day of Week

Estimated safety belt use by day of week, vehicle type, and all vehicles combined is shown in Table 8. Note that the survey was conducted over a 3-week period. Belt use clearly varied from day to day, but as is commonly found, there were no consistent trends in belt use by day of week.

Weather

Table 8 also shows safety belt use by prevailing weather condition. There was essentially no difference in belt use by any of the four weather conditions. Within each vehicle type there appears to be a large range in belt use during rainy conditions, but the number of observations for these groups are quite low. Therefore, comparisons of safety belt use by weather should be considered with caution.

Sex

As is typically found in Michigan (see e.g., Eby, Molnar, & Olk, 2000; Eby, Vivoda, & Fordyce, 2002), safety belt use was higher for women than for men in the survey. This difference, of about 10 percentage points, was found across all vehicle types.

Age Group

Because of the low number of occupants under age 16 riding in the front-outboard passenger position, use rates for the two youngest age groups should be interpreted with caution. Excluding these age groups, we found that safety belt use increased with age, as has been found in the past (see e.g., Eby, Molnar, & Olk, 2000; Eby, Vivoda, & Fordyce, 2002). These results continue to make the case that belt use programs should target beginning drivers and young drivers.

Seating Position

Estimated safety belt use by position in vehicle, vehicle type, and all vehicles combined is also shown in Table 8. As discussed earlier, safety belt use for drivers is slightly higher than use by front-right passengers for all vehicle types combined. This trend was also noted within each of the four vehicle types.

Table 8. Percent Shoulder Belt Use and Unweighted N by Vehicle Type and Subgroup										
	All Vehicles		Passenger Car		Sport-Utility Vehicle		Van/Minivan		Pickup Truck	
	Percent Use	N	Percent Use	N	Percent Use	N	Percent Use	N	Percent Use	N
Site Type										
Intersection	82.6	8,570	84.8	4,226	82.4	1,556	83.4	1,266	76.8	1,522
Exit Ramp	85.5	3,651	89.5	1,862	82.6	635	82.8	561	79.3	593
Time of Day										
7 - 9 a.m.	85.7	940	88.4	463	88.6	182	86.8	153	70.4	142
9 - 11 a.m.	83.1	2,262	86.5	1,087	82.2	393	87.4	370	71.8	412
11 - 1 p.m.	82.0	2,179	84.6	1,085	83.9	332	84.9	347	70.6	415
1 - 3 p.m.	84.1	3,670	86.8	1,782	81.5	752	85.4	529	77.4	607
3 - 5 p.m.	84.7	3,025	87.4	1,583	85.1	514	78.6	413	82.7	515
5 - 7 p.m.	82.8	145	88.6	88	55.6	18	93.3	15	75.0	24
Day of Week										
Monday	84.7	1,984	89.0	1,170	86.1	303	85.7	284	70.7	227
Tuesday	83.0	1,733	88.4	817	74.6	293	80.1	268	82.7	355
Wednesday	85.0	897	88.8	438	84.6	159	83.0	135	80.2	165
Thursday	84.6	1,765	85.3	920	86.2	270	87.3	285	79.0	290
Friday	82.7	2,681	87.0	1,305	80.2	481	83.0	417	75.6	478
Saturday	84.2	1,484	87.0	656	88.7	277	86.6	220	76.8	331
Sunday	85.3	1,677	88.1	782	88.8	408	86.0	218	75.0	269
Weather										
Sunny	83.2	1,853	85.3	788	83.3	467	81.0	253	80.2	345
Cloudy	84.6	8,175	87.5	4,246	83.6	1,348	87.9	1,243	76.2	1,338
Rain	87.1	651	88.6	294	70.4	105	75.5	97	84.8	155
Snow	84.1	1,542	86.9	760	84.1	271	83.6	234	76.0	277
Sex										
Male	78.8	6,664	82.1	2,967	77.9	1,081	77.9	952	74.8	1,664
Female	89.4	5,551	90.7	3,118	87.2	1,110	88.8	873	86.2	450
Age										
0 - 3	100.0	2	---	0	100.0	1	100.0	1	---	0
4 - 15	81.5	384	81.4	173	76.3	79	92.7	74	70.4	58
16 - 29	81.6	3,274	84.4	1,909	78.5	506	82.5	297	74.1	562
30 - 59	83.8	7,280	87.0	3,181	83.6	1,481	83.8	1,252	77.6	1,366
60 - Up	87.5	1,277	91.0	823	88.8	124	81.6	202	78.8	128
Position										
Driver	84.3	9,813	87.4	4,899	83.3	1,755	83.8	1,420	78.0	1,739
Passenger	80.7	2,408	83.4	1,189	79.0	436	81.5	407	73.8	376

Safety Belt Use by Age and Sex Combined

Table 9 shows estimated safety belt use rates and unweighted Ns by age and sex combined. Again, because of low sample sizes for the two youngest age groups, results for these groups should be considered with caution, and will be excluded from the following discussion. For both sexes, belt use increased with age. However, the overall difference among the three age groups was much higher for males than females. For example, safety belt use for 60-up males was 9.1 percentage points higher than 16-to-29-year-old males, while belt use for 60-up females, was only 2.5 percentage points higher than for 16-to-29-year-old females. As stated earlier, male belt use was the highest for the 60-up age group (84.3 percent), however, it is striking that this rate is lower than even the lowest rate among female motorists. These results argue strongly for belt use campaigns to continue to focus upon male motorists.

Table 9. Percent Shoulder Belt Use and Unweighted N by Age and Sex (All Vehicle Types Combined)

Age Group	Male		Female	
	Percent Use	Unweighted N	Percent Use	Unweighted N
0 - 3	100.0	1	100.0	1
4 - 15	76.1	211	87.7	173
16 - 29	75.2	1,673	88.2	1,634
30 - 59	79.2	4,137	89.8	3,140
60 - Up	84.3	676	90.7	601

DISCUSSION

The estimated statewide safety belt use rates for front-outboard occupants of passenger cars, sport-utility vehicles, vans/minivans, and pickup trucks combined was 83.8 ± 2.4 percent during the baseline survey wave, and 83.6 ± 1.4 percent during the post survey wave. The mini survey extraction from the post survey showed a belt use rate of 83.2 ± 2.2 percent. These results reveal that safety belt use remained about the same throughout the study.

Belt use rates were also analyzed and compared across survey waves as a function of stratum. Belt use in Stratum 1 was the highest in both survey waves and showed the smallest change, while Stratum 2 decreased slightly, and Stratum 4 increased slightly. The analysis of Stratum 3 reveals a slight decrease from the baseline to the post full survey, but no change when comparing the baseline to the mini extraction from the post survey. While there were some slight changes within each stratum from the baseline survey to the follow-up, these differences were not significant.

An analysis of safety belt use by seating position was also conducted and compared across the two survey waves. Belt use was higher for drivers than for passengers in both the baseline and post survey waves. This same trend was also noted in the mini survey extraction from the post full survey. Comparison of the baseline survey to the post full survey showed no change in safety belt use within either seating position.

As discussed earlier, the mini survey design used in the baseline survey wave only allowed for an analysis of safety belt use overall, by stratum, and by seating position. However, the full survey conducted as the post-campaign wave allowed for a more detailed analysis of belt use by several other subgroups. Specifically, belt use could also be analyzed by site type, time of day, day of week, prevailing weather condition, sex, age group, and vehicle type. The following paragraph discusses these additional subcategories.

In general, safety belt use observed during the full post survey showed the same general trends noted in previous surveys. Motorists in pickup trucks continued to have a lower belt use rate than motorists in other vehicle types. Belt use was slightly higher at freeway exit ramps than at intersections. Belt use appeared to be higher during the morning commute than at other times of the day. However, limited daylight hours in December, and the resulting low numbers of observations, may have contributed to some variations noted during early and late commute times. There were no consistent differences in belt use by day of week or weather. Males continued to have much lower belt use than females, and belt use generally increased with age.

While none of these individual results are surprising, it is somewhat surprising that there was no statewide change in belt use from the baseline to the post survey. This is puzzling because essentially the same mobilization activities were conducted earlier in the year (around the Memorial Day holiday), and an increase of 3.8 percentage points was observed, resulting in a statewide belt use rate of 83.9 percent. At the time, that was the highest belt use rate ever observed in Michigan.

It is important to note however, that the baseline survey wave for this study was only a mini survey. While there was no change in the overall rate of belt use between the baseline and post survey, there may have been a change within a subgroup that is not possible to examine, given the limited analyses available with data from a mini survey. This mobilization targeted motorists least likely to buckle up, specifically, young men and urban areas (OHSP, 2004). It is possible that there was an increase in belt use for young males, which could not be measured given the limited scope of the baseline mini survey. There was some indication that perhaps an increase was noted within Wayne county (Stratum 4), one of the targeted urban areas. However, there is a higher variance associated with a mini survey because of the lower numbers of observed motorists. Due to this higher variance, it was not possible to state that the observed increase was statistically significant. In other words, there may have been an increase within Wayne county, but this cannot be stated with certainty.

Another possible explanation for the lack of change in the safety belt use rate comes from evidence suggesting that safety belt use generally declines during the winter months (see e.g., Eby, Vivoda, & Fordyce, 2000). The lack of a change in belt use during the current study may not necessarily reflect a lack of response from the motoring public, but rather a reversal of a downward trend in belt use during these months. In other words, it may be the case that without the mobilization, belt use would have actually decreased in December; the fact that it remained the same could be the result of part-time winter users buckling-up more than they normally would. It is also possible that the more often a specific program or slogan is repeated to the public (i.e. “Buckle Up or Pay Up: Click It or Ticket”), the less impact the slogan has on motorists. This idea could also explain why essentially the same activities did not have an effect the second time they were implemented.

In conclusion, these results reveal that safety belt use did not significantly change from the baseline survey to the follow-up survey. More research is necessary to understand why this mobilization did not have its intended effect. The study does show that the traditional low belt use groups noted in previous studies remain a problem. Safety belt campaigns in Michigan should continue to focus on these groups, with new programs designed to reach these populations. NHTSA (2001) research suggests that these programs must be aggressive, including both media and increased police enforcement to have an effect. Perhaps a media message tailored more toward the target groups could be developed, or a more concentrated police presence in the target areas could be implemented.

REFERENCES

Cochran, W. W. (1977). *Sampling Techniques, 3rd ed.* New York, NY: Wiley.

Eby, D.W. (2000). *How Often Do People Use Safety Belts in Your Community? A Step-by-Step Guide for Assessing Community Safety Belt Use.* (Report No. UMTRI-2000-19). Ann Arbor, MI: University of Michigan Transportation Research Institute.

Eby, D.W., Molnar, L.J., & Olk, M.L. (2000). Trends in driver and front-right passenger safety belt use in Michigan: 1984-1998. *Accident Analysis & Prevention, 32*, 837-843.

Eby, D.W., Vivoda, J.M., & Fordyce, T.A. (2000). *A Study of Michigan Safety Belt Use Prior to Implementation of Standard Enforcement.* (Report No. UMTRI-2000-08). Ann Arbor, MI: The University of Michigan Transportation Research Institute.

Eby, D.W., Vivoda, J.M., & Fordyce, T.A. (2002). The effects of standard enforcement on Michigan safety belt use. *Accident Analysis and Prevention, 34* (6), 101-109.

Eby, D.W., Vivoda, J.M., & Spradlin, H.K. (2003). *An Evaluation fo the "Click It Or Ticket: buckle-up or Pay Up" Mobilization Campaign.* (Report No. UMTRI-2003-21). Ann Arbor, MI: University of Michigan Transportation Research Institute.

Federal Highway Administration (1982). *Highway Statistics 1982.* Washington, DC: US Department of Transportation.

Haseltine, P.W. (2001). Seat belt use in Canada. In *2001 Seat Belt Summit.* Arlington, VA: Automotive Coalition for Traffic Safety, Inc.

Michigan Office of Highway Safety Planning. (2002). *Click It or Ticket Information.* Retrieved February 5, 2004, from http://www.michigan.gov/printerFriendly/0,1687,7-123–11612–,00.html

Michigan Office of Highway Safety Planning. (2003a). *16,000 Motorists Receive Costly Reminder to Buckle Up During Statewide Safety Belt Mobilization.* Retrieved February 5, 2004, from http://www.michigan.gov/printerFriendly/0,1687,7-123–82829–,00.html.

Michigan Office of Highway Safety Planning. (2003b). *November 17-30 Safety Belt Mobilization.* Retrieved February 5, 2004, from http://www.michigan.gov/printer Friendly/0,1687,7-123–66763–,00.html.

Michigan Office of Highway Safety Planning. (2004). *Buckle Up or Pay Up Ads Start Today.* Retrieved February 5, 2004, from http://www.michigan.gov/printer Friendly/0,1687,7-123–8036–,00.html.

National Highway Traffic Safety Administration. (1992). Guidelines for State Observational Surveys of Safety Belt and Motorcycle Helmet Use. *Federal Register, 57*(125), 28899-28904.

National Highway Traffic Safety Administration (1998). *Uniform Criteria for State Observational Surveys of Seat Belt Use*. (Docket No. NHTSA-98-4280). Washington, DC: US Department of Transportation.

National Highway Traffic Safety Administration. (1999, personal communication). Letter to the Executive Director of the Michigan Office of Highway Safety Planning outlining federal regulations regarding inclusion of commercial/noncommercial vehicle occupants. April, 1999.

National Highway Traffic Safety Administration. (2000). *Traffic Safety Facts 2000 Occupant Protection.* (Report No. DOT HS 809 327). Washington, DC: US Department of Transportation.

National Highway Traffic Safety Administration. (2001). *Implementing a Standard Enforcement Seat Belt Law in Your State: A How-to Guide.* (Report No. DOT HS 809 291). Washington, DC: US Department of Transportation.

National Highway Traffic Safety Administration. (2002). *National Highway Traffic Safety Administration Occupant Protection Division: Winter, 2002*. Washington, DC: US Department of Transportation.

O'Neill, B. (2001). Seat belt use: where we've been, where we are, and what's next. In *2001 Seat Belt Summit.* Arlington, VA: Automotive Coalition for Traffic Safety, Inc.

Parrish, A.S. & Keith, K.M. (2003). *Evaluation of 2003 "Click It or Ticket."* (Report No. FHWA/CA/OR). Tuscaloosa, AL: University of Alabama.

Shinar, D. (1993). Demographic and socioeconomic correlates of safety belt use. *Accident Analysis and Prevention, 25* (6), 745-755.

Solomon, M.G., Ulmer, R.G., & Preusser, D.F. (2002). *Evaluation of Click It or Ticket Model Programs*. Report No. DOT-HS-809-498. Washington, DC: US Department of Transportation.

Streff, F. M., Eby, D. W., Molnar, L. J., Joksch, H. C., & Wallace, R. R. (1993). *Direct Observation of Safety Belt and Motorcycle Helmet Use in Michigan: Fall 1993*. Report No. UMTRI-93-44. Ann Arbor, MI: The University of Michigan Transportation Research Institute.

University of North Carolina Highway Safety Research Center. (2004). *Symposium Marks 10th Anniversary of 'Click It or Ticket.'* Retrieved February 11, 2004, from http://www.hsrc.unc.edu/pressrelease/clickitsympsium.htm.

US Bureau of the Census. (1992). *1990 Census of Population and Housing* (from University of Michigan UM-ULibrary Gopher-computer datafile).

US Census Bureau. (2003). *Census 2000 Gateway*. Retrieved March 3, 2003, from http://www.census.gov/main/www/cen2000.html.

Wagenaar, A. C. & Molnar, L. J. (1989). *Direct Observation of Safety Belt Use in Michigan: Spring 1989*. Report No. UMTRI-89-12. Ann Arbor, MI: The University of Michigan Transportation Research Institute.

Wagenaar, A. C., Molnar, L. J., & Businski, K. L. (1987a). *Direct Observation of Safety Belt Use in Michigan: December 1986*. (Report No. UMTRI-87-03). Ann Arbor, MI: The University of Michigan Transportation Research Institute.

Wagenaar, A. C., Molnar, L. J., & Businski, K. L. (1987b). *Direct Observation of Safety Belt Use in Michigan: April 1987*. Report No. UMTRI-87-25 . Ann Arbor, MI: The University of Michigan Transportation Research Institute.

Wagenaar, A. C., Molnar, L. J., & Businski, K. L. (1988). *Direct Observation of Safety Belt Use in Michigan: Spring 1988*. Report No. UMTRI-88-24 . Ann Arbor, MI: The University of Michigan Transportation Research Institute.

APPENDIX A

Site Listing

Survey Sites By Number

No.	County	Site Location	Type	Str
001	Oakland	EB Whipple Lake Rd. & Eston Rd.	I	1
*002	Kalamazoo	EB S Ave. & 29th St.	I	1
003	Oakland	SB Pontiac Trail & 10 Mile Rd.	I	1
004	*Washtenaw*	*SB Moon Rd. & Ann Arbor-Saline Rd./Saline-Milan Rd.*	*I*	1
005	Oakland	WB Drahner Rd. & Baldwin Rd.	I	1
006	Oakland	SB Rochester Rd. & 32 Mile Rd./Romeo Rd.	I	1
007	Oakland	SB Williams Lake Rd. & Elizabeth Lake Rd.	I	1
008	Ingham	SB Searles Rd. & Iosco Rd.	I	1
*009	Kalamazoo	WB D Ave. & Riverview Dr.	I	1
010	Washtenaw	EB N. Territorial Rd. & Dexter-Pinckney Rd.	I	1
*011	Washtenaw	NB Schleeweis Rd./Macomb St. & W. Main St.	I	1
012	Ingham	NB Shaftsburg Rd. & Haslett Rd.	I	1
013	Oakland	NB Middlebelt Rd. & 9 Mile Rd.	I	1
*014	Washtenaw	WB Packard Rd. & Carpenter Rd.	I	1
015	Ingham	EB Haslett Rd. & Marsh Rd.	I	1
*016	Washtenaw	*NB Jordan Rd./Monroe St. & US-12/Michigan Ave.*	*I*	1
017	Washtenaw	SB M-52/Main St. & Old US-12	I	1
018	Kalamazoo	SB 8th St. & Q Ave.	I	1
*019	Washtenaw	WB 8 Mile Rd. & Pontiac Trail	I	1
*020	Oakland	SB Lahser Rd. & 11 Mile Rd.	I	1
*021	Kalamazoo	NB Ravine Rd. & D Ave.	I	1
022	Washtenaw	EB Glacier Way/Glazier Way & Huron Pkwy.	I	1
023	Washtenaw	WB Bethel Church Rd. & M-52	I	1
024	Washtenaw	SB Platt Rd. & Willis Rd.	I	1
*025	Ingham	WB Fitchburg Rd. & Williamston Rd.	I	1
026	Washtenaw	EB Merritt Rd. & Stoney Creek Rd.	I	1
027	Oakland	SB Hickory Ridge Rd. & M-59/Highland Rd.	I	1
028	Kalamazoo	SB Douglas Ave. & D Ave.	I	1
*029	Oakland	WB Walnut Lake Rd. & Haggerty Rd.	I	1
030	Oakland	NB Jossman Rd. & Grange Hall Rd.	I	1
031	Kalamazoo	EB H Ave. & 3rd St.	I	1
032	Kalamazoo	EB TU Ave. & 24th St./Sprinkle Rd.	I	1
033	Oakland	WBD I-96 & Milford Rd.. (Exit 155B)	ER	1
*034	Washtenaw	WBP I-94 & Whittaker Rd./Huron St. (Exit 183)	ER	1
*035	Kalamazoo	SBP US-131 & M-43 (Exit 38B)	ER	1
036	Washtenaw	SBD US-23 & N. Territorial Rd.	ER	1
*037	Kalamazoo	EBP I-94 & Portage Rd.	ER	1
038	Oakland	EBP I-696 & Orchard Lake Rd. (Exit 5)	ER	1
039	Kalamazoo	WBP I-94 & 9th St. (Exit 72)	ER	1
*040	Washtenaw	WBD I-94 & Jackson Rd.	ER	1
041	Kalamazoo	*NBD US-131 & Stadium Dr./Business I-94*	*ER*	1
042	Kalamazoo	NBP US-131 & Q Ave./Centre Ave.	ER	1
*043	Livingston	SB County Farm Rd. & Coon Lake Rd.	I	2
044	Bay	WB Nebodish Rd. & Knight Rd.	I	2
045	Macomb	SB Camp Ground Rd. & 31 Mile Rd.	I	2
046	Jackson	SB Benton Rd./Moon Lake Rd. & M-50/ Brooklyn Rd.	I	2
047	Allegan	SB 6th St. & M-89	I	2
048	Kent	EB 36th St. & Snow Ave.	I	2
049	Livingston	EB Chase Lake Rd. & Fowlerville Rd.	I	2
*050	Allegan	WB 144th Ave. & 2nd St.	I	2
051	Livingston	SB Cedar Lake Rd. & Coon Lake Rd.	I	2
052	Jackson	NB Mt. Hope Rd. & Waterloo-Munith Rd.	I	2
*053	*Kent*	*WB Cascade Rd. & Thornapple River Dr.*	*I*	2
*054	Allegan	NB 62nd St. & 102nd Ave.	I	2
055	Kent	SB Meddler Ave. & 18 Mile Rd.	I	2
056	Eaton	SB Houston Rd. & Kinneville Rd.	I	2
057	Macomb	SB M-19/Memphis Ridge Rd. & 32 Mile Rd./ Division Rd.	I	2
*058	Allegan	NB 66th St. & 118th Ave.	I	2
059	Grn Traverse	NB Silver Lake Rd./County Rd. 633 & US-31	I	2
*060	Grn Traverse	EB Riley Rd./Tenth St. & M-137	I	2
*061	Bay	SB 9 Mile Rd. & Beaver Rd.	I	2
062	Kent	SB Ramsdell Dr. & M-57/14 Mile Rd.	I	2
*063	Eaton	NB Ionia Rd. & M-50/Clinton Trail	I	2
064	Macomb	EB 23 Mile Rd. & Romeo Plank Rd.	I	2
*065	Livingston	NB Old US-23/Whitmore Lake Rd. & Grand River Rd.	I	2
066	Jackson	SWB Horton Rd. & Badgley Rd.	I	2
067	Kent	SB Belmont Ave. & West River Dr.	I	2
*068	Eaton	EB 5 Point Hwy. & Ionia Rd.	I	2
069	Allegan	WB 129th Ave. & 10th St.	I	2
*070	Eaton	EB M-43 & M-100	I	2
071	Ottawa	WB Taylor St. & 72nd Ave.	I	2

072	Bay	EB Cass Rd. & Farley Rd.	I	2
073	Allegan	EB 126th Ave. & 66th St.	I	2
074	Bay	NB Mackinaw Rd. & Cody-Estey Rd.	I	2
075	Jackson	EBD I-94 & Elm Ave. (Exit 141)	ER	2
076	Kent	NBD US-131 & 100th St. (Exit 72)	ER	2
*077	Ottawa	NBD I-196 & Byron Rd.	ER	2
*078	Kent	SBP US-131 & Hall St.	ER	2
079	Macomb	SBP M-53 & 26 Mile Rd.	ER	2
080	Bay	NBD I-75 & Wilder Rd. (Exit 164)	ER	2
081	Livingston	EBD I-96 & Fowlerville Rd. (Exit 129)	ER	2
*082	Macomb	EBP I-94 & 12 Mile Rd. (Exit 231)	ER	2
083	Jackson	WBD I-94 & Sargent Rd. (Exit 145)	ER	2
084	Allegan	NBP US-31/I-196 & Washington Rd./ Blue Star Hwy (Exit 47A)	ER	2
085	Calhoun	EB O Drive N. & 12 Mile Rd.	I	3
*086	Berrien	EB Mayflower Rd. & Chicago Rd.	I	3
*087	Marquette	SWB C.R. 456 & Sporley Lake Rd.	I	3
088	Lenawee	EB Munger Rd. & M-52	I	3
*089	Genesee	EB Pierson Rd. & Elms Rd.	I	3
*090	Clinton	NB Scott Rd. & M-21/State	I	3
091	Calhoun	WB R Dr. S. & 8 Mile Rd./Adolph Rd.	I	3
092	Calhoun	EB V Dr. N. & 20 Mile Rd.	I	3
093	Calhoun	NWB Dickman Rd./M-96 & Avenue A	I	3
094	St. Clair	WB Hewitt Rd. & Fargo Rd.	I	3
095	Monroe	SB Swan Creek Rd. & Labo Rd.	I	3
*096	Muskegon	EB Sweeter Rd. & Maple Island	I	3
*097	Calhoun	SB P Dr. N./Yawger Rd. & Hubbard Rd./5 Mile Rd.	I	3
098	St. Clair	WB Bryce Rd. & Cribbins Rd.	I	3
099	St. Clair	WB Lindsey Rd. & Palms Rd.	I	3
100	Van Buren	SB Broadway/M-140 & Phoenix Rd./BL I-196/C.R. 388	I	3
101	Ionia	SB Fisk Rd./Heffron Rd. & Montcalm Ave.	I	3
102	Clinton	EB Taft Rd. & Shepardsville Rd.	I	3
103	Calhoun	SB S. County Line Rd. & 23 Mile Rd.	I	3
*104	Calhoun	NB Waubascon Rd./4 1/2 Mile Rd. & Baseline Rd.	I	3
105	Monroe	WB Day Rd. & Ann Arbor Rd.	I	3
106	St. Joseph	WB Balk Rd./C.R. 139 & Grim Rd./Sherman Mills Rd.	I	3
107	Lapeer	EB Armstrong/C.R. 7 & M-53/Van Dyke Hwy.	I	3
*108	Saginaw	SB Chapin N./Kane Rd. & Frost Rd.	I	3
109	St. Clair	SB Werner/Ellsworth & Gratiot	I	3
110	Lenawee	NB Ogden Hwy. & US-223	I	3
111	Lapeer	SB Wheeling Rd. & Bowers Rd./M-52	I	3
112	Saginaw	NB Raucholz Rd. & Ithaca Rd.	I	3
*113	Shiawassee	NEB Winegar Rd. & Lansing Rd.	I	3
114	St. Joseph	SB Rosenbaugh Rd./40th St. & Michigan Ave./C.R. 120	I	3
*115	Saginaw	NB East Rd. & Ditch Rd.	I	3
116	Muskegon	EB Heights-Ravenna Rd. & Sullivan Rd.	I	3
117	Saginaw	S/EBD I-675 & Veterans Memorial Parkway (Exit 1)	ER	3
*118	Genesee	NBP I-475 & Bristol Rd./Hemphill/M-121 (Exit #4)	ER	3
119	Calhoun	EBP I-94 & 26 Mile Rd./25 1/2 Mile Rd. (Exit 119)	ER	3
120	Berrien	WBD I-94 & M-239/La Porte (Exit #1)	ER	3
*121	Van Buren	N/EBP US-31/I-196 & M-140 (Exit #18)	ER	3
122	Monroe	NBD I-75 & Huron River Dr. (Exit 26, to South Huron River Drive)	ER	3
123	Genesee	SBD US-23/I-75 & Mount Morris Rd. (Exit #126)	ER	3
*124	Isabella	SBD US-27/US-127 & M-20	ER	3
*125	Genesee	EBD I-69 & Belsay Rd. (Exit #141)	ER	3
126	St. Clair	WBD I-94/I-69 & Water St.	ER	3
127	Wayne	WB 8 Mile Rd. & Beck Rd.	I	4
*128	Wayne	EB Warren Rd. & Wayne Rd.	I	4
129	Wayne	EB McNichols Rd. & Woodward Ave.	I	4
*130	Wayne	NB Canton Center Rd. & Cherry Hill Rd.	I	4
131	Wayne	WB Ecorse Rd. & Pardee Rd.	I	4
132	Wayne	EB Michigan Ave. & Sheldon Rd.	I	4
*133	Wayne	EB Ecorse Rd. & Middlebelt Rd.	I	4
*134	Wayne	NB M-85/Fort Rd. & Emmons Rd.	I	4
135	Wayne	WB Glenwood Rd. & Wayne Rd.	I	4
136	Wayne	NB Haggerty Rd. & 7 Mile Rd.	I	4
*137	Wayne	WB 6 Mile Rd. & Inkster Rd.	I	4
138	Wayne	SB Inkster Rd. & Goddard Rd.	I	4
139	Wayne	SB Merriman Rd. & Cherry Hill Rd.	I	4
140	Wayne	SEB Outer Dr. & Pelham Rd.	I	4
*141	Wayne	NB Meridian Rd. & Macomb Rd.	I	4
142	Wayne	WB Ford Rd. & Venoy Rd.	I	4

*143	Wayne	SWB Vernor Rd. & Gratiot Rd.	I	4	
144	Wayne	WB 5 Mile Rd. & Beck Rd.		I	4
145	Wayne	EB 7 Mile Rd. & Livernois Rd.		I	4
*146	Wayne	NB Gunston/Hoover Rd. & McNichols Rd.		I	4
147	Wayne	SB W. Jefferson/ Biddle Ave. & Southfield Rd.		I	4
148	Wayne	EB Goddard Rd. & Wayne Rd.	I	4	
*149	Wayne	WB 8 Mile Rd. & Kelly Rd.		I	4
150	Wayne	SB Merriman Rd. & US-12/Michigan Ave.		I	4
151	Wayne	SB Telegraph Rd. & Plymouth Rd.		I	4
*152	Wayne	WB Sibley Rd. & Inkster Rd.		I	4
153	Wayne	NEB Mack Rd. & Moross Rd.		I	4
154	Wayne	WB Annapolis Rd. & Inkster Rd.		I	4
*155	Wayne	SB Greenfield Rd. & Grand River Rd.		I	4
156	Wayne	EB Joy Rd. & Livernois Rd.		I	4
157	Wayne	SEB Conner Ave. & Gratiot Rd.		I	4
158	Wayne	NWB Grand River Rd. & Wyoming Ave.		I	4
159	Wayne	WBP I-96 & Evergreen Rd.		ER	4
160	Wayne	WBP I-94 & Haggerty Rd. (Exit 192)		ER	4
*161	Wayne	NBD I-75 & Gibralter Rd. (Exit 29)		ER	4
162	Wayne	SBP I-75 & Southfield Rd.		ER	4
*163	Wayne	NBD I-275 & 6 Mile Rd. (Exit 170)		ER	4
164	Wayne	NBP I-275 & M-153/Ford Rd. (Exit 25)		ER	4
165	Wayne	NBD I-275 & Eureka Rd. (Exit 15)		ER	4
*166	Wayne	NBP I-75 & Springwells Ave. (Exit 45)		ER	4
167	Wayne	WBD I-94 & Pelham Rd. (Exit 204)		ER	4
168	Wayne	SBD I-75 & Sibley Rd.		ER	4

*Included in the Mini Survey Subsample

APPENDIX B

Calculation of Variances, Confidence Bands, and Relative Error

The variances for the belt use estimates were calculated using an equation derived from Cochran's (1977) equation 11.30 from section 11.8. The resulting formula was:

$$var(r) = \frac{n}{n-1} \sum_i \left(\frac{g_i}{\sum g_k}\right)^2 (r_i - r)^2 + \frac{n}{N} \sum_i \left(\frac{g_i}{\sum g_k}\right)^2 \frac{s_i^2}{g_i}$$

where $var(r_i)$ equals the variance within a stratum and vehicle type, n is the number of observed intersections, g_i is the weighted number of vehicle occupants at intersection I, g_k is the total weighted number of occupants for a certain vehicle type at all 42 sites (14 in the mini survey) within the stratum, r_i is the weighted belt use rate at intersection I, r is the stratum belt use rate, N is the total number of intersections within a stratum, and $s_i = r_i(1-r_i)$. In the actual calculation of stratum variances, the second term of this equation is negligible. If we conservatively estimate N to be 2000, the second term only adds 2.1×10^{-6} units to the largest variance (Stratum 4). This additional variance does not significantly add to the variance captured in the first term. Therefore, since N was not known exactly, the second term was dropped in the variance calculations. The overall estimated variance for each vehicle type was calculated using the formula:

$$var(r_{all}) = \frac{var(r_1) + var(r_2) + var(r_3) + 0.83^2 \times var(r_4)}{3.83^2}$$

The Wayne County stratum variance was multiplied by 0.88 to account for the similar weighting that was done to estimate overall belt use. The 95 percent confidence bands were calculated using the formula:

$$95\%\ Confidence\ Band = r_{all} \pm 1.96 \times \sqrt{Variance}$$

where r is the belt use of interest. This formula is used for the calculation of confidence bands for each stratum and for the overall belt use estimate.

Finally, the relative error or precision of the estimate was computed using the formula:

$$RelativeError \bullet \frac{StandardError}{r_{all}}$$

The federal guidelines (NHTSA, 1992, 1998) stipulate that the relative error of the belt use estimate must be under 5 percent.

APPENDIX C

PDA Data Collection Details

The current study marks the first during which all data collection was conducted using Personal Digital Assistants (PDAs). The transition from paper to PDA data collection was made primarily to decrease the time necessary to move from the end of the data collection phase of a survey to data analysis. With paper data, there is automatically two to three weeks of additional time built-in while the paper data are being entered into an electronic format. Before making this transition, a pilot study was conducted to compare data collection by PDA to paper. Several key factors were tested during the pilot study including accuracy, volume (speed), ease of use, mechanical issues (i.e. battery life), and environmental issues (i.e. weather, daylight). The pilot study found PDA use to be equal to, or better than paper data collection on every factor tested. Before making the change to PDA data collection, electronic versions of the *Site Description Form* and *Observation Form* were developed. The following pages show examples of the electronic forms and discuss other factors related to using PDAs for safety belt data collection.

The goal of adapting the existing paper forms to an electronic format was to create electronic forms that were very similar to the paper forms, while taking advantage of the advanced, built-in capabilities of the PDA. As such, the electronic *Site Description Form* incorporated a built-in traffic counter, used the PDA's calendar function for date entry, and included high resolution color on the screens. The first screen of the *Site Description Form* (Figure 2) allows users to type in the site location (street names and standing location). Observers use the PDA stylus to tap on the appropriate choices of site type, site choice, and traffic control. If a mistake is made, the observer can change the data they have input, simply by tapping on the correct choice. All selected choices appear highlighted on the screen.

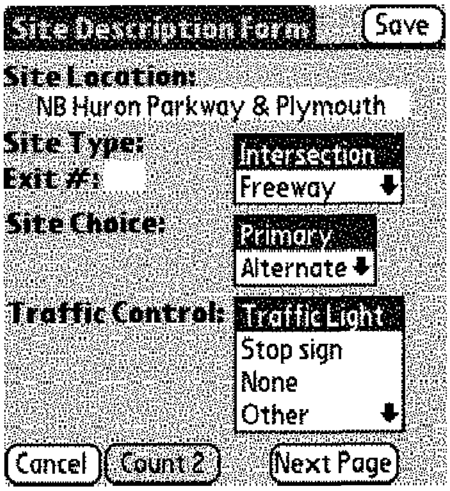

Figure 2. Site Description Form - Screen 1

Screens 2 and 3 are shown in Figure 3. As seen in this figure, observers enter their name, the weather, day of week, and median information, simply by tapping the appropriate choice on the display list. Date is entered by tapping on the "Date" button. This brings up a calendar for observers to tap on the appropriate date. Screen 3 allows users to sketch in the intersection and show where they are standing, and to record the start time for the site.

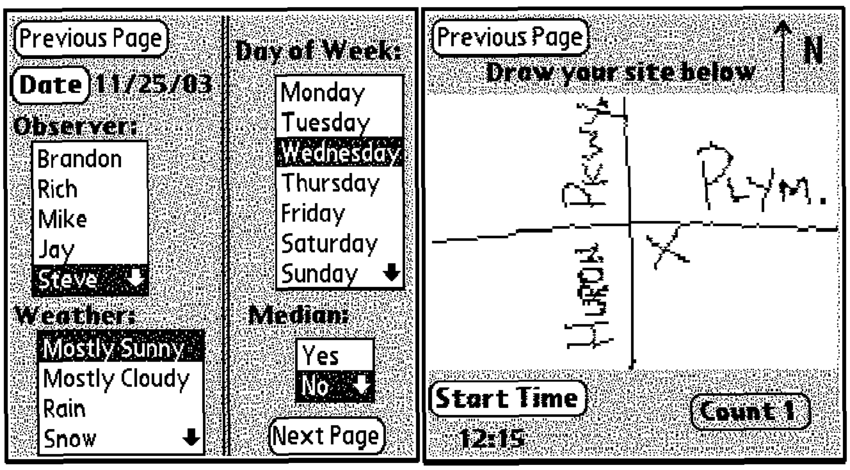

Figure 3. Site Description Form - Screens 2 and 3

In the past, observers had to put away their paper form, get out a mechanical traffic counter, and begin a traffic count after entering the start time. Using a PDA, it is possible to incorporate a traffic counter directly into the *Site Description Form*[7]. Figure 4 shows an example of the electronic traffic counter screen of the *Site Description Form*. To count each vehicle that passes, observers tap on the large "+" button. The size of this button allows the observer to tap the screen while keeping their eyes on the roadway. Each tap increases the count that is displayed at the top of the screen. If a mistake is made, the observer can decrease the count by tapping on the small "-" button on the left of the screen.

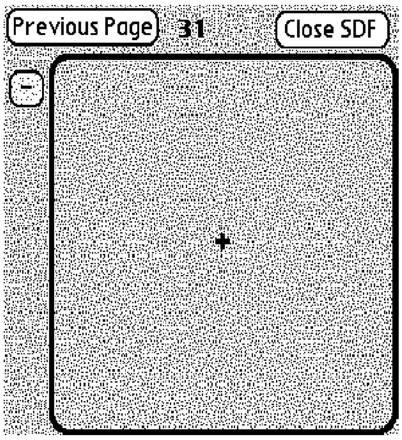

Figure 4. Site Description Form - Traffic Counter Screen

The last screen of the electronic *Site Description Form*, shown in Figure 5, allows the user to enter the end time of the site observation and interruption (if any). Finally, observers can type in any comments regarding the site or traffic flow that may be important.

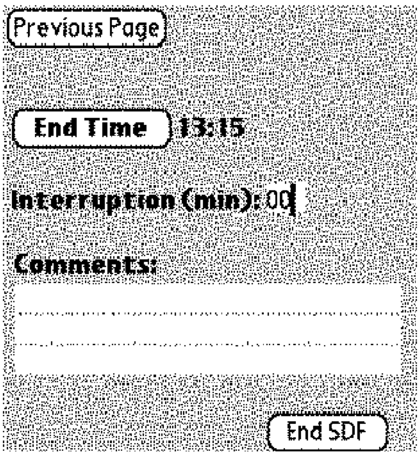

Figure 5. Site Description Form - Final Screen

[7]The PDA traffic counting method was compared with a mechanical counter during the pilot testing and no difference was found between the two methods.

To allow for easier data entry, the electronic *Observation Form* was divided into three screens, one for driver information, one for front-right passenger information, and one for vehicle information. As shown in Figure 6, each screen is accessible by tapping on the appropriate tab along the top of the screen. The screens have also been designed with different colors, with the driver screen blue, passenger screen green, and vehicle screen yellow. As shown below, the first screen that appears in the form is the driver screen. Each category of data, along with the choices for each category, are displayed on the screen. As in the Site Description Form, users simply tap on the choices that correspond to the motorist that is being observed. These data then appear highlighted on the screen. Since most motorists are not actively using a cellular phone while driving, "No Cell Phone" is already highlighted as a default. If the motorist is using a cell phone, the proper choice can simply be selected from the list.

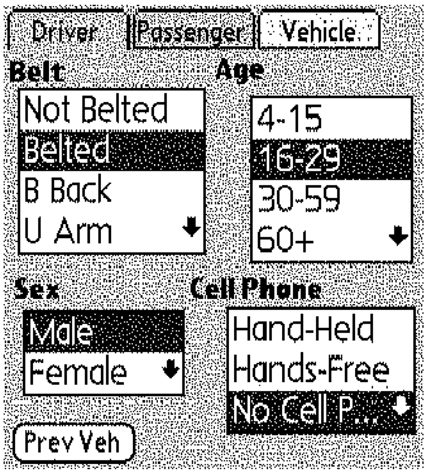

Figure 6. Observation Form - Driver Screen

Figure 7 shows the passenger and vehicle screens from the *Observation Form*. If no passenger is present, users tap on the "No Passenger" area to put a check mark in that box. On the vehicle screen, "Not Commercial" is selected as a default since the majority of observed vehicles are not used for commercial purposes. Once data are complete for one vehicle, observers tap the "Next Vehicle" button to continue collecting data.

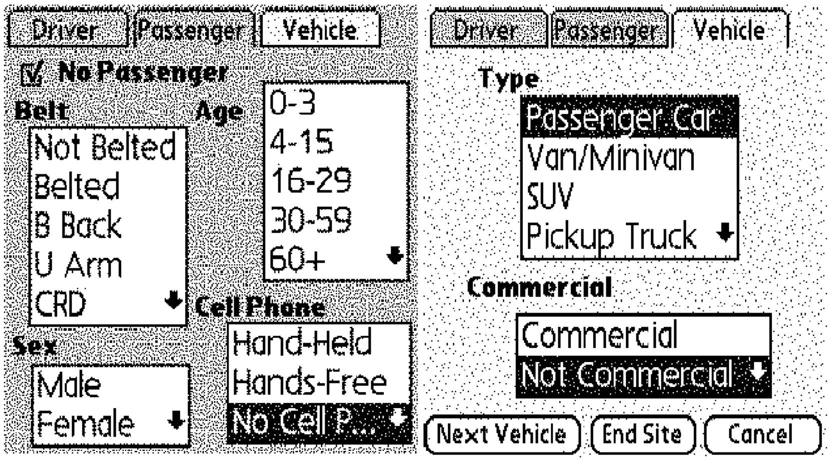

Figure 7. Observation Form - Passenger and Vehicle Screens

Each PDA also had a built-in cellular phone as well as wireless e-mail capability. At regular intervals, usually twice a day, observers e-mailed completed data directly from the PDA to the project supervisor. *Site Description* and *Observation Forms* from completed sites were "zipped," using a compression program, and then transmitted directly to a pre-determined e-mail account. The e-mailing of data allowed the project field supervisor to immediately check data for errors, and begin to compile a data analysis file as the project progressed. After confirmation of data transmission, the supervisor sent a text message to the observer's PDA notifying them that the e-mail was successful. At this point, the observer transferred the site data from the internal memory of the PDA to a Secure Digital (SD) memory card.