2013 DIRECT OBSERVATION SURVEY OF MOTORCYCLE HELMET USE

Prepared for:
Office of Highway Safety Planning
333 South Grand Avenue
Lansing, MI

Prepared by:
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Transportation Research Group
Detroit, MI

MICHIGAN OHSP Office of Highway Safety Planning

Date: September 2013

WAYNE STATE UNIVERSITY

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FINAL REPORT

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16. Abstract

This report documents the results of the 2013 Direct Observation Survey of motorcycle helmet use. Helmet use by riders and passengers was monitored at 167 roadside locations throughout the summer of 2013. In addition to helmet use information, data were collected for motorcycle type, as well as gender, age, and race of each observed rider, as well as whether or not the motorcyclist was wearing high-visibility equipment. Separate helmet use rate estimates were provided for normal travel as determined through data collected at randomly selected locations throughout Michigan, as well as for large riding events and rallies. The helmet use rate at randomly selected roadside locations was 73.0 percent while the rate at motorcycle events and rallies was 58.8 percent. The usage rate for high-visibility gear was 5.6 percent in the State of Michigan.

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1.0 INTRODUCTION

According to the National Highway Traffic Safety Administration (NHTSA), 4,612 motorcyclists died and approximately 81,000 were injured in motor vehicle crashes in the United States in 2011 [*1*]. Motorcyclist fatalities increased consistently from 1997 to 2008, peaking at 5,312, prior to stabilizing at approximately 4,500 over the past three years (2009-2011).

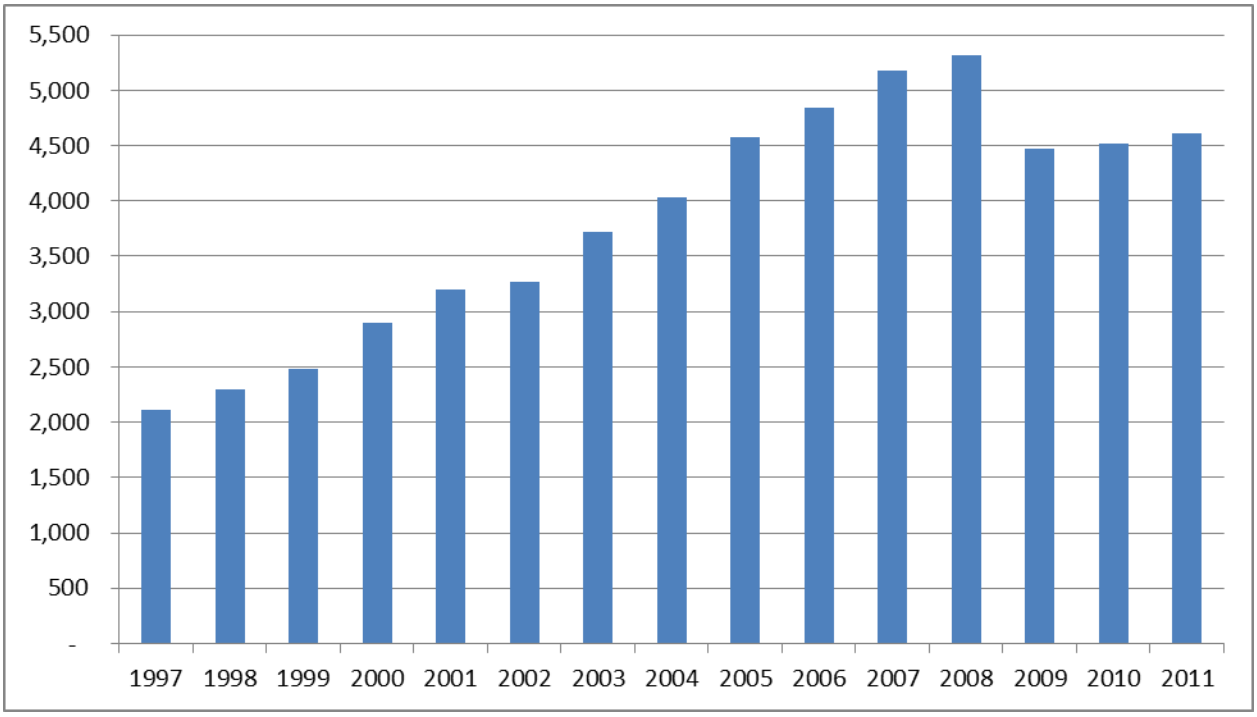

Figure 1. Trend of Motorcyclists Fatalities in the USA

[Source: NHTSA and Fatal Accident Reporting System (FARS)]

In the State of Michigan, trends in motorcycle fatalities have generally followed those of total motorcycle crashes. The year 2012 marked the highest number of motorcycle fatalities over the most recent nine-year period. This year also marked the weakening of Michigan's motorcycle helmet law. Prior to April 1, 2012, Michigan had a universal law in place, which required all motorcyclists to wear United States Department of Transportation (USDOT) approved helmets. The enactment of Michigan Senate Bill (SB) 291 allows motorcyclists to ride helmet free if they: (1) carry $20,000 in additional medical insurance; (2) are at least 21 years of age; and (3) have at least two years of riding experience or have passed a safety training test. As of August 2013, Washington D.C. and 19 states have universal helmet laws in place while Michigan is one of 28 states with a partial helmet law [*2*]. Most states in this category require riders who are 17 and younger to be helmeted, while some of the others states require riders to be 20 years old and younger to be helmeted. Illinois, Iowa, and New Hampshire are the only states that have no laws mandating helmet use.

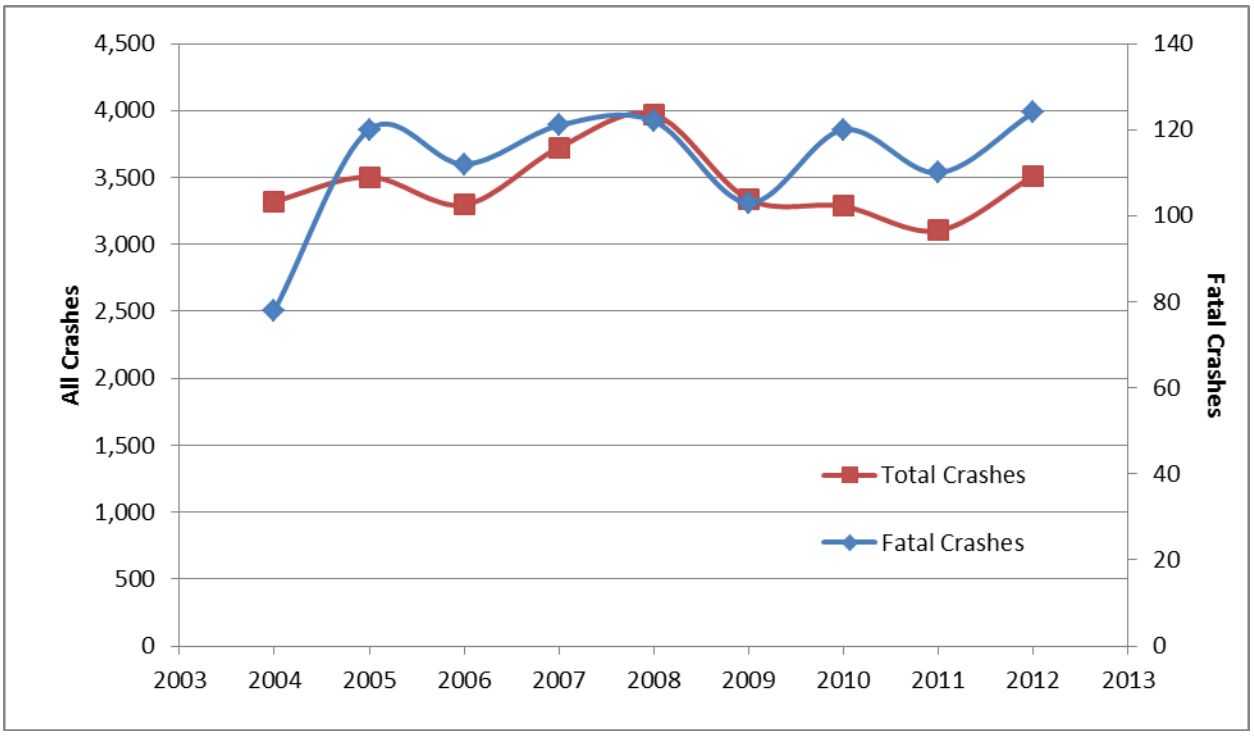

Figure 2. Trend of Motorcyclist Fatalities and All Motorcycle-Involved Crashes in Michigan [Source: 2013 Michigan Traffic Crash Facts, MI OHSP]

The national use of DOT-compliant helmets decreased from 66 percent in 2011 to 60 percent in 2012 [3]. The helmet use among passengers also decreased, but more considerably. Helmet use for passengers decreased from 64 percent in 2011 to 46 percent in 2012. This helmet use survey was part of the National Occupant Protection Use Survey (NOPUS) conducted by the National Center for Statistics and Analysis (NCSA) of NHTSA.

The most recent motorcycle helmet use survey in the State of Michigan was conducted in 2006 through funding from the Michigan Office of Highway Safety Planning (OHSP) [*4*]. This survey was conducted concurrently with the 2006 post-*Click it or Ticket* (CIOT) safety belt use survey. In the 2006 survey, a total of 2,274 motorcycle riders were observed and the overall usage rate among all riders was 99.4 percent. This survey also involved the collection of data on the use of other protective gear. Only 25 percent of riders were found to wear protective gear on their upper bodies while 88 percent of riders were observed wearing some form of full-length pants.

The past observations of motorcycle helmet use in Michigan, performed in 2006, indicated a very high compliance rate (99.4 percent). With the recent legislative change reducing the coverage of Michigan's helmet use law, the purpose of this study was to estimate the current statewide motorcycle helmet use rate. The results of this study will provide important information to assess the impacts of the helmet law

change. Further, these data may be used in combination with police-reported crash data to ascertain the safety and resultant economic impacts of this policy change.

The overall objective of this study was to estimate the statewide use rates of motorcycle helmets and high visibility gear by motorcyclists in Michigan. Data collection was conducted in coordination with the observational surveys of safety belt use. These data were supplemented by additional sites selected based on scheduled motorcycle rallies/events.

The specific objectives of this study were as follows:

- Select a methodology for collecting data from a representative sample of sites throughout the state, which would ensure reliable statewide statistics, in an economically feasible manner.
- Provide training to all staff conducting the observation surveys and conduct quality assurance/quality control (QA/QC) of the data collection efforts.
- Observe and record motorcycle high visibility gear use along with driver/passenger demographics and other characteristics, as listed below:
    - Motorcycle type
    - High visibility of rider and passenger
    - Helmet use of rider and passenger
    - Gender, age, and ethnicity of rider and passenger
- Summarize and cross-tabulate the observational data in a spreadsheet format indicating overall helmet use, helmet use by time of day and day of week, and helmet use by various demographic characteristics.

2.0 METHODOLOGY

The observational survey for motorcycle helmet use was conducted in coordination with the 2013 direct observation surveys of safety belt and child restraint device use. Additional observations were performed at locations along routes for motorcycle events or rallies. Since the motorcycle helmet use survey was conducted in conjunction with the statewide restraint use surveys, the methodology largely followed the *Uniform Criteria for State Observational Surveys of Seat Belt Use* from Title 23, Part 1240.12 of the Code of Federal Regulations.

2.1 Design of Study

Michigan is comprised of 83 counties; 40 of which account for about 85 percent of the passenger vehicle crash-related fatalities according to Fatality Analysis Reporting System (FARS) data averages for the years 2005 to 2009. Observation locations from within these 40 counties were selected for inclusion in the survey.

2.2 Data Collection Process

All motorcycles and mopeds were eligible for observation. The cover sheet and data collection form are shown in Appendix I. The cover sheet was designed to allow for documentation of descriptive site information, including: date, site location, site number, alternate site data, assigned traffic flow, number of lanes available and observed, start and end times for observations, and weather conditions. This cover form was completed by the data collector at each site. It should be noted that the cover sheet is universal and could be utilized for other observational studies such as direct observations of seat belt use and child restraint devices.

The observation form was used to record helmet use by the rider and passenger. Additional data collected include rider and passenger age, gender, and ethnicity, as well as motorcycle type and whether or not the rider and passenger were wearing high visibility gear.

At each location, high-definition video cameras were temporarily installed and aimed to observe one direction of traffic. During the seat belt use study, the cameras recorded during the 60 minute duration of the safety belt observation period. For the child restraint/booster seat use study, a camera was placed at a convenient location near the sites for a period of two to four hours. At the events/rallies, a camera was placed near the staging area for motorcycles and recorded for 15 to 30 minutes for “poker” or group runs, and two to four hours for rallies.

2.3 Quality Control

The policies and procedures utilized during the conduct of each wave of direct observation surveys of safety belt use are based upon the *Uniform Criteria for State Observational Surveys of Seat Belt Use* from Title 23, Part 1240.12 of the Code of Federal Regulations. The criteria state that policies should be in place in the event observations cannot be made due to unanticipated events, such as road construction. In such situations, data collectors were instructed to observe at a pre-assigned alternate location.

During the full-scale data collection activities, independent auditors were sent out to the field to covertly observe the data collectors. These field audits were conducted to ensure compliance with the data collection procedures. No major violations of policies or procedure were observed as a part of these audits. The random checks were conducted at least twice for each observer and at five percent of all observational sites.

3.0 SELECTION OF OBSERVATION LOCATIONS

The observation locations came from two different areas: random sites and sites from motorcycle events/rallies.

3.1 Random Site Selection

The locations for the random sites included the same observation locations from the direct observation surveys of seat belt and child restraint device use. These sites are generally representative of statewide travel patterns or all vehicle types. Prior to the start of each seat belt or child restraint survey, cameras were set up to observe the highest traffic flow direction in order to maximize the number of motorcycle observations. The sites included in the random sample are listed in Appendix II.

3.2 Event/Rally Site Selection

The locations for the selection of the event/rally sites were determined from websites where information about statewide events were posted. Table 1 is a descriptive list of events and rallies observed during this study. All events/ rallies occurred on the weekends with the exception of Ride Your Motorcycle to Work Day, which occurred on a Monday. At these events, a camera was placed near the rally and was set to record for two to four hours. These rallies generally lasted an entire weekend. The other events from Table 1 included "poker" runs or group runs. These runs are events where riders drive a predetermined route to locations determined by the event sponsors.

Table 1. Event/Rally Sites

Date	Strata	County	City	Event Name
6/15/2013	1	Oakland	Ferndale	Cops on a Run
6/17/2013	1	Oakland	Royal Oak	Ride Your Motorcycle to Work Day*
8/17/2013	1	Oakland	Ferndale	Woodward Dream Cruise*
8/18/2013	2	Monroe	Temperance	Blackhawk Motorcycle Club Bean Soup Run
8/17/2013	2	Kent	Byron Center	B.F.E. Poker Run
8/17/2013	2	Livingston	Fowlerville	Fowlerville Easy Rider Rodeo*
8/17/2013	3	Genesee	Davison	Davison Eagles Prostate Run
5/17/2013	4	Macomb	Clinton Twp.	Gibraltar Trade Center Bike Night*
6/17/2013	4	Wayne	Detroit	Ride Your Motorcycle to Work Day*

* Denotes rally or bike night. Other sites are poker runs or group rides

3.3 Outline for Data Collection

Data collection began on May 17, 2013 and concluded September 16, 2013. The motorcycle observational surveys were conducted concurrently with the seat belt use surveys, which took place from May 27, 2013 to June 13, 2013 and September 3, 2013 to September 16, 2013 and the child restraint device surveys, which were conducted from July 2, 2013 to August 15, 2013. Additional data collection occurred throughout the summer at weekend motorcycle events/rallies.

The camera set up consisted of a consumer-grade high-definition camera with an external battery placed atop an eight foot aluminum pole. At the conclusion of the observational period, the camera set ups were removed and the recorded videos were returned to the office. Each video was reviewed by a trained member of the Wayne State University-Transportation Research Group (WSU-TRG) staff and the relevant data for each observed motorcycle were recorded into an Excel spreadsheet.

The rider of each motorcycle and passengers (if and when present) were observed for type of helmet use. In these surveys, both the rider and passenger were separately identified based on their gender, estimated age, and race. The rider age categories included those aged 16-29, 30-59, and 60 and over. The passenger age categories included those aged 0-15, 16-29, 30-59, and 60 and over. The rider and passenger races were categorized as Caucasian, African American, Other Race, and Unknown. The other race category consisted of those of Asian/Pacific Islander, Native American, and Hispanic ethnicities. The rider and passenger helmet use was classified as No Helmet, Full Helmet, Open Face (3/4) Helmet, or Half Shell Helmet. It should be noted that it was very difficult to discern demographic characteristics for riders wearing full helmets, as the rider's facial characteristics were typically obscured. The observers also noted whether or not the rider and passenger had on some type of high visibility gear. High visibility gear consisted of white, florescent yellow, or orange colored helmets and/or apparel like vests, jackets, or pants that were florescent yellow or orange with a reflective strip. Motorcycles were categorized by type into ten groups: Standard, Touring, Cruiser, Chopper/Custom, Sport, Dual-purpose, Moped/Scooter, Trike, Other, or Unknown.

4.0 OBSERVER TRAINING

The Principal Investigator and Co-Investigators from WSU served as the QA/QC Monitors, conducting site audits of the Data Collectors. Each Data Collector was monitored at least once by a QA/QC Monitor. The Data Collectors were by comprised of WSU staff, many of whom have participated in prior safety restraint use surveys. All data collectors were able to stand for long periods of time, work outdoors, and successfully complete the training program. The training program for Data Collectors was conducted at WSU, beginning approximately two weeks prior to the first data collection period and included both lecture and classroom and field exercises. Each of these staff members has received or is pursuing an engineering degree and has been trained in general traffic data collection methods and procedures. For this project, each Data Collector received specific training composed of a day-long workshop, technical assistance, and multiple days of field data collection exercises.

At the conclusion of the classroom training, the data collectors conducted their first field practice at a location near the WSU campus. QA/QC Monitors were available during this period to respond to questions and offer assistance to data collectors as needed. Reliability and repeatability field data collection practice continued during the two weeks leading up to full-scale survey implementation.

As a part of the training program, each member of the data collection team received a training manual comprised of the information received during the training session, the schedule for data collection, and all necessary field supplies. The training manual included descriptive text, which was supplemented by photographs of different helmet types, motorcycle types, and high visibility gear.

5.0 DATA ANALYSIS

The data collected in the field were entered into a spreadsheet by the observer at the conclusion of the data collection activities for each day and verified for accuracy. Separate rates for motorcycle helmet use were determined for the random observation sites and the rallies/events. The overall statewide helmet use rate was based solely on the statewide random sample of observation sites. The event/rally locations were not included in the overall statewide helmet use rate as these events mostly occurred on weekends and were not representative of typical daily travel. A series of 95-percent confidence intervals were also determined for each estimate.

5.1 Overall Statewide Helmet Use Calculations

A weighting procedure was performed to estimate the helmet use rates, as described in the following sample calculations. A rider or passenger was considered helmeted if he/she was wearing a full, open face (3/4), or half shell helmet. To determine the helmet use rate for each site, the total number of helmeted riders and passengers is divided by the total number of riders and passengers observed. All sites were combined at the stratum level to arrive at the stratum-level use rates. The overall non-weighted helmet use rate may be computed by taking the sum total of all helmeted riders and passengers divided by the total number of riders and passengers.

The variance for each stratum was determined by the following equation [*5*]:

$$Variance_j = \frac{n_j}{n_j - 1} \sum_{i=1}^{n_j} \left[\left(\frac{g_{ij}}{\sum_{i=1}^{n_j} g_{ij}} \right)^2 \left(r_{ij} - r_j \right)^2 \right]$$

Where,

n_j = number of observation locations stratum j

g_{ij} = number of observations at location i in stratum j

r_i = helmet use rate for location i in stratum j

r_j = overall helmet use rate for stratum j

5.2 Weighted Statewide Helmet Use Calculations

The statewide motorcycle helmet use rates were calculated by weighting the stratum-level helmet use rates by the number of motorcycle registrations per stratum. The motorcycle registrations by county were obtained from the 2011 Michigan Secretary of State Registration Database. Table 2 provides a summary for the registrations by county and stratum. Figure 3 is a map of Michigan where the shaded counties are involved in this helmet use survey. The total number of motorcycle registrations over the four strata is 253,439. That is 83.09 percent of the total of Michigan's motorcycle registrations. Stratum 1 was assigned a weight factor equal to 0.212 (53,813 divided by 253,439). Stratum 2 was assigned a weight factor equal to 0.272 (668,832 divided by 253,439). Stratum 3 was assigned a weight factor equal to 0.288 (73,054 divided by 253,439). Stratum 4 was assigned a weight factor equal to 0.228 (57,740 divided by 253,439). The sum of the weight factors for all four strata equaled 1.00. The weight factors are then multiplied by the total number of riders and passengers helmeted in each stratum divided by the total number of riders and passengers observed in each stratum. The final percentage in each stratum in added together to provide an overall weighted helmet use.

The overall statewide variance was calculated using the following formula:

$$Variance_{TOTAL} = \frac{\sum_{\forall j}\left(w_j^2 Var_j\right)}{\left(\sum_{\forall j} w_j\right)^2}$$

Where, w_j = motorcycle registration weight factor for stratum j.

The 95 percent confidence interval is equal to the weighted helmet use rate plus/minus 1.96 (for the Z-test at alpha = 0.05) multiplied by the square root of the stratum's or statewide variance expressed as a percent. The standard error is equal to the square root of the variance.

Table 2. 2011 Motorcycle Registrations by County and Strata (Michigan Secretary of State Registration Database)

County Name	No. of Motorcycles	Percent Statewide for Michigan
Stratum 1		
Ingham County	6,845	2.24%
Kalamazoo County	7,323	2.40%
Oakland County	31,121	10.20%
Washtenaw County	8,524	2.79%
Total	**53,813**	**17.64%**
Stratum 2		
Allegan County	4,571	1.50%
Bay County	4,114	1.35%
Calhoun County	5,250	1.72%
Eaton County	4,061	1.33%
Grand Traverse County	3,278	1.07%
Jackson County	6,226	2.04%
Kent County	15,805	5.18%
Livingston County	7,229	2.37%
Midland County	3,370	1.10%
Monroe County	6,779	2.22%
Ottawa County	8,149	2.67%
Total	**68,832**	**22.57%**
Stratum 3		
Berrien County	6,064	1.99%
Branch County	1,858	0.61%
Clare County	1,351	0.44%
Clinton County	2,487	0.82%
Genesee County	12,793	4.19%
Ionia County	2,280	0.75%
Isabella County	1,884	0.62%
Lapeer County	4,333	1.42%
Lenawee County	4,646	1.52%
Montcalm County	2,354	0.77%
Muskegon County	7,169	2.35%
Newaygo County	2,234	0.73%
Saginaw County	5,583	1.83%
Sanilac County	1,921	0.63%
Shiawassee County	2,999	0.98%
St. Clair County	6,333	2.08%
St. Joseph County	3,053	1.00%
Van Buren County	3,712	1.22%
Total	**73,054**	**23.95%**
Stratum 4		
Macomb County	21,759	7.13%
Wayne County	35,981	11.80%
Total	**57,740**	**18.93%**
Total Strata	**253,439**	**83.09%**

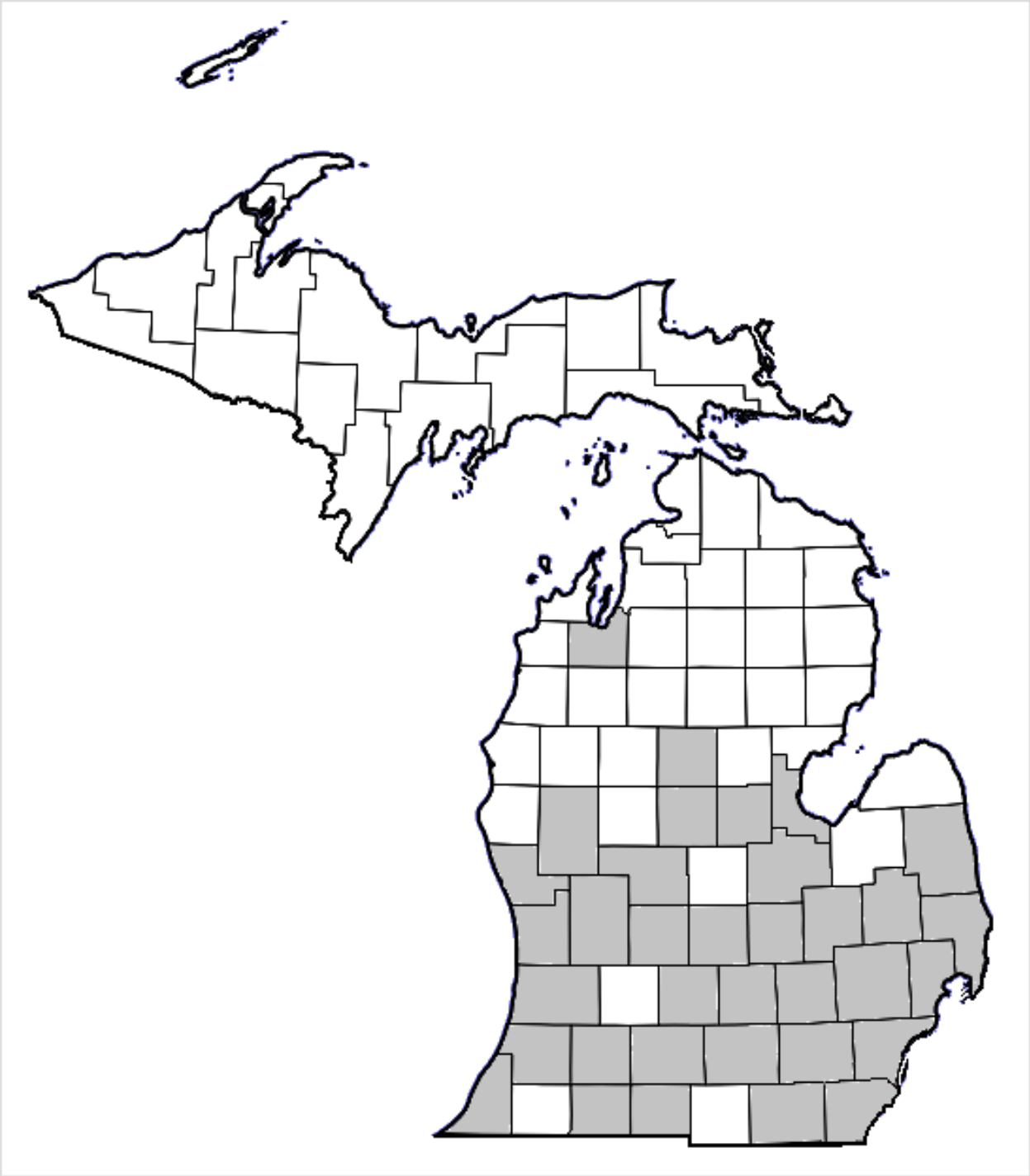

Figure 3. 35-County Statewide Sample for the Direct Observation Motorcycle Helmet Use Survey

6.0 RESULTS AND CONCLUSIONS

The direct observation survey was performed between Friday, May 17th and Monday, September 16th, 2013. During this period, a total of 2,584 riders were observed on 2,157 motorcycles at 176 observation sites throughout the state of Michigan. These data were separated into two samples:

1. A sample of 1,252 riders who were observed at randomly selected roadside locations that are representative of statewide travel patterns (based upon total motor vehicle travel as motorcycle-specific volume data are not available); and
2. A sample of 1,332 riders who were observed as a part of nine motorcycle events and rallies throughout the state.

The first sample was obtained based on a random probability-based sample that is representative of travel activity from 7 AM to 6 PM and was consequently utilized to calculate the statewide helmet use rate estimate. The second sample was used to provide a comparison of how helmet use rates vary between large motorcycle events/rallies and the typical travel periods observed in the first sample. The second sample was not utilized in the calculation of overall statewide helmet use rates.

6.1 Motorcycle Helmet Use Rates

The statewide helmet use rate (as determined through the random sampling scheme) and the event/rally-specific sample are shown in Table 3. Both the statewide use rate and the event/rally use rate were calculated based upon the procedures described in Section 5.2 "Weighted Statewide Helmet Use Calculations" of this report.

Table 3. Statewide Helmet Use Rate for Riders and Passengers by Sample

Observation Sample	Motorcycle Helmet Use Rate*	Standard Error
Random Probability Sample	73.0% ± 3.5%	1.8%
Motorcycle Event/Rally Sample	58.8% ± 5.2%	2.7%

* Weighted Motorcycle Helmet Usage ± 95% Confidence Band

These results show that the statewide motorcycle helmet use rate is 73.0 percent. This rate is very similar to the helmet use rate among crash-involved motorcyclists, which was found to be 74.7 percent over the period from April 1, 2012 to December 31, 2012 [*6*]. This is a marked decrease from the 99.4 percent use rate observed during the 2006 survey, which was performed prior to the weakening of the Michigan helmet use law [*4*]. As preliminary crash statistics from the 2012 riding season show significant increases in fatal and serious injuries, it appears that changes to the helmet use legislation has resulted

in more severe injury outcomes. This finding is supported by recent research on crash-related injury outcomes [7].

In comparison to the statewide survey, helmet use rates were significantly lower (14.2 percentage points) at motorcycle events and rallies. This decrease in helmet use is likely a reflection of the differences between the riding populations, travel periods, and trip purposes between the rallies/events and the random statewide sample. In addition to providing statewide and event-specific use rates, use rates were also compared with respect to demographics and other pertinent characteristics in order to better understand factors that may contribute to differences in use rates. Tables 4 through 7 present use rates by select motorcycle and rider characteristics. These tables present aggregate summaries that combine the data collected from all included locations, including the randomly selected roadside locations and the riding events/rallies.

Table 4 shows a summary of the helmet types observed for each motorcycle type. These data show that helmet use was lowest on chopper/custom/other motorcycles (33.3 percent). Use rates were also low among riders of mopeds and scooters at 44.7 percent. This result is expected as moped/scooters cannot be driven on freeways or expressways due to their low top-end speed. Helmet use was highest among sport bike riders, who had a user rate of 94.5 percent. Overall, half shell helmets were more commonly observed (23.5 percent of all riders) than full helmets (17.9 percent) or open face helmets (16.4 percent). Full helmets were most frequently worn by riders on sport bikes, followed by those on dual-purpose motorcycles. Open face helmets were also prevalent among those on dual-purpose motorcycles, as well as among trike occupants. Half shells were worn most frequently by those on touring motorcycles, trikes, and cruisers.

Table 4. Percent of Helmet Use by Helmet Type and Motorcycle Type

Motorcycle Type	Number of Riders Observed	Helmet Type				Helmet Use Rate (percent)
		Full Helmet	Open Face (3/4)	Half Shell	No Helmet	
Standard	404	21.3%	9.9%	18.8%	50.0%	50.0%
Touring	956	8.6%	18.2%	29.5%	43.7%	56.3%
Cruiser	846	11.5%	18.7%	25.4%	44.4%	55.6%
Chopper/Custom/Other	48	4.2%	10.4%	18.8%	66.7%	33.3%
Sport	199	86.9%	6.0%	1.5%	5.5%	94.5%
Dual-Purpose	24	45.8%	37.5%	4.2%	12.5%	87.5%
Moped/Scooter	38	18.4%	18.4%	7.9%	55.3%	44.7%
Trike	69	7.2%	27.5%	26.1%	39.1%	60.9%
Total	**2,584**	**17.9%**	**16.4%**	**23.5%**	**42.2%**	**57.8%**

Table 5 summarizes helmet use for riders and passengers by the day of the week and time of the day. Table 6 presents helmet use by gender, age race, and riding position. Tables 5 and 6 were generated using data obtained from all observation locations.

Table 5. Statewide Motorcycle Use Summary by Day of Week and Time of Day

Day of the Week	Number of Riders Observed	Number of Riders Helmeted	Helmet Use Rate (percent)
Sunday	195	134	68.7%
Monday	94	77	81.9%
Tuesday	78	65	83.3%
Wednesday	107	73	68.2%
Thursday	248	189	76.2%
Friday	526	349	66.3%
Saturday	1,336	607	45.4%
Total	**2,584**	**1,494**	**57.8%**
Time of Day	**Number of Riders Observed**	**Number of Riders Helmeted**	**Helmet Use Rate (percent)**
7 am - 8 am	18	17	94.4%
8 am - 9 am	38	27	71.1%
9 am - 10 am	269	67	24.9%
10 am - 11 am	250	117	46.8%
11 am - 12 pm	491	252	51.3%
12 pm - 1 pm	172	90	52.3%
1 pm - 2 pm	260	171	65.8%
2 pm - 3 pm	288	191	66.3%
3 pm - 4 pm	261	200	76.6%
4 pm - 5 pm	164	113	68.9%
5 pm - 6 pm	109	77	70.6%
6 pm - 7 pm	90	62	68.9%
7 pm - 8 pm	106	70	66.0%
8 pm - 9 pm	68	40	58.8%
Total	**2,584**	**1,494**	**57.8%**

Helmet use rates were highest on Tuesdays (83.3 percent) and lowest on Saturdays (45.4 percent), although it must be noted that a majority of the Saturday observations were obtained at events/rallies. Afternoon periods tended to have higher helmet use rates than morning periods.

Table 6. Statewide Motorcycle Use Summary by Gender, Age, Race, and Riding Position

Gender	Number of Riders Observed	Number of Riders Helmeted	Helmet Use Rate (percent)
Male	2,052	1,132	55.2%
Female	413	246	59.6%
Unknown	119	116	97.5%
Total	**2,584**	**1,494**	**57.8%**
Age	**Number of Riders Observed**	**Number of Riders Helmeted**	**Helmet Use Rate (percent)**
0-15	12	6	50.0%
16-29	570	324	56.8%
30-59	1,592	808	50.8%
60+	170	119	70.0%
Unknown	240	233	97.1%
Total	**2,584**	**1,490**	**57.7%**
Race	**Number of Riders Observed**	**Number of Riders Helmeted**	**Helmet Use Rate (percent)**
Caucasian	2,355	1,309	55.6%
African American	96	59	61.5%
Other	9	3	33.3%
Unknown	124	123	99.2%
Total	**2,584**	**1,494**	**57.8%**
Riding Position	**Number of Riders Observed**	**Number of Riders Helmeted**	**Helmet Use Rate (percent)**
Driver	2,157	1,241	57.5%
Passenger	427	253	59.3%
Total	**2,584**	**1,494**	**57.8%**

Females (59.6 percent) had a higher use rate than males (55.2 percent). Riders ages 60 and older had the highest helmet use rate (70.0 percent), while riders ages 30-59 had the lowest use rates (56.8 percent). The highest use rate among races was that for African Americans at 61.5 percent, while Caucasians had a helmet use rate of 55.6 percent. Helmet use rates were relatively consistent between riders and passengers. The relatively high number of riders in the “unknown” demographic categories was likely due to the difficulties associated with observing such information for riders wearing full helmets.

Table 7 provides separate helmet use rates for each gender and age category. There were not sufficiently large samples across all racial categories to perform further demographic separation by race.

Table 7. Statewide Motorcycle Helmet Use by Gender and Age

Gender	Age	Number of Riders Observed	Number of Riders Helmeted	Helmet Use Rate (percent)
Males	0-15	10	8	80.0%
	16-29	427	251	58.8%
	30-59	1,337	650	48.6%
	60+	153	103	67.3%
	Unknown	125	120	96.0%
TOTAL MALES		**2,052**	**1,132**	**55.2%**
Females	0-15	1	1	100.0%
	16-29	137	67	48.9%
	30-59	247	151	61.1%
	60+	15	14	93.3%
	Unknown	13	13	100.0%
TOTAL FEMALES		**413**	**246**	**59.6%**

For male riders, the lowest use rate was observed among riders age 30-59 with a use rate of 48.6 percent. Among female riders, the lowest use rate was observed among riders age 16-29 with a use rate of 48.9 percent.

6.2 High-Visibility Equipment Use

The helmet use survey also included an assessment of the utilization of high-visibility equipment among riders, which is summarized in Table 8 based on motorcycle type, gender, age, race, and riding position. It should be noted that observers only assessed if the rider was wearing any type of high-visibility gear. The specific type of high-visibility gear that was worn was not recorded.

Table 8. Statewide High-Visibility Equipment Use Summary by Motorcycle Type, Gender, Age, Race, and Riding Position

Motorcycle Type	Number of Riders Observed	Number of Riders Wearing Hi-Vis. Equip.	Rate of High-Vis. Equip. Use (percent)
Standard	404	30	7.4%
Touring	956	52	5.4%
Cruiser	846	24	2.8%
Chopper/Custom	48	0	0.0%
Sport	199	25	12.6%
Dual-Purpose	24	3	12.5%
Moped/Scooter	38	4	10.5%
Trike	69	6	8.7%
Total	**2,584**	**144**	**5.6%**
Gender	**Number of Riders Observed**	**Number of Riders Wearing Hi-Vis. Equip.**	**Rate of High-Vis. Equip. Use (percent)**
Male	2,052	108	5.3%
Female	413	14	3.4%
Unknown	119	22	18.5%
Total	**2,584**	**144**	**5.6%**
Age	**Number of Riders Observed**	**Number of Riders Wearing Hi-Vis. Equip.**	**Rate of High-Vis. Equip. Use (percent)**
0-15	12	2	16.7%
16-29	570	33	5.8%
30-59	1,592	64	4.0%
60+	170	14	8.2%
Unknown	240	31	12.9%
Total	**2,584**	**144**	**5.6%**
Race	**Number of Riders Observed**	**Number of Riders Wearing Hi-Vis. Equip.**	**Rate of High-Vis. Equip. Use (percent)**
Caucasian	2,355	123	5.2%
African American	96	3	3.1%
Other	9	0	0.0%
Unknown	124	18	14.5%
Total	**2,584**	**144**	**5.6%**
Riding Position	**Number of Riders Observed**	**Number of Riders Wearing Hi-Vis. Equip.**	**Rate of High-Vis. Equip. Use (percent)**
Driver	2,157	130	6.0%
Passenger	427	14	3.3%
Total	**2,584**	**144**	**5.6%**

High-visibility gear was used by only 5.6 percent of riders. Sport and dual-purpose motorcycles had the highest percentage of riders wearing high-visibility equipment at approximately 12.5 percent. Male riders and riders age 60 and older were observed to more frequently utilize high visibility gear.

Table 9 displays a summary of the helmet use rates based on the use of high-visibility equipment. Not surprisingly, helmets were used at a much higher rate (94.4 percent) by users of high-visibility equipment than riders not wearing such equipment (55.7 percent).

Table 9. Helmet Use by High-Visibility Equipment Use

Use of High-Visibility Equipment	Number of Riders Observed	Number of Riders Helmeted	Helmet Use Rate (percent)
Used	144	136	94.4%
Not Used	2,440	1,358	55.7%
Total	**2,584**	**1,494**	**57.8%**

6.3 Conclusions

The 2013 overall statewide helmet use rate among motorcycle riders in Michigan was 73.0 percent. This rate is substantially lower than that found during the most recent study performed in 2006 that found a helmet use rate of 99.4 percent [*4*]. The decline in helmet use is clearly associated with the weakening of Michigan helmet use law, enacted in April of 2012. It should be noted that the Michigan helmet use rate remains 13 percentage points higher than the 60 percent helmet use rate observed in the nationwide NOPUS survey in 2012. The percentage of riders wearing high-visibility equipment was 5.6 percent, which is a concern because non-helmeted riders were also less likely to wear such equipment, introducing additional risk for this group.

Based upon these findings, continued efforts are warranted to encourage the use of both motorcycle helmets and high-visibility gear. Such efforts may include educational campaigns targeted towards those groups that exhibited the lowest use rates. Organized motorcycle events and rallies present one avenue for such initiatives as these events showed considerably lower helmet use rates. Given the strong support from empirical research, these campaigns should emphasize the documented safety benefits associated with the use of helmets and high-visibility gear.

REFERENCES

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3. NHTSA's National Center for Statistics and Analysis, "Traffic Safety Facts – Motorcycle Helmet Use in 2012 – Overall Results", U.S. Department of Transportation, NHTSA, DOT HS 811 759, May 2013.

4. Datta, T.K., McAvoy, D, and Grillo, L. *Motorcycle Protective Gear Use Observational Survey - Final Report.* Wayne State University, Michigan Office of Highway Safety Planning, Lansing, Michigan, 2006.

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7. Barrette, T.P., Kirsch, T.J., Savolainen, P.T., Russo, B.J., and Gates, T.J. "Aggregate and Disaggregate-Level Assessments of the Effects of Helmet Use and Universal Helmet Laws on Motorcyclist Injuries and Fatalities". Submitted to the Transportation Research Board for presentation and publication, August 2013.

APPENDIX I – DATA COLLECTION COVER SHEET AND OBSERVATION FORM

DIRECT OBSERVATION SURVEY COVER SHEET

Date: _____ - _____ - 2013 **Observers Name:_____**

Survey Type:

Safety Belt **CRD/Booster Seat** **Motorcycle Helmet**

Site Identification:

Site Location: _____

Site Number:_____

City_____County:_____Stratum_____

Alternate Site Information:

Is this an alternate site? No Yes
(Circle one)

If yes, please provide a reason for using an alternate site from the reserve list:

_____

Site Description:

Assigned traffic flow: North South East West

Number of lanes observed: _____

Total number of lanes in this direction: _____

Weather Conditions: Clear Light Fog Light Rain

Site Start and End Time (total obs. period must last EXACTLY 60 min):

Start time: _____am/pm **End time: _____am/pm**

Sample Sizes

Safety Bely Survey:

60 Minute Volume Count (for lanes being observed): _____Vehicles

Number of Observations Recorded in 60 min: _____Vehicles

CRD/Booster Seat Survey:

Total Number of Children Observed in 60 min: _____Children

Motorcycle Helmet Use Survey:

Number of Observations Recorded in 60 min: _____Motorcycles

MOTORCYCLE TYPE:					
❑ Standard	❑ Touring	❑ Cruiser	❑ Chopper/Custom	❑ Other	
❑ Sport	❑ Dual-Purpose	❑ Moped/Scooter	❑ Trike	❑ Unknown	
RIDER			**AGE:**	**GENDER:**	**RACE:**
HIGH-VISIBILITY	**HELMET USE:**		❑ 16-29	❑ Male	❑ White
			❑ 30-59	❑ Female	❑ Black
❑ No	❑ Full Helmet	❑ Open Face (3/4)	❑ 60+	❑ Unknown	❑ Other
❑ Yes	❑ Half Shell	❑ No Helmet	❑ Unknown		❑ Unknown
PASSENGER			**AGE:**	**GENDER:**	**RACE:**
HIGH-VISIBILITY	**HELMET USE:**		❑ 0 to 15	❑ Male	❑ White
			❑ 16-29	❑ Female	❑ Black
❑ No	❑ Full Helmet	❑ Open Face (3/4)	❑ 30-59	❑ Unknown	❑ Other
❑ Yes	❑ Half Shell	❑ No Helmet	❑ 60+		❑ Unknown
			❑ Unknown		

MOTORCYCLE TYPE:					
❑ Standard	❑ Touring	❑ Cruiser	❑ Chopper/Custom	❑ Other	
❑ Sport	❑ Dual-Purpose	❑ Moped/Scooter	❑ Trike	❑ Unknown	
RIDER			**AGE:**	**GENDER:**	**RACE:**
HIGH-VISIBILITY	**HELMET USE:**		❑ 16-29	❑ Male	❑ White
			❑ 30-59	❑ Female	❑ Black
❑ No	❑ Full Helmet	❑ Open Face (3/4)	❑ 60+	❑ Unknown	❑ Other
❑ Yes	❑ Half Shell	❑ No Helmet	❑ Unknown		❑ Unknown
PASSENGER			**AGE:**	**GENDER:**	**RACE:**
HIGH-VISIBILITY	**HELMET USE:**		❑ 0 to 15	❑ Male	❑ White
			❑ 16-29	❑ Female	❑ Black
❑ No	❑ Full Helmet	❑ Open Face (3/4)	❑ 30-59	❑ Unknown	❑ Other
❑ Yes	❑ Half Shell	❑ No Helmet	❑ 60+		❑ Unknown
			❑ Unknown		

MOTORCYCLE TYPE:					
❑ Standard	❑ Touring	❑ Cruiser	❑ Chopper/Custom	❑ Other	
❑ Sport	❑ Dual-Purpose	❑ Moped/Scooter	❑ Trike	❑ Unknown	
RIDER			**AGE:**	**GENDER:**	**RACE:**
HIGH-VISIBILITY	**HELMET USE:**		❑ 16-29	❑ Male	❑ White
			❑ 30-59	❑ Female	❑ Black
❑ No	❑ Full Helmet	❑ Open Face (3/4)	❑ 60+	❑ Unknown	❑ Other
❑ Yes	❑ Half Shell	❑ No Helmet	❑ Unknown		❑ Unknown
PASSENGER			**AGE:**	**GENDER:**	**RACE:**
HIGH-VISIBILITY	**HELMET USE:**		❑ 0 to 15	❑ Male	❑ White
			❑ 16-29	❑ Female	❑ Black
❑ No	❑ Full Helmet	❑ Open Face (3/4)	❑ 30-59	❑ Unknown	❑ Other
❑ Yes	❑ Half Shell	❑ No Helmet	❑ 60+		❑ Unknown
			❑ Unknown		

APPENDIX II - COMPLETE LISTING OF MICHIGAN OBSERVATIONAL SITES BY STRATUM AND COUNTY, INCLUDING OBSERVATIONAL DATA FOR EACH SITE

Stratum	County	Random or Event	Observation Site	Actual Total # of Obs.	Actual Helmeted # of Obs.	% Helmet Use
1	Ingham	Random	E Saginaw St and Hagadorn Rd	10	8	80.0%
1	Ingham	Random	E Saginaw St and N Larch St	13	7	53.8%
1	Ingham	Random	Eaton Rapids Rd and Bishop Rd	7	6	85.7%
1	Ingham	Random	I-96 Bus and N Martin Luther King Jr Blvd	6	6	100.0%
1	Ingham	Random	Lansing Rd and W Mt Hope Hwy	6	4	66.7%
1	Ingham	Random	S Martin Luther King Jr Blvd and W Jolly Rd	3	3	100.0%
1	Ingham	Random	S MLK Jr and W Jolly Rd	4	2	50.0%
1	Ingham	Random	S MLK Jr Blvd and W Holmes Rd	13	9	69.2%
1	Ingham	Random	State Hwy 43 and Marsh Rd	3	3	100.0%
1	Ingham	Random	State Hwy 52 and N Clinton St	5	4	80.0%
1	Ingham	Random	US Hwy 127 and N Cedar St	13	10	76.9%
1	Kalamazoo	Random	E C Ave and 32nd St N	7	5	71.4%
1	Kalamazoo	Random	E Michigan Ave and 35th St N	6	2	33.3%
1	Kalamazoo	Random	E Michigan Ave and N Edwards St	8	6	75.0%
1	Kalamazoo	Random	S Westnedge and Romence Rd	42	29	69.0%
1	Kalamazoo	Random	State Hwy 43 and M 40	6	2	33.3%
1	Kalamazoo	Random	State Hwy 43 and Solon St	7	6	85.7%
1	Kalamazoo	Random	W Kalamazoo Ave and N Rose St	3	1	33.3%
1	Oakland	Event	Campbell/Hilton Rd and 10 Mile Rd	67	60	89.6%
1	Oakland	Random	Crooks and Long Lake	2	2	100.0%
1	Oakland	Random	Dixie Hwy and Williams Lake Rd	9	7	77.8%
1	Oakland	Random	Evergreen and 10 Mile	2	1	50.0%
1	Oakland	Random	I-696 and Orchard Lake Rd	1	0	0.0%
1	Oakland	Event	I-75 and 11 Mile Rd	26	20	76.9%
1	Oakland	Random	I-96 and 8 Mile Rd	4	4	100.0%
1	Oakland	Random	Lapeer and Dutton Rd	6	5	83.3%
1	Oakland	Random	N Glenwood Ave and N Perry Ave	2	2	100.0%
1	Oakland	Random	Northwestern Hwy and Orchard Lake Rd	1	0	0.0%
1	Oakland	Random	Rochester and Avon Rd	4	4	100.0%
1	Oakland	Random	S Main St and E University Dr	9	8	88.9%
1	Oakland	Random	State Hwy 10 and W 13 Mile Rd	1	1	100.0%
1	Oakland	Random	State Hwy 15 and E Seymour Lake Rd	11	11	100.0%
1	Oakland	Random	State Hwy 5 and W 13 Mile Rd	17	17	100.0%
1	Oakland	Random	State Hwy 5 and W 8 Mile Rd	1	0	0.0%
1	Oakland	Random	State Hwy 59 and Hartland Rd	17	15	88.2%
1	Oakland	Random	Telegraph Rd and W Maple Rd	2	2	100.0%
1	Oakland	Event	Woodward Ave and Albany St	115	76	66.1%
1	Oakland	Random	Woodward Ave and Fairwood Blvd	32	28	87.5%
1	Oakland	Random	Woodward Ave and W 12 Mile Rd	20	19	95.0%
1	Washtenaw	Random	E Arkona Rd and Dexter St	8	7	87.5%
1	Washtenaw	Random	I-94 EB Ramp and State St	20	16	80.0%
1	Washtenaw	Random	State Hwy 52 and E Old US-12	4	3	75.0%
1	Washtenaw	Random	US 12 (I-94) and S Huron St	2	2	100.0%
1	Washtenaw	Random	US Hwy 12 and S Huron St	2	2	100.0%
1	Washtenaw	Random	W Michigan Ave and Platt Rd	1	1	100.0%

Stratum	County	Random or Event	Observation Site	Actual Total # of Obs.	Actual Helmeted # of Obs.	% Helmet Use
2	Allegan	Random	34th St and 128th Ave	4	3	75.0%
2	Allegan	Random	Lincoln Rd and Monroe Rd	3	3	100.0%
2	Allegan	Random	US Hwy 31 and M-89	1	0	0.0%
2	Allegan	Random	Viaduct Rd and Central Ave	2	2	100.0%
2	Bay	Random	M-13 and W Thomas	6	3	50.0%
2	Calhoun	Random	I-194 and E Columbia Ave	2	2	100.0%
2	Calhoun	Random	I-69 and M-60 E	2	2	100.0%
2	Calhoun	Random	M66 and E Burr Oak Rd	5	2	40.0%
2	Calhoun	Random	W Dickman Rd and Hill Brady Rd N	5	1	20.0%
2	Eaton	Random	Grand Ledge Hwy and Charlotte St	5	3	60.0%
2	Eaton	Random	I-69 NB Exit Ramp and M-50	1	1	100.0%
2	Eaton	Random	M-50 and E. Lawrence Ave	2	2	100.0%
2	Eaton	Random	Michigan Rd (M-99) and Holt Highway	3	3	100.0%
2	Eaton	Random	W Saginaw St and N Waverly Rd	45	34	75.6%
2	Grand Traverse	Random	Hwy 31 and M-72	1	1	100.0%
2	Grand Traverse	Random	Hwy 72 and Division	6	6	100.0%
2	Grand Traverse	Random	State Hwy 72 and N Division St	3	3	100.0%
2	Grand Traverse	Random	US Hwy 31 and M-72	2	2	100.0%
2	Jackson	Random	I-94 and 28 Mile Rd	1	1	100.0%
2	Jackson	Random	N Main St and Chicago St	1	1	100.0%
2	Jackson	Random	S Meridian Rd and Jefferson Rd	30	18	60.0%
2	Jackson	Random	State Hwy 50 and US-127	4	4	100.0%
2	Kent	Random	I-96 and 28th St	3	3	100.0%
2	Kent	Random	I-96 and Beltline Ave	5	5	100.0%
2	Kent	Random	I-96 and Walker Ave NW	9	7	77.8%
2	Kent	Event	Pfieffer Farm Dr, Byron Center, MI	129	64	49.6%
2	Kent	Random	State Hwy 11 and 3 Mile Rd NW	4	2	50.0%
2	Kent	Random	Whistlevale Rd and 76th St SW	1	1	100.0%
2	Kent	Random	Wilson Ave SW and Burton Ave SW	20	14	70.0%
2	Livingston	Event	8800 W Grand River Rd, Fowlerville, MI	619	126	20.4%
2	Livingston	Random	I-96 and Fowlerville	3	2	66.7%
2	Livingston	Random	M-36 and Chilson Rd	3	2	66.7%
2	Midland	Random	Isabella Rd and S Meridian Rd	2	1	50.0%
2	Midland	Random	US-10 and Eastman Ave	8	6	75.0%
2	Monroe	Random	Detroit- Toledo Expy and Luna Pier Rd.	1	1	100.0%
2	Monroe	Random	I-75 and S. Otter Creek Rd.	1	1	100.0%
2	Monroe	Random	Sarah St and Bedford Dr, Temperance	53	20	37.7%
2	Monroe	Random	State Hwy 50 and Ridge Hwy	1	0	0.0%
2	Monroe	Random	US. Hwy 23 and Tecumseh St.	6	6	100.0%
2	Monroe	Random	W. Monroe St. and Riely St./Main St.	5	3	60.0%
2	Ottawa	Random	Chicago Dr and Cottonwood Dr	20	14	70.0%
2	Ottawa	Random	Hwy 45 and Olive Rd	3	2	66.7%
2	Ottawa	Random	State Hwy 45 and W Olive Rd	13	10	76.9%

Stratum	County	Random or Event	Observation Site	Actual Total # of Obs.	Actual Helmeted # of Obs.	% Helmet Use
3	Berrien	Random	Hwy 31 and Napier	4	4	100.0%
3	Berrien	Random	I-196 and Hagar Shore Rd	2	1	50.0%
3	Berrien	Random	I-94 and Sawyer Rd	6	3	50.0%
3	Berrien	Random	US Hwy 12/I-94 and E Napier Rd	6	2	33.3%
3	Branch	Random	I-96 and Chicago St	10	5	50.0%
3	Clare	Random	Hwy 127 and Clare	1	1	100.0%
3	Clare	Random	Hwy 127 and Colonville Rd	2	2	100.0%
3	Clare	Random	US Hwy 127 and E Colonville Rd	1	1	100.0%
3	Genesee	Random	I-69 and Grand River	2	2	100.0%
3	Genesee	Random	I-75 and W Pierson Rd	7	7	100.0%
3	Genesee	Random	I-75 NB Exit Ramp and Pierson	4	0	0.0%
3	Genesee	Event	M-15 and Richfield Rd	75	56	74.7%
3	Genesee	Random	W Pierson Rd and N Linden Rd	13	8	61.5%
3	Ionia	Random	Button Rd and Whites Bridge Rd	1	1	100.0%
3	Lapeer	Random	N Branch and Van Dyke	1	1	100.0%
3	Lenawee	Random	State Hwy 52 and W Monroe Rd	3	3	100.0%
3	Lenawee	Random	US Hwy 12 and M 52	3	2	66.7%
3	Montcalm	Random	Greenville Rd and E Vandeinse Rd	6	5	83.3%
3	Montcalm	Random	M-46 and M-91	2	2	100.0%
3	Montcalm	Random	N Greenville Rd and W Howard City Edmore Rd	4	2	50.0%
3	Montcalm	Random	State Hwy 46 and Holland Rd	6	5	83.3%
3	Montcalm	Random	State Hwy 66 and W Stanton Rd	8	2	25.0%
3	Muskegon	Random	E Apple Ave and S Maple Island Rd	9	4	44.4%
3	Muskegon	Random	Shoreline Dr and Terrrace St	10	6	60.0%
3	Newaygo	Random	Evergren Dr and Curve St	17	16	94.1%
3	Newaygo	Random	Hwy 20 and Evergreen	2	1	50.0%
3	Newaygo	Random	Hwy 82 and Mason	2	0	0.0%
3	Newaygo	Random	M-37 and Curve Rd	7	4	57.1%
3	Newaygo	Random	S Charles St and E Baseline Rd	32	25	78.1%
3	Newaygo	Random	State Hwy 20 ans N Evergreen Dr	8	5	62.5%
3	Newaygo	Random	State Hwy 82 and Mason Dr	1	1	100.0%
3	Saginaw	Random	Bay and Tittabawassee	13	9	69.2%
3	Saginaw	Random	E Washington Rd and Vassar Rd	5	2	40.0%
3	Saginaw	Random	M-81 and N Portsmouth	1	1	100.0%
3	Saginaw	Random	N Main St and E Holland Rd	3	2	66.7%
3	Saginaw	Random	N Michigan and Tittabawassee	1	0	0.0%
3	Saginaw	Random	Oakley Rd and Brady Rd	4	4	100.0%
3	Saginaw	Random	Oakley Rd and W Brady Rd	9	8	88.9%
3	Saginaw	Random	State Hwy 52 and E 2nd St	5	5	100.0%
3	Saginaw	Random	US Hwy 23 and Dixie Hwy	26	10	38.5%
3	Saginaw	Random	US-23 SB Exit Ramp and Dixie Hwy	2	2	100.0%
3	Saginaw	Random	Vassar and E Washington	3	3	100.0%
3	Sanilac	Random	M-25 (Lakeshore Rd) and Washington Rd	25	20	80.0%
3	Sanilac	Random	State Hwy 53 and W Marlette Rd	1	1	100.0%
3	Sanilac	Random	Van Dyke and Sanilac Rd	2	2	100.0%
3	Shiawasee	Random	I-69 and State Hwy 71	1	0	0.0%
3	Shiawasee	Random	S M-52 and W Lansing Rd	5	4	80.0%
3	St. Clair	Random	Beard Rd and North Rd	2	2	100.0%
3	St. Clair	Random	Gratiot and Huron	4	3	75.0%
3	St. Clair	Random	Gratoit Blvd and Huron Blvd	1	1	100.0%
3	St. Clair	Random	I-94 and Fred Moore Hwy	2	1	50.0%
3	St. Clair	Random	I-94 and Fred W Monroe Hwy	10	10	100.0%
3	St. Clair	Random	I-94 and Gratiot	2	2	100.0%
3	St. Clair	Random	I-94 and Gratiot Rd	5	4	80.0%
3	St. Clair	Random	State Hwy 29 and Bethuy	4	3	75.0%
3	St. Clair	Random	State Hwy 29 and Bethuy Rd	2	2	100.0%
3	St. Joseph	Random	State Hwy 66 and S Centerville Rd	38	15	39.5%
3	St. Joseph	Random	US Hwy 12 annd M-62	8	4	50.0%
3	St. Joseph	Random	US Hwy 131 N and N Washington St	17	14	82.4%
3	Van Buren	Random	I-196 and 32nd Ave	3	3	100.0%

Stratum	County	Random or Event	Observation Site	Actual Total # of Obs.	Actual Helmeted # of Obs.	% Helmet Use
4	Macomb	Random	20 Mile Rd and Romeo Plank Rd	21	18	85.7%
4	Macomb	Random	Earl Memorial Hwy and E. 14 Mile Rd.	4	3	75.0%
4	Macomb	Event	Gibraltar Trade Center/ N. River Rd.	240	148	61.7%
4	Macomb	Random	Hall Rd and Schoenherr Rd	34	20	58.8%
4	Macomb	Random	I-94 and North River Rd	2	2	100.0%
4	Macomb	Random	Metropolitan Pkwy Crossover and Curwood Dr.	8	7	87.5%
4	Macomb	Random	State Hwy 19 and Division Rd	6	5	83.3%
4	Macomb	Random	State Hwy 53 Byp and 32 Mile Rd.	3	2	66.7%
4	Macomb	Random	State Hwy 53 Byp and Van Dyke Rd.	6	6	100.0%
4	Macomb	Random	State Hwy 59 and Groesbeck Hwy	8	6	75.0%
4	Macomb	Random	Van Dyke Ave. and 12 Mile Rd.	1	0	0.0%
4	Macomb	Random	Van Dyke Ave. and 15 Mile Rd.	2	1	50.0%
4	Wayne	Random	Haggerty and Six Mile Rd	26	21	80.8%
4	Wayne	Random	I-275 and Ford Rd	1	1	100.0%
4	Wayne	Random	I-75 and Mack Ave	2	2	100.0%
4	Wayne	Random	I-75 and Northline Rd	10	6	60.0%
4	Wayne	Random	I-94 and Belleville Rd	7	6	85.7%
4	Wayne	Random	I-94 and Middlebelt Rd	4	1	25.0%
4	Wayne	Random	I-94 and Trumbull	25	21	84.0%
4	Wayne	Random	I-96 and Newburgh Rd	4	3	75.0%
4	Wayne	Random	M-59 and Oakwood Blvd	4	4	100.0%
4	Wayne	Random	Michigan Ave and Canton Center	21	12	57.1%
4	Wayne	Random	Michigan Ave and Evergreen Rd	1	1	100.0%
4	Wayne	Random	State Hwy 153 and N. Wayne Rd.	3	3	100.0%
4	Wayne	Random	Telegraph and Goddard	10	6	60.0%
4	Wayne	Random	Telegraph Rd and Van Born Rd	31	20	64.5%
4	Wayne	Random	Telegraph Rd and Wick Rd	42	35	83.3%
4	Wayne	Event	Woodward and Warren	8	7	87.5%