

Michigan Transparency Report Methodology 2010 – per Section 148 (c)(1)(D) of SAFETEA-LU

Introduction

This report methodology is prepared by the Michigan Department of Transportation (MDOT), to report on all public roads in the state. The methodology is based on the guidance offered in the April 10, 2006 FHWA 5% Reporting Guidance Document and the subsequent HSIP related web conference held June 20, 2006.

In Michigan, there are approximately 122,000 miles of public roads, of which 92 percent are under local jurisdiction. MDOT does not have a consistent methodology to conduct statewide surveillance of the road network due to lack of data on locally owned roads. As MDOT does not have jurisdiction over local roads, it has not been our practice to develop a statewide list of “hazardous” locations due to the availability of resources to address locations of concern, and the competing priorities of local units of government.

MDOT is in the process of developing new system surveillance tools which will allow review of the entire statewide network. For the purposes of this report separate methods were developed for MDOT and locally owned roads and makes best use of the available information with the objective to identify intersections and segments with the “**most severe safety needs**”.

In Michigan a statewide GIS referencing system is utilized on which all crashes, on all roads, are referenced to. We have good crash data, located such that we can conduct a statewide analysis to determine the most “hazardous” locations. Michigan crash data contains information on the severity of the crash, whether it is a fatal injury (K), incapacitating injury (A), non-incapacitating injury (B), possible injury (C) or property damage only (O) crash. We have information on the number of injuries by severity, if any, suffered by all parties involved in a crash.

MDOT does not have accurate traffic volume data for all roads statewide, thus other exposure measures needed to be considered.

Methodology – MDOT Jurisdiction

Safety Analyst (SA) 4.1.1 was utilized for the identification of trunkline (MDOT owned) locations for this report. Currently, Michigan is not able to utilize SA for roadways on the locally owned network. Initially, analysis was conducted using all trunkline data. In reviewing the resulting locations it was found that segments in and around the Metro Detroit area made up the majority of the list. Thus, segments for Metro Detroit were analyzed separately from the remainder of the state.

A typical SA analysis involved removing all sites with zero crashes. Also, crashes with trains, animals and other objects were removed from analysis. Train and other object crash types occur in the database in very small numbers and do not occur at a frequency considered statistically significant. Animal crashes are not considered critical in that there aren't proven

countermeasures available for mitigation. Removal of these certain site types and crashes greatly speeds up the run time of the software.

Once a list of locations is generated for a particular type (segments, ramps or intersections) the data was inspected to ensure that appropriate locations were included in the report. For example, if a site subtype was not labeled appropriately it was removed from analysis. Mis-located crashes were also removed.

Locations: Segments

For all segments a basic network screening with sliding window was conducted. Fatal and incapacitating injuries were selected for analysis and the “excess accident frequency” safety performance measure targeted. As mentioned above the surveillance was conducted in two parts – Metro Detroit and the remainder of the state. In order to limit the resources required to analyze and field review each location the top 10 segments from each list were included in the report. Thus, 20 segments are included in this Transparency Report.

Locations: Ramps & Intersections

For ramps and intersections a basic network screening was conducted. Fatal and incapacitating injuries were selected for analysis and the “excess accident frequency” safety performance measure targeted. In order to limit the resources required to analyze and field review each location the top 10 ramps and top 20 intersections were included in the report.

Overall, 50 trunkline locations were included in this year’s Transparency Report. Methodology regarding locally owned locations is as follows.

Methodology – Local Agency Jurisdiction

Crashes were divided into intersection related crashes and lane departure crashes. Intersection and lane departure crashes are identified as focus areas in the current (2008) Michigan Strategic Highway Safety Plan (SHSP). Each of these focus areas served as the basis for analysis for this year’s report.

Our preference would have been to develop an “index” or some type of ranking tool that would include at least three factors: crash frequency, crash severity, and crash rate based on vehicle miles traveled (VMT). As noted, we do not have the luxury of statewide VMT data, by route, so MDOT has elected to proceed with the available data. The locations that were identified in this method resulted in analysis of data available from crash reports only.

For this report, Michigan has elected to use K and A incidents to measure safety needs. Rather than have a measure of exposure, we are using a density of crashes per intersection or per one mile segment. Our approach is to develop a combined index value for a location (intersection or segment) based on the frequency of K and A crashes and the societal costs of K and A injuries at a location.

The methodology to identify intersections and segments with safety concerns was constrained to examining locations where crashes were reported and located. Unlocated crashes are not included in this analysis. Currently in Michigan this is a relatively small number.

Locations: Intersections

For intersections, statewide crash data for the years 2009-2011 were used. A database for locations containing crashes located within 150 feet of an intersection was created.

The index for an intersection was determined as follows:

The total number of K and A crashes at an intersection was established. Every intersection statewide with at least two reported K or A crashes was included in the analysis. It was felt that locations with a single K or A crash were truly random and were excluded from the analysis. Locations were ranked, in descending order (the most severe ranked 1), by the total number of K and A crashes at the location.

Each location was also ranked by the societal cost (loss) of K and A injuries (the location with the highest total number ranked 1) at that location. This loss value was calculated using 2010 National Safety Council value from www.nsc.org which assigns a K injury a value of \$1,410,000 and an A injury a value of \$69,200.

Each time a variable was ranked, those locations having the same number of crashes (or alternately the same loss value for K and A injuries) were all assigned the low ranking value. For example, if intersection locations 3 through 6 had seven crashes, each location would be ranked 3. The next rank assigned would be 7.

An index number was assigned to each location and was equal to the sum of the rank for frequency plus the rank for loss. The lower the value of the variable index the “more severe” the location.

Examination of a histogram of the variable index showed that it was not “normally” distributed. Taking the natural log of the variable index allows one to determine the geometric mean, geometric standard deviation and confidence intervals from a “log normal” distribution.

Taking the 99% confidence interval (the mean minus 3 standard deviations) gives the 9 “most severe” locations in the state. Rather than taking 5% of 9 locations we chose to include them all in our report.

Locations: Segments (Lane Departure)

2007-2011 statewide crash data was used for the segment analysis for all roads.

A study file consisting of crashes indicated as “lane departure” was created for this portion of the analysis. The approach was to accumulate crashes by reference segment number to determine the number of crashes per mile.

An index number for each location in the database was determined and analyzed for all segments, as described above for intersections. From these databases we developed our “most severe” segment locations.

Taking the 99% confidence interval (the mean minus 3 standard deviations) gives the 6 “most severe” local locations in the state. All locations were included in the report.

Following the creation of the list of locations of interest, cursory field reviews were conducted for all locations included in the Transparency Report. Repeat locations may not have been field reviewed this year but have been for previous Transparency Reports.

It should be noted that presently we do not have a good means to approach the segment analysis on the locally owned network. The establishment of segment length is somewhat arbitrary and is an artifact of our referencing system. We are looking at ways to improve our segment analysis – perhaps through the use of tools that are in development phase.

Issues

For several of the locations identified a correctable crash pattern was not identified. Our approach was designed to identify locations that have poor safety performance, not necessarily those with poor safety performance that can be fixed in terms of engineering countermeasures or behavioral treatments.

At some of the locations identified in our methodology the safety treatments have already been applied. It was determined that finding every location statewide that has already had treatments applied and filtering them out of the database is too timely a task to undertake. For now they remain a part of the report.

In several cases, locations included in the report are repeat locations from previous year’s reports. This does not necessarily mean that the crashes vary widely from previous reports or even include crashes in the newest year of data. These locations remain a part of the report as well.

Michigan’s crash data base system is in good condition. A new system completed in 2004 has a number of features which will allow for the continuous improvement of data quality and accuracy. Also, in 2009, the crash database was updated such that if any of the Michigan SHSP focus areas applies to a crash that crash is now flagged (i.e. – lane departure, young driver, impaired driver, etc.) and searchable.

Michigan is working to better integrate existing traffic safety databases, and extend the coverage to the entire network. Of primary importance will be the development of plans to collect, or access ADT/VMT data across the entire state.

We will continue to improve our method of determining locations to be included in future reports of this nature. More work is required on the fundamental approach, and conducting sensitivity analysis. Our application of this methodology suggests that it is sensitive, but consistently yields locations with safety concerns.

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