UTC Spotlight
University Transportation Centers Program
June 2009
U.S. Department of Transportation, Research and Innovative Technology Administration

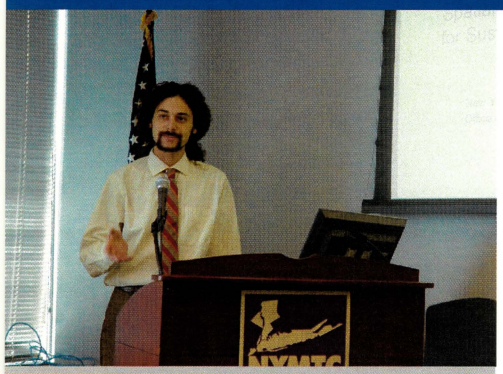


Photo by: Ellen Thorson

This monthly report from the University Transportation Centers Program highlights some of the recent accomplishments and products from one of the University Transportation Centers (UTCs) managed by the U.S. Department of Transportation's Research and Innovative Technology Administration.

Spatial Analysis and GIS Support for Pedestrian Safety in New York City

Spatial Analysis for Pedestrian Safety in New York City

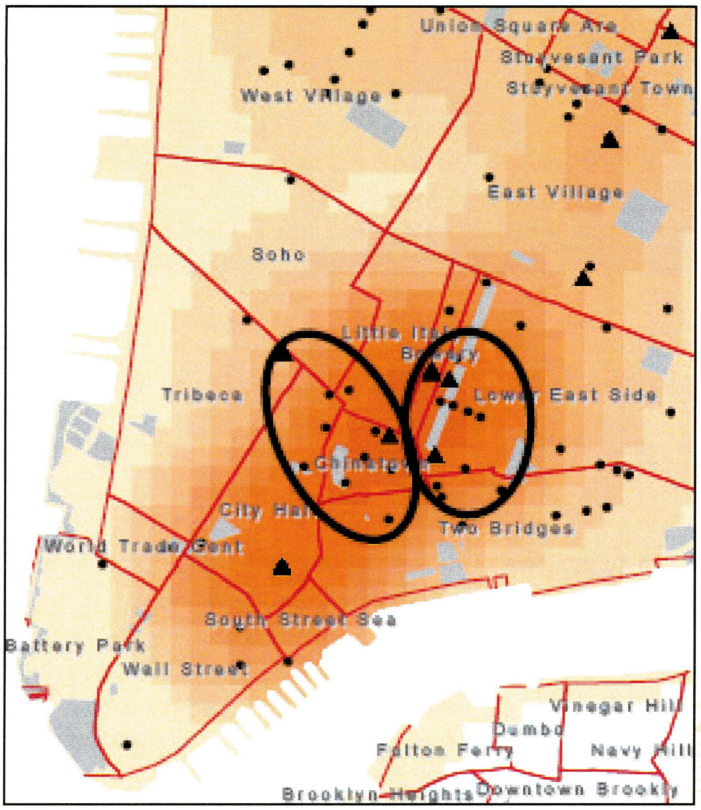
Since the early 1990s, The New York City Department of Transportation (NYCDOT) has been active in instituting programs aimed at improving safety, with a special focus on pedestrians and cyclists. New York has experienced dramatic pedestrian safety gains since 1990—reducing the pedestrian fatality rate per resident by nearly 60 percent and the severe injury rate by 49 percent—but the total pedestrian injury rate has fallen by only 22 percent. It was recognized that to achieve further reductions, the Department's safety programs required a geographic and demographic focus. Seniors were identified as among the most vulnerable groups—from 2002 to 2006, pedestrians over 65 years of age accounted for a disproportionate share of pedestrian fatalities and severe injuries in the city, representing only 12 percent of the population, but 38 percent of pedestrian fatalities and 15 percent of severe injuries. NYCDOT initiated a study to analyze in detail pedestrian-injury crashes among seniors and to identify a strategy to decrease their incidence and severity.

The study involved data conversion into a Geographic Information System (GIS) format, data analysis, and countermeasure design. The analysis phase consisted of the spatial analysis of senior pedestrian and all pedestrian crashes; analysis of crash factors and related investigations of crash causation; site visits and onsite data collection; and informal surveys of pedestrians. Efforts were also made to improve access to crash data by project managers, a process that continues.

By using GIS software, the researcher was able to create maps detailing the density of crashes across New York City, pinpointing the areas where design efforts might yield the most benefit. Previous studies had missed geographic "hotspots" resulting from multiple problematic intersections near one another—the type of pattern seen in neighborhoods with high senior pedestrian activity levels. This study also accounted for the severity of pedestrian crashes, an important attribute in urban areas where low-speed crashes may be more common, but less dangerous, than higher speed crashes in nonurban areas.

Safe Streets for Seniors

Maps of the density of all senior pedestrian severe injuries and fatalities in New York City, over a 5-year period, were produced using the Kernel Density technique. This technique allows the easy identification of hotspots with a high concentrations of crashes by dividing the city into a grid, and then giving each square in the grid a value corresponding to the density of crashes nearby. Additional tests were run to



Matthew Roe

Kernel density map displaying levels of concentration of senior pedestrian crashes.

compare the results of this test with other spatial techniques, confirming that these areas had more crashes, at a statistically significant level, than the baseline for the city as a whole.

After the analysis was complete, 25 crash hotspots were chosen as focus areas for a new NYCDOT program named "Safe Streets for Seniors." In this program, NYCDOT is implementing immediate and long-term design and operational treatments tailored to the needs of pedestrians over the age of 65. Five focus areas, one in each borough, were selected as pilot areas and studied, together with NYCDOT staff, to develop appropriate safety improvements. "Working on the design team was a great experience," said Matthew Roe, lead researcher for the project. "As a planner, that's something I could never have gotten in a classroom." Analysis and implementation were undertaken almost concurrently, with construction by NYCDOT's in-house teams starting in one area, as design was begun on the next. Implementation has been completed at three of the five pilot areas.

Typical improvements included crosswalk curb extensions and pedestrian refuge islands with tree pits; high-visibility crosswalks; leading pedestrian intervals (which give pedestrians a head start before the parallel vehicles are given a green light, decreasing turn conflicts); and the retiming of pedestrian flashing "Don't Walk" phases for a 3 foot-per-second walking speed, the average speed for pedestrians over 65. On one street without a sidewalk next to a park, excess roadway space was converted into a "floating" parking lane, which protects a flush, painted "sidewalk," providing pedestrian space without capital construction.

The benefits of this research will continue well into the future. For example, the research was expanded to include all pedestrian crashes, using GIS to create a system of priority rankings that accounted for the severity of each. In addition, the concept of the "severity profile" was developed by measuring the likelihood of a fatality or severe injury once a crash has occurred, showing that pedestrians struck mid-block had a much lower risk of death than pedestrians struck while crossing against a signal at an intersection. Crossing with a signal was better, but not at a statistically significant level, than crossing mid-block, a finding that may indicate the overall health of urban streets: high pedestrian activity levels mean low vehicle speeds, greatly reducing the risks to pedestrians. As the project supervisor at DOT states, "Matthew [Roe] has greatly enhanced our analytical abilities through his knowledge of GIS."

Other findings included the identification of factors related to crash density such as neighborhood, land use, and street types. These connections between roadway characteristics, neighborhood characteristics, and crash rates are being investigated further by NYCDOT-funded studies, now being conducted by UTRC member schools NYU and CCNY.

About This Project

Dr. Robert Paaswell (paaswell@utrc2.org) is the Director of the University Transportation Research Center (UTRC) Region II, at City College of City University of New York. Partnering with the New York City Department of Transportation (NYCDOT) and the New York Metropolitan Transportation Council (NYMTC, the Metropolitan Planning Organization for the New York Metropolitan Region), the UTRC sponsored research to investigate the geographic patterns in, and causes of, pedestrian crashes among seniors. The lead researcher was Matthew Roe, a planning student at Columbia University's Graduate School of Architecture, Planning, and Preservation, who was selected to participate in a UTRC/NYMTC program established to honor the memory of three NYMTC employees who died in the September 11 attack on the World Trade Center. Ann Marie Doherty and Seth Berman were the fellowship advisors at NYCDOT. The work was conducted from October 2007 to September 2008, and resulted in the implementation of safety measures at prioritized locations.