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Identifying Pedestrian High-Crash Locations as Part of Florida's Highway Safety Improvement Program

A Systematic Approach

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From 1997 to 2001, pedestrian fatalities represented 25.9% (2,065 fatalities) of all traffic fatalities in Florida. The latest available statewide crash data from the Florida Department of Highway Safety and Motor Vehicles reveals 8,487 pedestrian crashes, resulting in 510 deaths and 7,894 injuries, in 2001. However, a methodology is not currently available to identify pedestrian high-crash locations in Florida as part of the Highway Safety Improvement Program (HSIP). A study was conducted to provide the framework for the systematic identification of pedestrian high-crash locations on the state highway system as part of the HSIP. The study methodology uses the Poisson distribution to determine abnormally high pedestrian crash frequencies in a year for 1-mi roadway segments. Four-lane and six-lane divided roadways with continuous sidewalks on both sides of the road in Miami-Dade County were included. The crash data, the latest available from the crash database of the Florida Department of Transportation, correspond to the years 1997, 1998, and 1999. A χ^2 goodness-of-fit test was performed to determine how well the data could be modeled by a Poisson process. The goodness-of-fit test was significant at the 2.5% level for the 1999 data, at the 10% level for the 1998 data, and less than 1% for the 1997 data. With a confidence level of at least 90%, a pedestrian crash frequency of three crashes in a 1-mi segment was found to be abnormally high for the four-lane divided facilities. For the six-lane divided facilities, four pedestrian crashes per 1-mi segment were established as the threshold value. From these threshold values, 22 1-mi segments were identified as pedestrian high-crash locations in Miami-Dade County for 1999.

Pedestrian crash data compiled by the Florida Department of Highway Safety and Motor Vehicles (HSMV) indicates that 2,065 pedestrians died in Florida during the 5-year period from 1997 through 2001. Pedestrian fatalities represented 25.9% of all traffic fatalities during this period. The latest statewide crash data reveal a total of 8,487 pedestrian crashes resulting in 510 deaths and 7,894 injuries in 2001 (*1*). Pedestrian fatalities represented 16.9% of the traffic fatalities in Florida in 2001. However, there is no systematic approach for the identification and evaluation of locations with abnormally high pedestrian crash frequencies on Florida's state highway system.

The current methodology used by the Florida Department of Transportation (DOT) to identify high-crash spots and segments is the Rate Quality Control Method (*2*). This method, which was originally used to evaluate the quality control of manufacturing industrial processes, uses a statistical test to determine if the crash rate at a particular spot or segment is abnormally high when compared with the crash rate of locations of similar roadway characteristics (*3*). In Florida, similar locations are defined based on roadway facility types. General categories are defined based on the number of lanes, urban or rural, and divided or undivided facilities. A critical crash rate, above which a roadway spot or segment is considered a high-crash location, is determined based on the average crash rate for a particular facility type and the vehicular exposure at the study location. Critical crash rates are calculated using Equation 1.

$$R_c = \lambda + k\sqrt{\frac{\lambda}{m}} + \frac{1}{2m} \quad (1)$$

where

R_c = critical crash rate for a particular location (crashes per million vehicles or crashes per million vehicle-miles),
λ = average crash rate for all road locations of similar characteristics (crashes per million vehicles or million vehicle-miles),
m = number of vehicles traversing a particular road section (millions of vehicle-miles) or number of vehicles entering a particular intersection (millions of vehicles) during the analysis period, and
k = probability factor determined by the level of statistical significance desired for R_c.

In Equation 1, the first two terms result from the normal approximation to the Poisson distribution. The last term of the equation serves as a correction factor because the Poisson distribution is a discrete distribution, whereas the normal distribution is a continuous distribution. Since this method is based on the normal approximation to the Poisson distribution, it cannot be used with fewer than nine crashes (*4*). Although this method has been useful for identifying locations with a high number of crashes, it cannot be used to identify high-crash locations that are prone to specific types of crashes, because the average crash rates are based on the total number of crashes and are not stratified by crash type. For example, using an average crash rate based on the total number of crashes, a location that is prone to pedestrian crashes may not receive the attention it needs if its total number of crashes is not high. Therefore, a location with a high pedestrian crash frequency but with low

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