Introduction

The Michigan 5% report methodology is prepared by the Michigan Department of Transportation (MDOT), to report on all public roads in the state, and has been updated for 2007. 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 any current methodology to conduct statewide routine surveillance of the road network that includes local 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 a method was developed to make 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 (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

For 2007, intersection related crashes were compiled for analysis. Intersection crashes are identified as a focus area in the Michigan Strategic Highway Safety Plan (SHSP). As there is an emphasis on intersection crashes in Michigan's SHSP, and one can implement many intersection countermeasures at intersections (versus segments) more rapidly, Michigan chose to focus only on intersections for this years 5% report.

Our preference for analysis 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 from crash reports only.

For this report year, Michigan decided 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. Our approach is to develop a combined score for an intersection based on the frequency of K and A crashes and the economic "loss" of K's and A's at a location.

Unlocated crashes are not included in this analysis (currently in Michigan this is a relatively small number).

Intersection Analysis

Looking at intersections, statewide crash data for the years 2004-2006 were used. A crash file containing crashes indicated as “intersection related” was created.

The score 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. 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 worst ranked 1), by the total number of K and A crashes at the location.

To establish a measure for “loss” the number of fatalities and/or A injuries were used. A straight weighting scheme was used where an assigned dollar value for loss for K’s and a value for A’s was used (values from the National Safety Council website). The number of K’s was in turn multiplied by that dollar loss and the number of A’s by its respective loss value. The two computed values were added to create a single loss variable for each intersection.

The value for the variable loss was then ranked with the greatest loss being ranked 1.

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

A score was assigned to each location and was the sum of the rank for frequency plus the rank for loss. The lower the value of score the worse the location.

Examination of a histogram of the variable score showed that score was not “normally” distributed. Taking the natural log of the variable score 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 48 worst locations in the state. Rather than taking 5% of 48 locations MDOT chose to use all 48 locations. As the crashes for each location were analyzed it was discovered that 3 locations were repeated in the list. This was due to varying intersection descriptions for those locations. The three repeated locations were dropped from analysis. Also, one location had a mislocated crash and the score for this location was revised. Due to this, the location dropped out of the analysis (down to rank #76). Therefore, a total of 44 locations were analyzed.

Issues

Our approach to this exercise was to not constrain this analysis any more than necessary. For a number of the locations identified, no correctable crash pattern was 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 fixes, or behavioral treatments. A future approach may include focusing on finding locations with correctable crash patterns such as lane departure crashes.

As this is a statewide review, MDOT responded solely to state owned locations. Each region was responsible for reporting on locations within their region. Locations under the jurisdiction of a

local agency were reported on by that agency. Statewide safety personnel were made available to advise any reporting group should they request assistance.

At some of the locations identified in our methodology the safety treatments have already been applied. In others, safety treatments were simplistic in nature and have already been implemented.

In many cases a potential treatment at a signalized location is to install a box span signal display. It is now standard in Michigan to install box spans at trunkline intersections where the signal span is to be upgraded. Also, on-going signal optimization projects on all trunklines (to be completed within five years) may mitigate some of the crashes at signalized locations.

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.

The next step for Michigan is to better integrate existing traffic safety databases, and extend the coverage to the entire network. Discussions are under way to begin the planning for this action. Of primary importance will be the development of plans to collect, or access ADT/VMT data. While many local agencies collect traffic count information in some form, there are no standards in place for collecting and adjusting count information.

We will continue to improve our method of determining our 5% locations. More work is required on the fundamental approach, conducting sensitivity analyses, and improving our segment identification process. Our application of this methodology suggests that it is sensitive, but did consistently yield locations with safety problems.

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