

# New England University Transportation Center



NE University Transportation Center  
77 Massachusetts Avenue, E40-279  
Cambridge, MA 02139  
Phone: 617-253-0753  
Fax: 617-258-7570  
web.mit.edu/utc

**Principal Investigator:** John N. Ivan  
**Title:** Professor, Civil & Env. Engr.  
**University:** University of Connecticut  
**Email:** [john.ivan@uconn.edu](mailto:john.ivan@uconn.edu)  
**Phone:** 860-486-0352

**Co-Principal Investigator:** Nalini Ravishanker  
**Title:** Professor, Statistics  
**University:** University of Connecticut  
**Email:** [Nalini.ravishanker@uconn.edu](mailto:Nalini.ravishanker@uconn.edu)  
**Phone:** 860-486-4760

## Final Report

*Project Title:*

# Effectiveness of Interventions at Midblock Crossings for Improving Senior and Other Pedestrian Safety

**Project Number:**

UCNR24-30A

**Project End Date:**

May 31, 2015

**Submission Date:**

Dec. 30, 2015

The contents of this report reflect the views of the authors, who are responsible for the facts and the accuracy of the information presented herein. This document is disseminated under the sponsorship of the Department of Transportation, University Transportation Centers Program, in the interest of information exchange. The U.S. Government assumes no liability for the contents or the use thereof.

The New England University Transportation Center is a consortium of 8 universities funded by the U.S. Department of Transportation, University Transportation Centers Program. Members of the consortium are MIT, the University of Connecticut, University of Maine, University of Massachusetts, University of New Hampshire, University of Rhode Island, University of Vermont and Harvard University. MIT is the lead university.

## **Brief description of project:**

This project evaluated the effectiveness of designed interventions on pedestrian crash experience at midblock crossings, focusing on seniors, children and other pedestrians. From the large crash database, we studied crashes involving pedestrians in situations with and without the interventions, and merged this data against a database containing the road and roadside characteristics. We fit a suitable regression and identify important covariates. Conflicts between pedestrians and vehicles subject to the interventions were observed using a variation of the Swedish Traffic Conflicts Technique, and classified by estimated age of the pedestrian and the severity of the conflict. Observations were made at locations specifically targeted for having characteristics found to be associated with senior pedestrian crash severity relative to non-seniors. We carried out a statistical test of association between conflict severity and crash severity based on data obtained through field observation and sampled from the crash database.

The next two sections describe two studies that were conducted and documented in refereed journal articles.

## **Study 1: Effectiveness of Treatments at Midblock Crossings for Improving Pedestrian Safety in Connecticut**

This paper describes an observational study of the effectiveness of treatments aimed at improving pedestrian safety at midblock crossings in Connecticut. The treatments evaluated include in-street pedestrian warning signs, textured pavements, and pedestrian traffic signals. Observation locations were selected to include a sample of each treatment along with other midblock crosswalks that received none of these treatments but had characteristics similar to the selected treatment locations for a total of 37 treated and 27 untreated locations. Interactions between pedestrians and vehicles are observed using a variation of the Swedish Traffic Conflicts Technique, and classified by the severity of the interaction, ranging from no interaction to serious conflict, as well as whether or not the pedestrian is senior (65 years of age or older). Location characteristics including vehicle volume, crossing distance, number of lanes, speed limit, on-street parking, presence of median, land use and weather condition were also observed. A generalized linear model for categorical responses was estimated to predict pedestrian interaction severity for each pedestrian observed, using a partial proportional odds framework as a function of the presence of treatment and the location variables to control for their effects. We found that in-street pedestrian warning signs and textured pavements were associated with reduced interaction severity only in conjunction with one another. Pedestrian traffic signals were also associated with reduced interaction severity.

## **Study 2: A Semiparametric Statistical Approach to Evaluate Conflict Severity as a Surrogate for Crashes in the Context of Pedestrian Safety**

There is growing interest among traffic engineers for using so-called surrogate measures of safety as an alternative to crash counts, especially in contexts where the temporal and/or spatial crash occurrence rate is extremely low. In order to facilitate this paradigm shift, it is useful to demonstrate significant association between conflicts and crashes, and how this association might vary by location. As an alternative to the traditional method of regression analysis, we

investigate a semi-parametric statistical approach that enables us to rank-order locations by decreasing magnitude of the association between crash and conflict counts. We demonstrate the method in the context of pedestrian safety at intersections in central Connecticut with variation in several characteristics including crossing distance, pedestrian signal phasing type, presence or absence of parking and surrounding land use. Locations with high association between conflicts and crashes were more likely to have exclusive pedestrian phasing and on-street parking. Among these locations, those with high conflict and crash counts were more likely to have on-street parking and be in non-residential areas. The method can be applied easily to other road safety contexts as well as consideration of other surrogate measures of safety. Our approach is also relevant to more general data mining settings where there is a need to identify a subpopulation in which there is a strong association between a pair of variables of interest.

## **Publications**

1. Yaohua Zhang, Sha Mamun, Eamon Flannery, John N. Ivan, Nalini Ravishanker. “Effectiveness of Treatments at Midblock Crossings for Improving Pedestrian Safety in Connecticut”, submitted for publication in *Journal of Transportation Safety and Security*, 2015.
2. Yaohua Zhang, Nalini Ravishanker, Ivan John, Sha A. Mamun. “A Semiparametric Statistical Approach to Evaluate Conflict Severity as a Surrogate for Crashes in the Context of Pedestrian Safety”, submitted for publication in *Accident Analysis & Prevention*, 2015.