

# **PEDESTRIAN SAFETY AT MIDBLOCK LOCATIONS**

## **PROBLEM STATEMENT**

Pedestrian safety in Florida is significantly related to light conditions. Between 1986 and 2003, about 37 percent of all pedestrian crashes occurred while the pedestrians were attempting to cross roadways under dark conditions. While light conditions as an accident factor are not linked to as large a share of pedestrian crashes as midblock locations, the differential risk across light conditions is significantly higher than the differential risk across crossing locations. The probability of a pedestrian being fatally struck by a vehicle is, on average, over 6 times greater under dark conditions than under daylight conditions.

Another factor tied to pedestrian safety relates to uncontrolled midblock locations. Those with established pedestrian generators and attractors and adequate crossing demand along state roads rarely meet the current pedestrian signal warrant. Many of these locations are along multilane roads with high traffic volumes and speeds. Engineers are reluctant to mark uncontrolled midblock crosswalks without a good set of guidelines, and the existing guidelines need to be improved to be useful to the practitioner. Currently, they are unstructured, difficult to implement, and inconsistent. Moreover, under many conditions, the guidelines often discourage or even exclude uncontrolled midblock crosswalks from consideration. Conditions that occasion exclusion often include locations along multilane roads with high traffic volumes and speeds, i.e., those most in need of improvements for pedestrian crossings.

## **OBJECTIVES**

This project had two primary objectives. The first was to assess the interactive roles of crossing locations and light conditions in pedestrian injury severity using multivariate regression analysis to control for many other factors (other than location or light conditions) that also may influence pedestrian injury severity. The second was to develop guidelines for uncontrolled midblock crosswalks on Florida's State Highway System, including multilane roads with high traffic volumes and speeds.

## **FINDINGS AND CONCLUSIONS**

### **Light Conditions**

The study has estimated an ordered probit model using Florida crash data from 1986 to 2003. The empirical model is well behaved. It includes pedestrian attributes, driver attributes, road attributes, vehicle attributes, and weather conditions as control variables. All control variables that have specific expected directions of effects and are statistically significant have the expected signs. More important, all five interactive variables on crossing locations and light conditions are statistically significant and have the expected direction of effects.

The results provide new insights into the roles of crossing locations and light conditions on pedestrian injury severity. In terms of crossing locations, the probability of a pedestrian dying when struck by a vehicle is higher at midblock locations than at intersections for any light condition. In fact, the odds of sustaining a fatal injury at an intersection are consistently lower than the odds of sustaining a fatal injury at a midblock location: 49 percent lower under daylight conditions, 24 percent lower under dark conditions with street lighting, and 5 percent lower under dark conditions without street lighting. Relative to dark conditions without street lighting, daylight reduces the odds of a fatal injury by 75 percent at midblock locations and by 83 percent at intersections, while street lighting reduces the odds by 42 percent at midblock locations and by 54 percent at intersections.

## Guidelines

Researchers developed a set of guidelines for marking midblock crosswalks at uncontrolled locations on Florida's State Highway System. These guidelines and the process used to develop them share common features with guidelines employed in other localities. With respect to the process and guidelines developed:

- The process is based on a review of actual guidelines from other localities.
- The process is based on a solicitation of practitioner inputs.
- The guidelines include a set of demand criteria.
- The guidelines include a set of basic safety criteria.
- The guidelines include a set of basic treatments and a set of enhanced treatments.
- The guidelines reflect all MUTCD guidance on marking crosswalks at uncontrolled midblock locations.

Distinct features of the guidelines and the development process include the following:

- The process is more comprehensive and includes many forms of inputs than comparable processes.
- The process follows an inclusive philosophy toward marking crosswalks. Rather than excluding multilane roads, roads with high traffic volumes, or roads with high speeds from being considered for midblock crosswalks at uncontrolled locations, appropriate treatments for these environments are considered when there is a well-established crossing demand and adequate sight distance and lighting (i.e., this approach does not ignore well-established demand where it exists and can be addressed).
- The guidelines are structured to avoid gaps that would make their implementation difficult.
- The guidelines include a spreadsheet tool that uses information on block characteristics, roadside characteristics, intersection characteristics, cross-sectional characteristics, and crossing patterns to estimate the likelihood of pedestrians who currently cross in the block using a new midblock crosswalk.
- The guidelines take into account available evidence that crosswalk markings appear to increase pedestrian-vehicle collision risks. The development process sets up a simple model of pedestrian-vehicle collision risks. This model is used to identify three mechanisms through which pedestrian-vehicle collision risks may be higher in marked crosswalks. These mechanisms are multiple-threat collisions, pedestrians having a false sense of security, and lack of enhancements in addition to simple two-line markings. This model is further used to identify treatments to counter these mechanisms so that crosswalk markings do not lead to higher collision risks.
- The guidelines take into account the fact that the available evidence is uncertain. These guidelines are designed to be provisional and include a monitoring process for any new uncontrolled midblock crosswalks implemented under these guidelines.

## BENEFITS

This research shows that adequate lighting offers significant benefits for reducing pedestrian injury severity once the pedestrian is involved in a motor vehicle crash. This result has already been incorporated into the guidelines developed for placing midblock crosswalks at uncontrolled locations.

However, the existing evidence cannot be used to determine whether placing midblock crosswalks at uncontrolled locations will improve pedestrian safety. Researchers have incorporated this uncertainty into the developed guidelines. Further, the State Traffic Engineering and Operations Office is in the process of developing guidelines for placing midblock crosswalks at uncontrolled locations for the *Traffic Engineering Manual*. The results from this report may prove a useful aid in that effort.

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