

Region of Durham's Safety Improvement Program

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The Regional Municipality of Durham, with the aid of its consultant iTRANS Consulting Inc., has developed a state of the art proactive safety program. The program is a top down process commencing with a network screening to rank elements of the road network based on their potential for improving safety. It is followed by a diagnostic (safety audit) process and selection of countermeasures, and incorporating safety-motivated projects into the capital program.

What is unique about this process is the use of calibrated safety performance functions (*SPFs*) for municipal arterial roads. The use of safety performance functions is seen as state of the art for identifying problem locations within the road network. While other jurisdictions are investigating safety performance functions, the Region of Durham is one of two Ontario municipalities that have developed and are using safety performance functions.

Conventional techniques for identifying problem locations include using collision counts and/or rates. Conventional techniques are now known to have limitations with their statistical quality, which affects their ability to identify sites with the greatest potential for improvement. These difficulties are due to the potential bias due to the regression-to-the-mean phenomenon.

To overcome the difficulties with the conventional techniques, an approach based on safety performance functions has been developed. Conceptually, the network screening process:

Extracts collision counts (P) from the collision database

Estimates expected operational performance (SP) as a typical number of collisions for a comparison group of similar locations

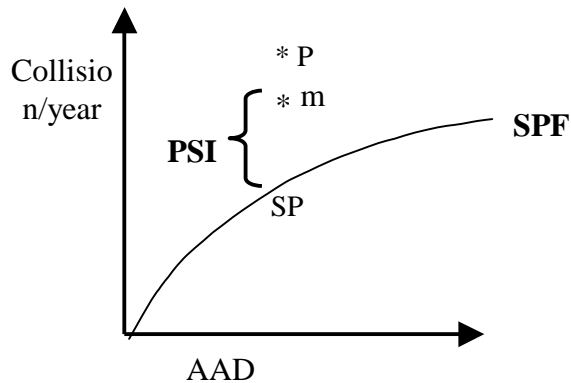
Estimates the long-term average number of collisions anticipated (m) for a given location by using the statistical relationship (equation)

Determines the Potential for Safety Improvement (PSI) separately for fatal / injury and PDO collisions; the PSI is the difference between the number of collisions for the specific site from (c) and the expected number of collisions from (b) for the comparison group:

$$\begin{aligned} PSI_{Fatal/Injury} &= m_{Fatal/Injury} - SP_{Fatal/Injury} \\ PSI_{PDO} &= m_{PDO} - SP_{PDO} \end{aligned}$$

Figure 1 depicts this relationship.

Figure 1: Potential for Safety Improvement Diagram



PSI_{index} values are estimated by weighting the $PSIs$ for each collision category relative to the cost of fatal and injury collisions and PDO collisions.

Ranks locations according to the PSI_{index} .

The network screening process is based on data contained in Durham's collision database, annual traffic volume database, and a road inventory database for road segments and intersections. The basic analytical tools are the safety performance functions ($SPFs$) and collision smoothing weights. This study comprises 1997-2000 data collected and recorded by the Region.

The network screening process is an initial identification of sites with potential for safety improvement. The ranking index is named PSI_{index} and the output listing will list locations in a descending order of PSI_{index} . Network Safety Screening software was developed to assist the Region in the ranking of sites in terms of potential for improved safety (based on PSI_{index} values).

Based on the PSI_{index} and other collision data, a list of sites is brought forward to the diagnostic review. The diagnostic process comprises detailed review of office and field investigations. The aim is to determine the causes of the collisions and other incidents. A "toolbox" for site by site safety reviews (diagnosis) was developed as part of the safety program. The findings of this diagnosis are analysed and potential improvement measures proposed. On the basis of their effectiveness and the cost of their implementation, it is possible to determine the most effective measure of combination of measures.