Advancing Pedestrian Safety Using Education and Enforcement In Pedestrian Focus Cities and States: North Carolina

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16. Abstract The goal of this effort was to assist selected communities in North Carolina in implementing and evaluating education and enforcement activities. The team worked with communities in the Triangle area of NC to develop a comprehensive, community-wide pedestrian safety program. The program was influenced by an understanding of health behavior theories and best practices and informed by several data sources, including an analysis of pedestrian crash data, site visits, stakeholder input, and pedestrian safety action plans. The intervention used several strategies including radio ads, printed material, paid advertising, community engagement, earned media, and training of law enforcement officers to build their level of effectiveness in the project. Program evaluation included multiple measures, including tracking program implementation records, self-reporting by law enforcement regarding their knowledge, attitudes, and capacity, and driver yielding behaviors. Results identified significant use of paid media to spread pedestrian safety messages and large amounts of positive earned media coverage. The officer training course resulted in significant improvements in knowledge, self-reported behaviors, and capacity to perform enforcement operations to support the campaign. While first-year enforcement operations were noteworthy, more effort is needed to maximize the visibility of the enforcement and plan more routine, sustained efforts throughout the region. Driver yielding behaviors varied by location but significant changes from the pre-enforcement period to the post-enforcement period were not observed in the first-year time frame. The exception was at sites where law enforcement was at its highest intensity. Yielding rates were associated with site characteristics such as crossing placement and speed limits, and may be affected by seasonal trends. Lessons learned on program development and deliveries are provided.		
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Overview

This project was one of four cooperative agreement awards made by the National Highway Traffic Safety Administration to promote pedestrian safety education and enforcement programs in pedestrian safety focus cities/States. As devised by the Federal Highway Administration, cities were identified as pedestrian focus cities if they had more than 20 average annual pedestrian fatalities or a pedestrian fatality rate greater than 2.33 per 100,000 population. States with a focus city were automatically identified as focus States (FHWA, 2012).

North Carolina was one of four NHTSA cooperative agreement recipients. The remaining three recipients included:

- Florida Department of Transportation;
- New Mexico Department of Transportation; and the
- City of Chicago.

Both NHTSA and FHWA believe in a "comprehensive approach" to pedestrian safety to reduce pedestrian crashes, injuries, and fatalities. Therefore, the funding of these agreements was to complement existing or planned pedestrian engineering treatments to improve infrastructure over the course of three or four years.

Each cooperative agreement recipient was funded by NHTSA to include three main elements:

1. A developed implementation plan for education and enforcement to enhance or improve pedestrian safety with a comprehensive approach. The intervention would be designed for easy implementation and replication in other cities or States;
2. Use of community pedestrian safety data as a targeting tool to implement and deploy education and enforcement in conjunction with infrastructure changes, which would be part of a pedestrian safety action plan; and
3. A report of the education and enforcement activities planned and implemented, including outcome and process measures, and a summary of lessons learned and recommendations.

Each project provided a separate report. The following represents a final report from North Carolina.

Background

In the United States and North Carolina, pedestrian deaths accounted for 14 percent and 15 percent (respectively) of all traffic-related motor vehicle traffic fatalities. According to the latest data available from NHTSA (2014), in 2012 there were 4,743 pedestrians killed in motor vehicle crashes in the United States. An additional 76,000 pedestrians were estimated to have been injured.

In North Carolina, there were 2,997 pedestrian-involved motor vehicle crashes in 2012, resulting in 188 pedestrian deaths and 215 additional serious injuries (UNC, 2012). The geographic focus of this study, the Triangle region of North Carolina, has been identified as a particularly high-risk region of the country and the State. Based on a special report done In 2011, the Raleigh-Cary region had the 13th highest pedestrian danger index (a measure of total pedestrian fatalities, fatalities per capita, and walking rates) out of the 52 metropolitan areas in the United States with over 1 million people (Ernst, 2011).

In the past two decades, the magnitude of the pedestrian crash problem coupled with a growing awareness of the health benefits of walking (among other co-benefits) has given rise to a number of interventions to improve pedestrian safety. While the number of pedestrian safety programs is growing, more information is needed to guide the development of such programs, document how the programs are implemented, and provide evidence of the effectiveness of various program activities.

Project Goals and Activities

The overall goal of this project was to assist selected communities within North Carolina to implement and evaluate the education and enforcement activities in their established or draft pedestrian safety plans. To accomplish this goal, the project team from the UNC Highway Safety Research Center (UNC-HSRC) sought to:

1. Review the literature and identify promising practices in conducting community-based pedestrian safety programs and theoretical evidence to support program development;
2. Perform crash-based analyses to identify local pedestrian safety concerns and target populations and geographic areas of interest;
3. Work with local partners to develop and implement appropriate, evidence-based pedestrian safety programs targeting significant numbers of pedestrians and drivers in the selected jurisdictions;
4. Provide technical assistance and training to support the program implementation;
5. Coordinate with local agencies to collect, manage, and analyze data related to the intervention;
6. Evaluate the program using both process and outcome measures; and
7. Present lessons learned and models for other communities across North Carolina and the United States.

The intent of this report is to document the development of the intervention, its implementation, and the results based on the first year evaluation.

Project Focus Areas

When the project began in October 2009, the UNC-HSRC team initially selected three communities to work with to implement pedestrian safety plans: Charlotte, Durham, and Wilson. This selection was based on an examination of NC pedestrian crashes that identified Charlotte (the largest city in the State) as having one of the highest pedestrian crash rates in the State. Similarly, Durham evidenced high rates of crashes among child pedestrians and local leadership expressed strong interest in the effort. Wilson also had a highly motivated local champion and was selected to represent a smaller NC town (population about 50,000).

Challenges and Opportunities

In any project, efforts are made to plan, garner buy-in and interest and go in a certain direction; and like any project, challenges arise and change in direction have to be made. For example, over the four years of the project, many factors affected the ability of the selected communities to participate in the study, and the project focus area evolved. Charlotte's Department of Transportation, for example, experienced a change in leadership and priorities that resulted in its draft pedestrian plan being stalled for approval and the focus of work shifted to environmental measures such as sidewalk and crossing improvements and the implementation of its Complete Streets policy, so limited staff resources could be devoted to build a comprehensive education and enforcement program. Also, the Charlotte Police Department structure had recently changed, dismantling the Traffic Safety Unit, so there was limited police capacity at the time to support the needed project activities. Similarly, turnover among Wilson's planning and police department staff—including key individuals who had largely been leading the effort—and a lack of community resources to implement its pedestrian safety plans during the project timeframe led to a reassessment of project partners and reallocation of resources.

At the same time, opportunities arose for collaboration with communities in the Triangle area (including Orange, Durham, and Wake County municipalities). In early 2011, a survey conducted by the North Carolina Department of Transportation (NCDOT) showed that education and enforcement was a high priority among stakeholders, and NCDOT committed to supporting a pilot program in the Triangle region, building on the work that was already being performed in Durham as part of this effort. As a result, since October 2011, municipalities in Orange, Durham, and Wake Counties have been active partners in the project, as well as NCDOT and other regional agencies. After the implementation of a comprehensive pedestrian education and enforcement program in 2012—called *Watch for Me NC*—additional partners joined in the planning of the 2013 program. These additional partners included the Wake County communities of Apex, Cary, Fuquay-Varina, Knightdale, Morrisville, and Wake Forest. Within these municipalities, eight area universities also participated in the project (described later).

This report largely details the 2012 efforts (and 2013 plans) in the Triangle region to conduct the *Watch for Me NC* program. However, the UNC-HSRC project team continued providing a base level of technical assistance and support to Wilson and Charlotte, and processes to develop programs in these communities (and progress or outcomes reported by them) are referenced where information was available. See Figure 1 for a map of the project focus areas.

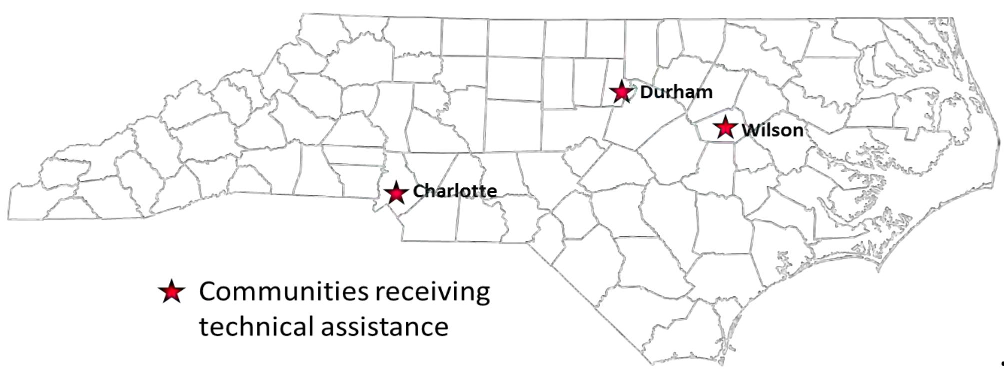

Figure 1. Map of communities initially selected for program

Figure 2. ***Watch for Me*** **program partners for 2012 and 2013**

Literature Review

While numerous pedestrian safety interventions have been implemented in the United States, there are few published reports evaluating their effectiveness or providing guidance on implementation development. A literature search was therefore performed to gather examples of community-based pedestrian safety interventions targeting broad populations with both education and enforcement measures, similar to what was developed for the *Watch for Me NC* intervention.

Table 1 summarizes the findings of the literature reviewed that met these inclusion criteria. Most studies examined either attitude/awareness measures or behavioral outcomes such as driver yielding or pedestrian crossing behavior. Two longer-term studies also examined changes in crash frequencies or rates over time (Datta et al., 2011; Zegeer et al., 2008). While the nature of the interventions and the intensity of their implementation vary widely, most studies found at least modest improvements in awareness and safety behaviors, or a reduction in pedestrian crashes or crash rates. The available research supports the hypothesis that community-based interventions can effectively reduce the incidence of pedestrian crashes and injuries, depending on the complexity and intensity of the intervention strategies used.

Table 1. Summary of evaluations of community-based pedestrian interventions.

Study	Location	Intervention Timeframe	Intervention Measures	Study Design	Outcome Measures and Analysis Method	Results
StreetSmart (2012)	Washington, DC	2000-Present; Evaluation covers only 2011-2012 program	• Radio ads • Outdoor ads • TV and digital media • Kickoff event • Law enforcement	Surveys conducted before and after intervention; no control groups	Knowledge, awareness, and attitudes among drivers and pedestrians; no methods documented	Increase (from 32 to 42%) in awareness of enforcement efforts; 7% increase in awareness of the campaign
Huang & Petritsch (2006)	Missoula, MT	2004-2005	• Radio ads • Outdoor ads • TV and digital media • Law enforcement	Before and after intervention observation of behaviors and survey; no control groups/sites	Chi-square test to measure differences in knowledge, awareness, and driver and pedestrian behaviors (use of signal and conflicts at crossings)	Pedestrians and motorists reported more awareness/recall of the program in the after period; few conflicts were observed and pedestrian behaviors (looking before crossing) showed modest improvements
Huang &Petritsch (2006)	Savannah, GA	Intermittent activity between 2005-2006	• TV news features • Crosswalk awareness actions • Walk to School Day	Before and after intervention observation of behaviors and survey; no control groups/sites	Chi-square test to measure differences in knowledge, awareness, and driver and pedestrian behaviors (use of signal and conflicts at crossings)	No significant changes were detected in pedestrian or driver awareness/recall of the program; no improvements in behaviors were observed; intensity of the intervention was extremely low
Huang & Petritsch (2006)	Washington, DC	2003	• Radio ads • Transit ads • TV and print coverage • Kickoff event • Law enforcement	Before and after intervention observation of behaviors and survey; no control groups/sites	Chi-square test to measure differences in knowledge, awareness, and driver and pedestrian behaviors (use of signal and conflicts at crossings)	Pedestrian awareness/recall of the program actually decreased significantly in the after-period; driver recall did not significantly change; pedestrian behavior (start crossing during WALK phase) saw modest increase but changes in driver behavior were not detected
Nee & Hallenbeck (2003)	Shoreline, WA	1999-2003	• Environmental changes • Law enforcement • Public information campaign	Before and 4-phase after observation of behaviors at two sites; no control sites	Chi-square test to measure differences in behaviors (pedestrian crossing behaviors and driver yielding) before and after intervention	Improved pedestrian behaviors (use of refuge island) and driver yielding from 0% to 17-70%, likely due to the significant package of environmental improvements and pedestrian crossing facilities. Driver compliance increased only on one leg of one intersection after the enforcement portion of the intervention; enforcement intensity was limited.

Study	Location	Intervention Timeframe	Intervention Measures	Study Design	Outcome Measures and Analysis Method	Results
Van Houten & Malenfant (2004)	Miami Beach, FL	2-week intervention and 1-year maintenance period (year not known)	• Press releases and earned media (TV and print) • Law enforcement	Repeated measure of driver behaviors before, during, and after intervention; 8 treated and 12 non-treated sites	Analysis method not described; raw percentages of driver yielding at each site and measurement wave were provided	Driver yielding went from 3.3% and 18.2% at baseline to 27% and 33.1% at the two treated corridors, respectively. Yielding at the untreated sites rose from 20.5% to 32.1%, which authors attribute to a spill-over effect of the high-visibility education component.
Van Houten, Malenfant, Huitema, & Blomberg (2013)	Gainesville, FL	2010-2011	• High-visibility law enforcement • Media coverage • Paid media • Signage • Environmental changes	Randomized enforcement to 6 of 12 sites; repeated measures of driver and pedestrian behaviors	Time-series regression models of changes in observed driver and pedestrian behavior at 12 sites	Yielding for staged crossings rose from 31.5% to 62%, and yielding for natural crossings rose from 45.4% to 82.7%. Program effects generalized to crosswalks not targeted for enforcement and were inversely proportional to the distance from the treated sites.
Datta et al. (2010)	Detroit, MI	2008-2009	• Environmental changes • Development of action plan • Law enforcement • Education and public outreach	Repeated measure of child pedestrian and adult pedestrian behaviors before, during, and after intervention; pre/post-test of child pedestrian knowledge; no control groups used	Two sample z-test of proportions to determine the statistical significance of any changes in observed child behaviors or pretest/ post-test knowledge; two sample tests of proportions to examine changes in pedestrian behavior before, during, and after enforcement, using Bonferroni Multiple Comparison Correction	Child pedestrian violation rate decreased from 34.79% to 30.35%; increases in the correct response were observed at all schools; pedestrian violations (walking outside the crosswalk or against the signal) reduced from 17 to 27% immediately after the campaign, with sustained reductions of 8 to 10% several weeks after active enforcement ceased
Zegeer et al. (2008)	Miami-Dade County, FL	1999-2003	• 16 specific education, enforcement, and engineering countermeasures targeting children, adults, and seniors	Before-after evaluation of pedestrian crash rates, using three comparison groups	Multivariate intervention ARIMA time-series analysis, along with nonparametric U tests were used to test changes in pedestrian crash rates over time	County-wide crash rates were reduced between 8.5% and 13.3%, depending on the comparison group used to adjust the model

In addition to examining literature evaluating specific pedestrian safety programs, we reviewed the broader public health literature for models and evidence regarding health behavior change, which can provide a theoretical foundation for such program development. Table 2 provides a brief summary of the theoretical underpinnings that were considered relevant to the development of a pedestrian safety program. Details of how the theories were considered and incorporated into tangible elements of the pedestrian intervention are provided in the next section.

Table 2. Health behavior models relevant to pedestrian safety interventions.

Theory or Model	Description
Behavioral model of pedestrian crashes (Snyder & Knoblauch, 1971)	The critical behaviors in the sequence leading to or avoiding a crash are (1) search, (2) detection, (3) evaluation, (4) decision, (5) action, (6) vehicle response. Pedestrian or bicycle safety interventions operating under this model can reduce or prevent crashes by (1) reducing human error in performing the series of behaviors above, or (2) by changing the built environment so that a potential crash is less likely or is easier to see and avoid.
Socio-Ecologic Framework (Northridge, 2003; Sallis, Owen, & Fisher, 2008; Sallis et al., 2006)	Individual behaviors are influenced by individual characteristics, interpersonal factors, the environment, and broader socio-cultural factors. Interaction between these factors also occurs. The practical implication is that multi-level interventions are likely to be the most effective in changing health behavior.
Stages of Change Theory or Transtheoretical Model (TTT) (Prochaska, DiClemente, Velicer, & Rossi, 1993)	Individuals reside on a continuum of motivation and readiness for behavior change: (1) Pre-contemplation, (2) Contemplation, (3) Preparation, (4) Action, (5) Maintenance, and (6) Termination. The goal of pedestrian safety interventions based on the TTT model is to move people to the next stage of change.
Health Belief Model (Champion & Skinner, 2008)	Personal behavior change is influenced by the perceived susceptibility and severity of a health risk, the perceived benefits and barriers to taking action, and internal or external "cues to action" that prompt one to take action. Interventions build on this model by aiming to educate the public about the magnitude, risk, and cost of the problem.
Deterrence Theory (Ross, 1982)	This theory states that people are more likely to avoid illegal behaviors when they believe that punishment for the behavior is certain and will be both swift and severe. Many traffic safety programs are predicated on this theory.
Social Learning Theory (Bandura, 1986)	Behaviors are learned, in part, by observing others but also by practicing the behavior and receiving reinforcement to continue the behavior. Under this theory, for example, drivers could learn to yield to pedestrians by observing other drivers model that behavior in an environment that reinforces it.
Diffusion of Innovation (Rogers, 1995)	The diffusion of innovations is the spread of adoption of new behaviors through a population. To appeal to early adopters, efforts to promote a new health behavior would position it as innovative. On the other hand, efforts to appeal to the late-comers would position the behavior as mainstream.

Intervention Development

Supported by the evidence gleaned from the literature review, the project team sought to work with local communities to develop a comprehensive, community-wide pedestrian safety program influenced by health behavior change models or theories referenced in Table 2. The overall program was based on several principles, including:

Multi-level: The intervention includes education (both direct and passive outreach), enforcement of laws, partnership development among municipal and police staff, and policy-change (such as provision of funding for routine education and enforcement support), which are coupled with on-going environmental improvements that are taking place independently of the intervention itself. This approach embodies a socio-ecological framework aiming at broader system structures that affect individual and group behaviors.

Health-risk driven: Interventions that target specific and defined behaviors and health risks are considered superior to programs that advocate that road users "be safe" or "street smart" or provide other vague messages. The *Watch for Me NC* program developed a series of specific messages targeted at behaviors identified as factors associated with common crashes based on an evaluation of five years of crash data in the Triangle. For example, a large portion of crashes occurred at intersections and involved drivers making turning maneuvers. Messages to pedestrians and to drivers emphasized the risk of crashes at intersections and advised them to scan in all directions for other road users before making their way through an intersection. An effort to increase road user scanning and detection of other modes is consistent with the Snyder and Knoblaugh (1971) behavioral model of pedestrian crashes.

Deterrence-based: The deterrence theory was considered in the development of intervention messages, some of which emphasized the legal consequence of failure to yield to pedestrians. Interviews with multiple press outlets emphasized the extensive enforcement outreach and the potential for tickets and warnings to those failing to obey the laws. Officers were also instructed to stress their city-wide presence and the likelihood of stopping (and punishing) errant drivers and pedestrians. They were provided with template press releases and other materials to help them highlight their enforcement efforts and summarize citation data.

Leverages social learning and diffusion of innovation: Programs with elements that seek to make desired behaviors normative and do not reinforce undesired behaviors have been shown to be effective. Based on driver yielding data collected from July 2012 to March 2013 at 12 high-crash sites in Raleigh and Durham, yielding to pedestrians in marked crosswalks is not yet a normative behavior. On average, drivers yielded to pedestrians approximately 20 percent of the time. It is anticipated that as yielding (and other safe behaviors) improve, more normative elements can be used and social learning principles can help diffuse the behaviors to other road users as they begin to perceive the behaviors as the norm.

In addition to the above principles, the program development was informed by several data sources, described in the following sections.

Pedestrian Crash Analysis

The UNC-HSRC team performed an analysis of 5 years of pedestrian crash data (2006-2010 or 2007-2011) in several communities, including Wilson, Durham, Charlotte, and Raleigh. Examples of the detailed crash analyses performed in the two largest communities, Charlotte and Raleigh, are provided in Appendix A and B.

On average, more than 2,400 pedestrians were struck by motor vehicles in North Carolina each year between 2006 and 2010. Within the Triangle focus area, men account for 59 percent of all crash victims. In terms of involvement by race, African-Americans comprise 46 percent of crash victims while Whites account for 39 percent. Examining crash involvement and ethnicity, Hispanics represent 11 percent of crash victims. Young adults 20 to 29 years old represent the largest block of pedestrian crash victims, accounting for 23 percent of crashes. Crashes were distributed nearly evenly across the seasons, with a slight uptick in the fall months: 26 percent occurred in spring, 20 percent in summer, 31 percent in fall, and 23 percent in winter. More than three-quarters (76 percent) of crashes happen during the work week (Monday to Friday).

Crashes in the Triangle focus region occurred most prominently in three areas.

- One in four crashes occurred when a car was turning at an intersection or driveway.
- Nearly one in three crashes occurred in parking lots.
- And more than half of all crashes occurred near bus stops or on roads with bus routes.

The crashes were crash-typed using the PBCAT system, see: www.pedbikeinfo.org/pbcat_us/index.cfm, which identified the primary pre-crash action. Based on a review of crash narratives and the analysis of PBCAT crash-typing, the primary crash types or pre-crash actions involved:

- Drivers failing to yield to pedestrians,
- Drivers and pedestrians failing to look or being distracted, and
- Pedestrians darting out into the roadway.

These analyses were used to identify specific crash “hot spots” in each community that merited further site visits to observe behaviors and potential infrastructure concerns. The analysis was also used to identify and/or justify potential sites and corridors for targeted law enforcement, and crash data were provided to the local police departments for consideration. Finally, the crash data helped guide elements of the communication strategy. For example, through the crash analysis we determined that August was the month in which the highest frequency of crashes occurred in the year, and thus the program was set to launch in August to address this peak-crash season. Similarly, as a large proportion of crashes were found to occur from 3 to 6 p.m., the radio time purchased focused on peak afternoon commute times. Upon the observation that pedestrian crash patterns overlapped significantly with high-ridership transit routes, the project team began efforts to place safety messages in and around buses. Thus, an evaluation of past pedestrian crashes provided valuable information in supporting the intervention development.

Site Visits

Following the comprehensive crash analysis, project team members planned site visits to those locations with a history of pedestrian crashes. Kernel density maps showing clusters of pedestrian crashes were used to narrow the list of potential target sites (see example in Figure 3).

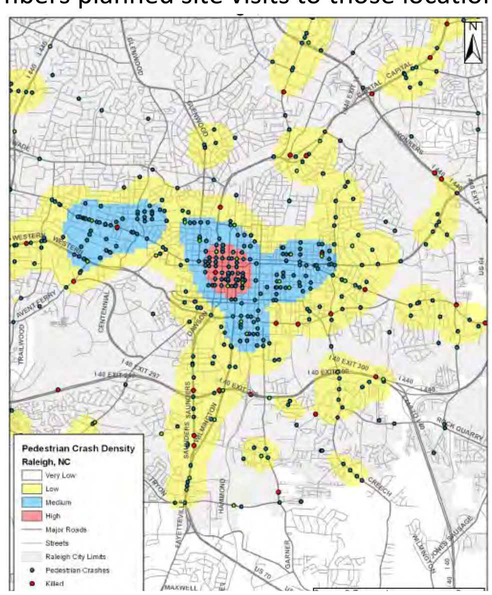

Figure 3. Kernel density map of pedestrian crashes in Raleigh, NC

Focusing on these “hot spots,” site visits were planned to visit high crash sites over the course of one to two days. In addition to these sites, project staff accumulated lists of priority locations through meetings with local stakeholder groups consisting of city planning staff, police, hospital employees, and representatives from local school boards. The individual sites included in the visits were typically high crash intersections or short (0.5 to 1.0 mile) segments. Equipped with crash maps and key information from police crash reports (demographic information, roadway conditions, crash narratives), project staff visited each site to record observations related to pedestrian and motorist behaviors, environmental characteristics, destinations, and other factors. Photographs were taken to document these observations, which were compiled with crash histories and notes into site visit reports. These detailed notes, available in Appendix C, provided an additional source of information for developing action plans to address safety issues in these cities.

Stakeholder Input

In order to gain a local perspective on pedestrian safety issues in these communities and identify key organizations within each municipality, it was critical to engage stake-holders. Multiple in-person meetings with various stakeholders were held, both in the beginning stages of planning the program and regularly throughout the year. Stakeholders included a range of partners at local, regional, and State levels, including:

- Capital Area Metropolitan Planning Organization,
- City of Durham (Planning, Engineering, and Police Departments),
- City of Raleigh (Planning, Transit, and Police Departments),
- Duke University (Transit Demand Management and Police Department),
- Durham Chapel Hill Carrboro Metropolitan Planning Organization,
- North Carolina Central University (Police Department),
- North Carolina Department of Transportation, Division of Bicycle and Pedestrians,
- North Carolina State University (Police Department and ITRE staff),
- St. Augustine's College (Police Department),
- Town of Carrboro (Planning, Communications, and Police Departments), and
- Town of Chapel Hill (Planning, Engineering, and Police Departments).

These stakeholders often represented and coordinated closely with other community groups, including municipal Bicycle and Pedestrian Advisory Councils (BPACs), local advocacy groups, transit services, parks and rec departments, city councils, business districts, and others.

A sub-set of this group, including a representative from each municipality, NCDOT, and the two regional metropolitan planning organizations (MPOs), was defined as a "steering committee" and held monthly meetings throughout the year. This group decided upon the name of the campaign, provided input on logo and material design, and helped inform the overall campaign strategy and identify opportunities for community engagement. Input from the steering committee and other stakeholders were used to identify populations of interest and to develop communication strategies to target specific groups, such as transit riders. Stakeholder input was also used to help conceptualize and test the messages to be developed for the public outreach components of the project. Stakeholders helped identify potential law enforcement sites and opportunities for outreach and engagement with the broader community. In most cases, the stakeholders took the lead in implementing the intervention, including performing the enforcement operations and distributing the educational material to disseminate pedestrian safety messages to the broader public.

Safety Action Plans

The site visit findings, crash analysis findings, and meetings with local stakeholders led to the development of targeted pedestrian safety action plans, developed by UNC-HSRC staff. In some cases, elements of these plans had already been developed by the local agencies. However, UNC-HSRC staff formalized the plans using inputs such as data analysis findings, field reviews, and stakeholder input to create detailed action plans specifically centered on education and enforcement interventions. These are provided in Appendix D. The information in these plans ultimately helped support the development of the *Watch for Me NC* intervention, a comprehensive education and enforcement effort aimed at addressing the needs and issues outlined in these plans. The following section describes some of the elements of this intervention.

Intervention Products

The intervention development resulted in several communication and training products, included in this section. All media and messaging materials can be found at the project Web site: www.watchformeNC.org. In general, messages were developed internally by NCDOT's communication staff, in coordination with the input received from HSRC and the steering committee.

Campaign Materials and Media

The campaign sought to use paid media and advertisements, such as radio ads, bumper stickers, and brochures, to raise awareness of pedestrian safety concerns and to encourage road users to drive and walk more safely. To maximize the benefit of those materials, the campaign crafted messages to specifically target behaviors most commonly associated with pedestrian crashes, as reflected in the Pedestrian Crash Analysis. For example, one series of ads encouraged drivers to look for pedestrians before turning at an intersection, where one in four crashes occur, while another series of ads encouraged pedestrians to look out for cars in parking lots, where a third of crashes happen.

Radio ads, as well as posters and brochures, were produced in English and Spanish to reach the two largest populations represented in the crash data. Paid media were disseminated through a variety of outlets, depending on the format of the media, though emphasis was placed on locating media in crash-heavy areas. For example, as more than half of all crashes occur near bus stops or along bus routes, the campaign placed ads and messaging both inside and outside of area buses. Pedestrian-focused safety messages were placed inside buses while driver-focused messages placed on bus exteriors.

Table 3 provides a description of the media and a summary of its placement and duration.

Table 3. Summary of paid media campaign materials.

Item Description	Placement and Time Frame	Example
Transit Ads: External Ads of various sizes placed on 2 regional bus systems on 31 buses. Had a series of 2 specific messages aimed at safe driving behaviors.	**Capital Area Transit (CAT) Buses:** 20 ads; run August 6-November 5 **Chapel Hill Transit**: 11 ads; run August 1-November 5	
Transit Ads: Internal 11 x 17 inch ads placed on 5 regional bus systems on 270 buses. Had a series of 6 specific messages aimed at safe pedestrian behaviors.	**CAT Buses:** 160 ads on 80 buses; 45 day placement starting August 6. **R-Line Interiors**: 6 ads on 3 buses; run August 6-November 5. **DATA Durham Buses:** 54 ads on 50 DATA buses and 4 Bull City Circulator Buses; run August 6-November 5. **Chapel Hill Transit**: 98 ads; run August 1-November 5. **NCSU Wolfline:** 35 ads; run for Fall semester.	
Bumper Stickers One standard-size bumper sticker with message aimed at drivers.	13,700 bumper stickers distributed to four city planning departments (Raleigh, Durham, Chapel Hill, and Carrboro) and four universities for distribution in Fall 2012.	

Item Description	Placement and Time Frame	Example
Radio Ads 15-second ads with safety messages aimed at drivers; versions in English and Spanish.	 1,168 plays with Curtis Media Group - 160 plays on 7 stations (6 English and 1 Spanish). An additional 24 plays on WRAL and 24 on WFXCM for a total of 1,192 plays. Run from July 30 to August 26, 2012.	 Listen to ads on campaign Web site: www.watchformenc.org/media/2012-campaign-media-coverage-and-press-releases/
Gas Tank Toppers Consisted of gas station pump toppers, billboards, and window clings.	 Placed at 16 gas stations in Durham and 28 gas stations in Raleigh, near high crash intersections and corridors	 
Brochures Tri-fold 8 ½ in by 11 in document with laws and safety tips aimed at drivers and pedestrians	 100,000 printed in English and 5,000 printed in Spanish. 2K each provided to four universities; 6K to City of Durham; 8K to City of Raleigh; 42K to police; others distributed to MPOs, libraries, community centers, and local businesses	

Item Description	Placement and Time Frame	Example
Banners 3 ft by 6 ft or 3 ft by 8 ft outdoor banners with messages aimed at drivers.	Placed in Carrboro at two high-volume intersections and in Durham at City Hall, and on St. Augustine University's campus.	
Posters 11 by 17 inch posters with a series of six messages aimed at pedestrians and six messages aimed at drivers	Placed in businesses, community centers, libraries, campuses, and other public locations throughout participating communities.	

Web site

To distribute information to a wide audience, inform the public and media, and track the development of the project, the team created a Web site, www.watchformenc.org, (see Figure 2). The site serves as a central information point for the campaign which continues to be active beyond the period of performance for the NHTSA project. It consists of four main sub-pages: About the Campaign, Crash Facts, Safety Resources, and Media. The site provides relevant data regarding crashes in the area as well as tips and information for being a safer driver and pedestrian. Furthermore, the site provides a single repository for all campaign materials so that all partner organizations or other interested groups, such as advocates or neighborhood associations, may access them as needed. Finally, the site also catalogs much of the media coverage of the campaign and lists contacts for the campaign. The site is regularly updated by UNC-HSRC staff.

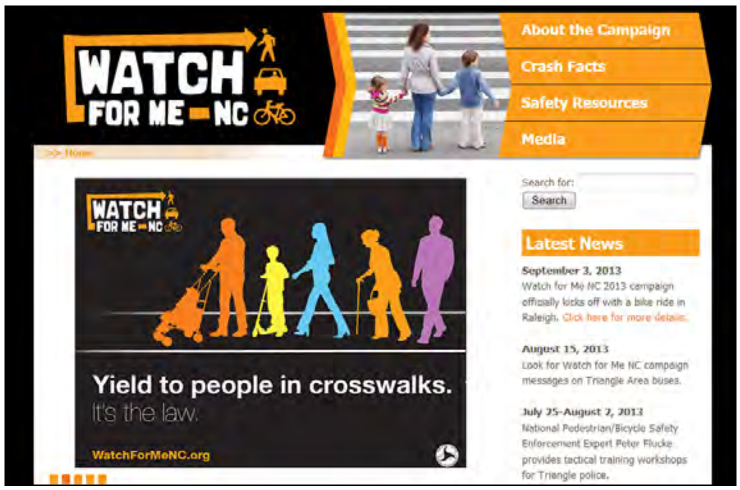

Figure 4. *Watch for Me NC* project Web site home page.

Law Enforcement Training and Support

Law enforcement officers rarely if ever receive training on pedestrian safety laws or how to enforce laws that impact the safety of pedestrians. To ensure that all officers were hearing the same thing and following the same procedure for pedestrian enforcement activities, it was necessary to provide training to local law enforcement agencies.

Training was provided to 43 officers (who either volunteered or were instructed to attend) from among 10 agencies in August 2012 to prepare them for performing pedestrian safety operations as part of the *Watch for Me NC* campaign. Peter Flucke of WE BIKE, etc., LLC [sic] was sub-contracted to lead the one-day course. The course involved classroom education regarding relevant North Carolina laws and promising practices in conducting enforcement, as well as field exercises in conducting targeted operations aimed at improving driver yielding at crosswalks (see Figure 3).

Figure 5. Law enforcement field training exercises.

Changes in officer attitudes and sense of capacity as a result of the training course are described in the Evaluation Results section to follow. Officers were provided with copies of the brochure to hand out during routine or targeted enforcement operations, as well as a template operations plan to help them coordinate and perform consistent and safe operations (see Appendix E). In addition to providing training and materials to the officers, NCDOT wrote an open letter to the district court judges and prosecutors, signed by *Watch for Me NC* partners, to alert them to the program activities, goals, and a request for their support of the law officers engaged in enforcement activities.

Evaluation Methods and Results

To comprehensively evaluate the *Watch for Me NC* program, the project team examined multiple measures, including program implementation records, self-reports from law enforcement officers regarding their knowledge, attitudes, and capacity, and driver yielding behaviors.

Program Implementation Measures, Methods, and Results

Program implementation records were used to document the intensity of the *Watch for Me NC* program. To collect such information, the project team developed paper forms and web-based surveys and distributed these to community partners to help track and document activities. Data was regularly requested from partner groups during the program through direct emails, calls, and in-person meetings. See Table 4 for a summary of the program implementation records available.

Table 4. Key *Watch for Me NC* program implementation measures.

Domain	Variable(s) Available
Paid Media	• Number of print material (posters, banners, bumper stickers, etc.) produced and disseminated by NCDOT and duration of exposure time • Total cost of all printed material and print and radio ad space purchased and cost/capita reached • Number of times ads were aired, radio station sources, and estimated number of impressions
Earned Media	• Press release dates • Media coverage source and publication date • Media coverage type, length, and slant • Number of impressions (e.g., media circulation) per media coverage • Ad equivalency (value of earned media) per media coverage
Website Usage	• Website visits • Unique Web site visitors • Page views • Percent new versus returning visitors • Visit frequency and duration
Law Enforcement Activities	• Count of safety operations run by agency • Count and type of warnings and citations administered per operation • Count of enforcement officer hours spent per operation, by agency • Count of safety materials disseminated, by agency
Community Engagement Activities	• List of partner agencies • Brief description of community engagement strategies used by partner agencies, including type of event, population reached, frequency, staff involvement, etc.

Paid Media

NCDOT and their media purchasing contractor, MSA Marketing, Inc., provided information regarding paid media contracting and printing services used from May 2012 to January 2013. A summary of the media purchased, including the amounts, locations distributed, and timeframe of the ad placement is provided in Table 3.

As mentioned, the radio ads aired almost 1,200 times on nine stations during peak commute times. Eighty percent of the ads ran during am and p.m. weekday drive times from 6-10 a.m. and 3-7 p.m.; another 20 percent ran during any weekday time from 6 a.m. to 7 p.m. The radio ads were estimated by MSA Marketing, Inc. to have reached 3,866,400 residents 18 to 54 years old. It was projected that 61 percent of adults should hear the message a total of 7 times. The purchased radio media package included two bonus on-air exposure times on three stations (WBBB, WPTF, and WRAL-FM Bill and Lynda Morning Show). In these, Greer Beaty, the NCDOT communications director at the time, performed on-air interviews on September 28 and October 1, 2012, to discuss the campaign and highlight the importance of pedestrian safety.

Earned Media

Earned media consisted of TV, radio, and print news coverage of the program that was not purchased. The project team began tracking news articles in May 2012, and has routinely searched Lexis-Nexis archives and Google News Alerts from the period of May 2012 to January 2014.

The campaign generated nearly two dozen stories in local media, including a front-page story in the Raleigh News & Observer newspaper (see Figure 4) and a television news story lasting more than 2.5 minutes on WRAL TV, the area’s largest station. The campaign was able to leverage multiple events into news stories, with the law enforcement education, law enforcement action and the concluding event featuring NHTSA's then Administrator David Strickland generating three rounds of coverage. Each round of coverage reached approximately half a million readers/television viewers. The advertising value equivalency (AVE) of all news coverage exceeded $15,000. AVE reflects the approximate cost to purchase an advertisement of equal size or duration and placed in a similar location in the newspaper or timeslot during the television news broadcast to the news story produced. The figure is calculated based on posted newspaper rate cards and rates charged by television stations during fall 2012.

Figure 6. Front-page news coverage of *Watch for Me NC* safety campaign.

Much of the news coverage was positive toward the campaign, highlighting the crash statistics of the area and what efforts were being taken to reduce those numbers through better education of drivers and pedestrians as well as enhanced enforcement of existing pedestrian safety laws. Commentary on the news outlets' Web sites also was largely positive, with many readers noting the need for drivers and pedestrians in the area to be safer and praising the goals of the campaign.

Website Usage

Data for the *Watch for Me NC* Web site usage during the relevant time period was extracted from Google Analytics. Due to an error in the plugin compatibility with the Web site, data from November 17, 2012, to January 10, 2013, is not available. Still, more than 4,000 unique users have visited the site, viewing more than 10,600 pages, and more than 86 percent of visitors were new to the site. The Media and Safety Resources pages were the most frequently visited, with 1,570 and 1,157 page views respectively. Traffic spiked in early October 2012, when area law enforcement agencies began their enforcement efforts. Site traffic continues to grow.

Law Enforcement Pedestrian Safety Activities

Law enforcement activities were tracked through direct interaction with law enforcement agency staff. Activities targeted both pedestrian crossing behaviors and drivers yielding behaviors to pedestrians crossing the road. Appendix F includes the program implementation data collection forms sent to police. While most staff were responsive to requests for information, certain police departments had multiple units performing operations and not all were well-coordinated or planned in advance. Thus, staff may have under-reported the true amount of enforcement activities taking place within their respective jurisdictions.

From October 2012 to March 2013, 6 police agencies reported conducting 37 operations, resulting in more than 460 warnings and 172 citations. Of these, drivers received 73 percent of the warnings and 98 percent of the citations. More than 40 hours were spent by over 150 officers, all without receiving over-time pay. Table 5 provides a breakdown of the enforcement activities by agency.

Table 5. Number of Targeted *Watch for Me NC* Police Operations.

Location	No. of Events	No. of Officers	Total Event Hours	Failure to Yield to Pedestrians			Pedestrian Crossing Violations		Brochures Distributed
				Oral Warning	*Written Warnings*	*Citations*	*Warnings*	*Citations*	
Carrboro	11	33	9.5+	0	14	54	0	0	
Chapel Hill	1	unk	unk	19	0	36	117	4	
Durham Sub-total	*18*	*70*	*27.75*	*98*	*31*	*72*	*5*	*0*	*4,588*
DPD	9	28+	3+	1	4	22	5	0	2,850
Duke	6	18	5.75	91	0	0	0	0	1,700
NCCU	5	8	17	6	27	1	0	0	
NCCU and DPD	1	16	2	0	0	49	0	0	38
Raleigh	4	48	4.5+	38	138	6	0	0	200
Grand Total	**37**	**151+**	**41.75+**	**155**	**183**	**168**	**122**	**4**	**4,788**

These first-year figures are noteworthy, particularly since for every agency (with the exception of Carrboro PD), it was the first time to ever conduct pedestrian-focused operations. However, the overall enforcement intensity per capita was relatively low. Given that the population of the Triangle area (Orange, Durham, and Wake County) is estimated to be 1,369,733, the total direct reach of the enforcement was less than half of 1 percent of the area population. The majority of enforcement operations occurred in October and November, during the peak of the campaign, in step with the press event and other outreach efforts. Some additional enforcement occurred in late February and early March at two Durham locations. In addition, Carrboro PD continued routine enforcement at several areas, as they have done for the past few years. However, there was no routine follow-up or repeat enforcement at the sites selected for evaluation. This is discussed more in the evaluation section that follows.

Community Engagement Activities

Regarding community engagement activities, in Year 1 four partner agencies provided summaries of activities in monthly meetings, but no formal data collection form was used. Efforts were made to reach out to a variety of local stakeholders, including Pedestrian or Transportation Advisory Councils (PACs/TACs), Community Advisory Councils (CACs), transit agencies, city councils, elected officials, school representatives, and other groups through community meetings. Campaign materials were distributed at the NC State Fair as well as other local events, such as Centerfest and Bull City Open Streets events in Durham. See Table 6 for a listing of some of the engagement activities reported by the project partners in the months before, during, and after the program launched in 2012.

Table 6. Summary of community engagement activities reported by partners.

Location	Activity Description	Expected Reach	Timeframe
Raleigh	HSRC staff presented project activities at the Raleigh Urban Design Center lunch seminar series	50 transportation professionals	May 2012
Raleigh	City of Raleigh staff provided pedestrian safety training to Wake County school teachers at PE in-service	80 Wake County PE teachers	July 2012
Raleigh	HSRC, CAMPO, and NCDOT presented the campaign to the multi-modal committee at NCDOT and the full Transportation Board	40 NCDOT executives and key decision-makers	July 2012
Durham	City of Durham and HSRC staff presented the campaign to the Durham BPAC and the Durham TAC	40 advocacy members and 40+ elected officials	July 2012
Raleigh	HSRC, CAMPO, and NCDOT presented to the CAMPO Transportation Advisory Committee and Technical Coordinating Committee (TCC)	80+ local transportation decision-makers and elected officials	July and August 2012
Durham	City of Durham staff presented to the Inter-Neighborhood Council and Partners Against Crime groups	50+ community members	August 2012
Durham	City of Durham planning and police staff posted about the campaign in Durham News article, report to the City Manager, and in a Durham TV episode, City Hall This Week Ep. 161	Durham city staff and local residents (65+ YouTube visits)	October 2012
Web-based	City of Raleigh communications staff included Watch for Me NC campaign safety messages in the Raleigh utility bill	All Raleigh municipal utility customers	October 2012
Web-based	NCDOT filmed an episode for NCDOT Now, a restricted-access news channel for NCDOT employees; additionally aired by 20 cable access stations across the State	Distributed to 10,000 NCDOT employees and sent to cable access stations with a viewership area of 6-7 million people total	Fall 2012
Web-based	Facebook posts made by City of Raleigh staff	250+ members of the Raleigh Bicycle and Pedestrian Advisory Commission FB group	Fall 2012
Web-based	UNC Student Services staff created feature story on UNC-Chapel Hill's home page: www.unc.edu	UNC students and staff	Fall 2012
Raleigh	City of Raleigh planning staff presented safety messages to Citizen Advisory Councils (CACs)	19 CACs	Fall 2012

Law Enforcement Self-Report Measures, Methods, and Results

A pretest-posttest comparative design was used to evaluate the outcome of implementing a training program for law enforcement professionals on pedestrian and bicycle safety. A self-administered questionnaire was designed to measure three key constructs, including: (1) officer knowledge of pedestrian safety issues, (2) attitudes regarding the role of law enforcement to promote pedestrian safety, and (3) resources/capacity to implement the *Watch for Me NC* intervention. Fundamental to the effectiveness of the *Watch for Me NC* intervention is the buy-in of the police officers responsible for implementing the enforcement operations to the full extent possible. A common premise is that officers who are familiar with the law and who have the resources/capacity to enforce the law, coupled with an attitude and sense of efficacy that supports conducting such activities, will be more able to successfully implement the enforcement elements of the program and contribute to the intensity of the intervention. See Appendix G for the questionnaire used.

Forty three law enforcement officers enrolled in the *Watch for Me NC* one-day training course and were provided the questionnaire before and after the course was delivered in August 2012. The course covered common pedestrian crashes and causes, NC laws relating to motorist and pedestrian behaviors, and effective practices for law enforcement to reinforce safe behaviors and implement tactical operations aimed at improving compliance with laws, including yielding to pedestrians in crosswalks. All 43 completed the pre-test; 41 of the 43 completed the post-test.

Before-after changes in questionnaire items measuring knowledge (% correct) were assessed using a z-statistic to test for differences between the two group proportions, assuming a null hypothesis of no change in score expected. Two-tailed p-values were calculated at the alpha = 0.05 level to define the "significance" of the results, meaning the probability of obtaining a test statistic as extreme or more than the one computed, given that the null hypothesis is true. For the questionnaire items measuring attitudes and self-reported behaviors using a 6-point Likert-scale score, a Student's t-test procedure was used to compare mean changes in scores, and two-tailed p-values were calculated at the alpha = 0.05 level. Results of the analysis are provided in Tables 7 and 8.

Ideally, the hypothesis testing would have accounted for the dependence of the samples using a paired data test, such as McNemar's, and paired t-tests rather than z-tests and Student's t. However, the questionnaire data were collected anonymously and the research team had no way to match the after data to the before data in order to pair the samples. Thus, the results cannot leverage the paired data to minimize the variation of the samples and may have slightly less power to detect a change in the mean estimate. This statistical concern may be minimal as most of the results were found to be significant, but should be considered when examining estimates that were found to be border-line significant.

As evidenced by the results in Table 7, participating officers showed significant improvement in knowledge of pedestrian issues after participation in the training. The average score (of correctly answering the eight multiple-choice knowledge items) went from 59 percent to 84 percent, a significant difference of 25 percentage points. Improvement in scores was most evident in items 1, 3, 4, and 8, most of which related to how often and where pedestrian crashes occur, who is involved, and how the presence of facilities can reduce crashes. These were all discussed in the course and many officers commented that this information was new and very useful in understanding the nature of pedestrian crashes and where enforcement could be deployed. Understanding of yielding laws at intersections and midblock crossings (as measured by items 2 and 7) also showed positive improvements of 13.5 and 19.9 percentage point increases, respectively, but was not significant at the alpha=.05 level, possibly due to lack of power due to the unmatched study design. The items that showed the least change (items 5 and 6) were already answered correctly more than 95 and 90 percent of the time before the course, so there was limited improvement to be made in those knowledge areas.

Similarly, Table 8 shows some strong changes in officer attitude and self-reported behaviors after the course. The biggest and most significant difference was seen in item 1, with more officers reporting that they strongly agreed with the statement, "I am familiar with pedestrian laws." Scores also reflected changes in attitude regarding their role in enforcing pedestrian safety and the resources available to them to conduct pedestrian-oriented enforcement. After the course, officers agreed more strongly that they have a role in preventing crashes, intend to enforce the law, and that they have lots of resources and plan to use them to enforce laws (items 6, 7, 9, 10). Correspondingly, they agreed less often with statements such as "the laws are difficult to enforce," "I do not have time to enforce pedestrian safety" and "There is little info to help me" (items 5, 8, and 11). Less change was observed between items addressing the importance of pedestrian safety in general (items 2 and 3), statements that were already highly agreed with before the course. The agreement with the importance of the issue may have been a reflection of the self-selection of the officers who volunteered to participate in the course to begin with.

The only response that was contrary to expectations was item 4, measuring the belief that pedestrian crashes are usually minor. Officers agreed with the statement that crashes were usually minor more often after the course, rather than disagreeing with the statement more. The instructor provided information regarding the severity of pedestrian crashes and statistics stating that 80 percent of pedestrian crashes result in an injury, but perhaps these training materials were unclear, not remembered, or the wording of the questionnaire caused some confusion that contributed to the unexpected result.

Overall, the quantitative results of the law enforcement survey reflect strong gains in officer knowledge of pedestrian safety issues and laws, sense of responsibility for conducting pedestrian safety operations, and sense of capacity to lead such operations. These results were consistent with the qualitative feedback received by the project team from course participants. Many officers expressed gratitude for the opportunity to be exposed to pedestrian laws and enforcement techniques, which receive little coverage in general police officer training.

Table 7. Changes in law officer knowledge before and after course delivery.

Item	KNOWLEDGE OF…	Before % Correct	After % Correct	% pt. Difference	Std. Error	z-value	2-tailed p-value
1	the frequency of pedestrian crashes	53.49%	92.68%	39.19%	0.0973	4.0268	**0.00023**
2	appropriate yielding behavior at an uncontrolled intersection	76.74%	90.24%	13.50%	0.0813	1.6595	0.10446
3	common pedestrian crash locations	39.53%	80.49%	40.95%	0.1071	3.8223	**0.00043**
4	who is most commonly at fault in a crash	27.91%	63.41%	35.51%	0.1086	3.2683	**0.00216**
5	ways to determine whether a driver could have yielded or not	95.35%	97.56%	2.21%	0.0405	0.5461	0.58788
6	public support for law enforcement	90.70%	97.56%	6.86%	0.0516	1.3289	0.19105
7	when pedestrian midblock crossings are legal	58.14%	78.05%	19.91%	0.1019	1.9530	0.05750
8	the crash reduction factor of sidewalks	30.23%	75.61%	45.38%	0.1090	4.1624	**0.00015**
TOTAL	**AVERAGE SCORE**	**59.01%**	**84.45%**	**25.44%**	**0.0986**	**2.5799**	**0.01347**

*Note: **Bold** values are significant at the alpha=.05 level*

Table 8. Changes in law officer attitude and self-reported knowledge and behavior before and after course delivery.

Item	ATTITUDE/BELIEF (1=Strongly Disagree; 6=Strongly Agree)	Before Avg.	Before Std. Dev.	After Avg.	After Std. Dev.	Difference	Student's T-value	2-tailed p-value
1	I am familiar with pedestrian laws	3.79	1.0592	5.12	0.7140	1.33	6.7217	**0.0000**
2	Drivers can pose a threat to pedestrians	5.30	1.0809	5.68	0.6496	0.38	1.9443	0.0553
3	Pedestrian safety is an important part of my job	5.23	1.2118	5.56	0.7088	0.33	1.5067	0.1357
4	Pedestrian crashes are usually minor	2.72	1.2785	3.37	1.5613	0.64	2.0756	**0.0411**
5	Pedestrian safety laws are difficult to enforce	3.77	1.1718	3.24	1.6849	-0.52	-1.6598	0.1008
6	I can help prevent pedestrian crashes	4.70	1.2254	5.39	0.8910	0.69	2.9505	**0.0041**
7	I intend to enforce pedestrian laws in next 3 months	4.79	1.1032	5.34	0.7283	0.55	2.6865	**0.0087**
8	I do not have time to enforce pedestrian safety	3.02	1.2245	2.41	1.1827	-0.61	-2.3153	**0.0231**
9	I have lots of resources to enforce pedestrian laws	3.98	1.3182	4.76	0.9945	0.78	3.0477	**0.0031**
10	I plan to use available resources to enforce pedestrian laws	4.60	1.0033	5.07	0.9053	0.47	2.2435	**0.0276**
11	There is little info to help me enforce pedestrian laws	2.86	0.9656	2.24	1.3561	-0.62	-2.4091	**0.0182**

*Note: **Bold** values are significant at the alpha=.05 level*

Observational Behavior Data Collection Measures, Methods, and Results

In addition to the process and self-reported measures described above, observational data of driver and pedestrian behaviors were collected at a sampling of crosswalks in the study area. Since crash data was unavailable for the after period (late 2012 and 2013) due to a processing lag and because pedestrian crashes are relatively rare events for any limited geographic area or short time period, direct behavioral measures were considered to be a more appropriate outcome measure for evaluating the effectiveness of the intervention in changing behaviors that can lead to crash prevention.

Data Collection Approach

Field data were collected weekly by HSRC staff at 11 public street crossings in Raleigh and Durham from July 2012 to March 2013. The sites were selected based on the following criteria:

1. Identified through 5-year crash analysis as having a high number of pedestrian crashes,
2. Posted speed limit was at or below 35 mph,
3. Crossings were located at unsignalized intersections or midblock locations,
4. A marked crosswalk was present (high visibility style markings),
5. The site was considered a safe/secure place for data collectors,
6. No construction was planned that would affect the infrastructure at the site,
7. The site was likely to receive a law enforcement operation, and
8. The site experienced adequate pedestrian traffic for conducting naturalistic observations.

Sites were grouped into "treatment" and "comparison" sites after data collection but prior to analysis. The comparison sites were defined as those that did not receive active enforcement during the intervention period, based on the administrative records provided by police (see Table 5). Law enforcement departments, based on internal resources available, selected a few of the sites for active enforcement based on no systematic process, but considering elements such as pedestrian volumes, speeds, safety concerns, and other factors. Although only treated sites received enforcement actions, both treatment and comparison sites had the potential to be affected by spill-over as a result of the media and outreach campaign. See Table 9 for a description of the site characteristics. Although each site varied, the general composition of the comparison sites had very similar physical characteristics (such as speed limit, crosswalk type, etc.) compared to the treatment sites, as both were selected using the same criteria described above.

At each site, two trained data collectors, following specific, well-established protocols (Van Houten, Malenfant, Huitema, & Blomberg, 2013), collected data related to observed driver behavior (including yielding, close stopping, hard breaking, attempted passing, and conflicts). The protocols provided a standardized way to observe both naturalistic and "staged" pedestrian crossings. To limit the variables, observation data was collection at the sites on dry-weather weekdays during day light hours, when most crashes had been occurring.

- Observations of natural pedestrian crossings (Naturalistic crossings) were collected, where pedestrian activity was high, in order to capture realistic pedestrian and driver interactions in a natural setting,
- Staged crossing were performed to complement the naturalistic crossings and were performed by the trained data collectors using a standardized crossing process in order to provide a

consistent test of driver behavior under more controlled circumstances than naturalistic conditions could offer. Staged crossings were designed to control certain conditions, including pedestrian volumes and pre-crossing behaviors, and achieve a higher sampling of pedestrian-driver interactions given the time available for data collection.

For both types of crossings, several quality assurance and control measures were put in place to ensure high quality and consistent data collection. These included a three-part training program for the data collectors, including the provision of written protocols, in-class training with visual examples and crossing scenarios, and field-based practice at actual data collection sites. It also included routine, weekly checks on the data collector operations to confirm fidelity to protocols and personal review of the data to check for inaccuracies and inconsistencies in data coding. Although weather-dependent, the data collection schedule aimed for consistency in the time of day and the day of week that each site was visited to help control for environmental effects. Similarly, while data collectors occasionally had to be substituted due to illness or personal schedules, the plan consistently used the same two primary data collectors from August to March to limit confounding due to individual differences in data collection or crossing behaviors. See Appendix H for the detailed observational data collection protocols and Appendix I for the observational data collection forms.

Analysis of Driver Yielding Behaviors

A total of 22,996 drivers were observed in 6,914 crossing events (both natural and staged) observed at the 11 sites from September 1, 2012, to March 11, 2013 (see Table 10). The “pre-enforcement” period consisted of data collected in September, before the enforcement elements of the campaign were launched but after the general education and public education elements were in place (which began in August). The “post-enforcement” period consisted of data collected from October 1 (for comparison sites) or starting the day after the first enforcement wave if after October 1. The post period runs through the end of data collection in March. Pre-post changes in driver yielding behaviors (% yielded to pedestrians in marked crosswalks) were assessed using a z-statistic to test for differences between the two group proportions, assuming a null hypothesis of no change expected. Two-tailed p-values were calculated at the alpha = 0.05 level to define significance. Staged crossings were analyzed separately from natural crossings.

Table 11 displays the results from the analysis of staged crossings. At the five comparison sites where enforcement operations were not conducted, driver yielding actually dropped slightly from almost 9 percent to 7.5 percent, (a difference of 1.5 percentage points), though the difference was not statistically significant except at one site. The treatment sites performed similarly, with a slight drop in yielding from 9.7 percent to 8 percent of drivers yielding but only one site showing a statistical significance in the difference. One site, however, showed a statistically significant improvement in yielding, from less than 1 percent to almost 3 percent at the intersection of Gregson and Lamond Street in Durham. While the absolute percentages of driver yielding were low, the change represents an almost three-fold increase in yielding at this site. Notably, this is the site where the press event with NHTSA Administrator David Strickland was held and the site of the most intensive enforcement activity of all of the sites treated, including a wave of informational stops and three waves of active enforcement performed during the study period. It was also the site with the highest driver speeds documented (above the 35 mph posted speed limit), which may have contributed to the low yielding rates. These results provide evidence of the need for more saturated enforcement at a site before changes in driver yielding can be measured.

Compared to other studies at different locations, it was surprising to researchers how low baseline yielding was at the North Carolina sites. Yielding rates ranged from a low of 1 percent to a high of 26 percent, with an average of less than 10 percent across both treatment and comparison. A lack of statewide driver education on right of way laws, no prior enforcement or general education conducted in the area, and the fact that site selection was predicated by a high crash history, may all contribute to the explanation of why driver yielding rates were so low (and remained low) over the study period.

Table 12 summarizes the results of the natural crossing observations, where no staged pedestrian (i.e., data collector) was present in the crosswalk. Generally, driver yielding to "real" pedestrians was much higher (both in the before and after periods) compared to the staged pedestrian yielding rates. Yielding rates ranged from a low of 7 percent (excluding one outlier) to a high of 50 percent, with an average of 25 percent of drivers yielding. This pattern is consistent with other studies (Van Houten & Malenfant, 2004 and Van Houten, Malenfant, Huitema, & Blomberg 2013) that theorized that typical pedestrians are more aggressive in indicating their intent to cross than "staged" pedestrians following the safety protocols for data collection.

Similar to the staged crossings, most of the natural crossings displayed a trend of slight but statistically insignificant decreases in yielding from the before period to the after period. Most of the variation was likely due to a limited sample size, as many sites had low pedestrian volumes during the times in which data collection was conducted and limited time was available for extended natural observations.

Overall, at both treatment and control sites using both staged and natural crossings to observe driver behaviors, results indicate that driver yielding rates were largely static throughout the study period, indicating that no major shifts in behaviors took place that could be attributed to the education or enforcement components of the *Watch for Me NC* campaign. The lack of change could be explained in part by insufficient intensity in the deployment of the enforcement operations (and/or educational components) at the specific sites selected for evaluation. The most intensive law enforcement activities occurred in Carrboro, where data collection for this evaluation was not performed. However, Carrboro officers provided some data which is explored in a sub-analysis in the following section.

Another explanation for the lack of measured behavior change among drivers could be that other factors may have a stronger effect on yielding behaviors and either counterbalanced or overshadowed the effectiveness of the education and enforcement measures. For example, a sub-analysis found a strong and significant relationship between speed limits and crosswalk placement with driver yielding rates (see Tables 13 and 14). For sites with speed limits between 25 and 30 mph, driver yielding rates were more than 5 percent higher than at sites with a speed limit of 35 mph. Similarly, sites placed at midblock locations, as opposed to crosswalks at unsignalized intersections, saw a 3 percent higher yielding rate. Future work is needed to adjust for these variables, as well as seasonal trends, to understand how they may impact driver yielding rates in relation to education and enforcement efforts.

Table 9. Summary of data collection site characteristics.

Site	Crossing Type	Crosswalk Markings	Posted Speed Limit	Total No. of Lanes	Direction of Traffic	Nearby Land Uses	Enforcement Received
Comparison Sites							
Martin @ State St (Raleigh)	Uncontrolled Intersection	High Visibility	25 mph	2	Two-way	Residential housing, church, and neighborhood school	N/A
Riddle @ Tobacco (Durham)	Midblock trail crossing with beacon	High Visibility	35 mph	2	Two-way	American Tobacco Trail and residential housing and two schools	N/A
South btw Salisbury and Wilmington (Raleigh)	Midblock	High Visibility	25 mph	3	Two-way	Raleigh Center for the Performing Arts, Shaw University, and CBD	N/A
Wilmington @ the Capitol (Raleigh)	Midblock	High Visibility	n.p.; assume 35 mph	3	One-way	Government offices and downtown CBD	N/A
Wilmington btw Hargett and Martin (Raleigh)	Midblock	High Visibility	n.p.; assume 35 mph	2	One-way	Transit hub and downtown CBD	N/A
Treatment Sites							
Anderson @ Yearby (Durham)	Uncontrolled Intersection	Continental	25 mph	2	Two-way	Duke campus, parking lots, and student housing	Warning-only enforcement on 10/12 and 10/24
Blount btw Hargett and Martin (Raleigh)	Midblock	High Visibility	n.p.; assume 35 mph	3	One-way	Transit hub and downtown CBD	Active enforcement on 10/4/12 and 10/5/12
Fayetteville @ Pekoe (Durham)	Uncontrolled Intersection	Continental	30 mph	2	Two-way	NCCU campus and police station	Active enforcement on 2/11/13, 2/12/13, 2/15/13, and 3/21/2013
Gregson @ Lamond (Durham)	Uncontrolled Intersection	High Visibility	35 mph	2	One-way	School and residential area	Informational checkpoint on 10/8/12; active enforcement on 10/9/12, 11/12/12, and 11/14/12
Main @ Brightleaf (Durham)	Midblock	High Visibility	25 mph	2 + median	Two-way	Commercial shopping district	Informational checkpoint 9/29/12-10/1/12
University @ Chapel (Durham)	Uncontrolled Intersection	High Visibility	25 mph	4	Two-way	Duke campus and staff parking lot	Warning-only enforcement on 10/16/12 and 10/25/12

Table 10. Summary of pedestrian crossing events and vehicles observed during two intervention waves.

Site	Pre-Enforcement						Post Enforcement						Total Crossing Events (N)	Total Cars Observed (N)
	Natural		*Staged*		*Sub-Total*		*Natural*		*Staged*		*Sub-Total*			
	Events (N)	Cars (N)	Events (N)	Cars (N)	Events (N)	Cars (N)	Events (N)	Cars (N)	Events (N)	Cars (N)	Events (N)	Cars (N)		
Anderson @ Yearby (D)	41	66	225	622	266	688	23	54	350	1,046	373	1,100	639	1,788
Blount btw Hargett and Martin (R)	47	119	175	706	222	825	108	317	400	1,685	508	2,002	730	2,827
Fayetteville @ Pekoe (D)	12	21	25	77	37	98	134	282	600	1,861	734	2,143	771	2,241
Gregson @ Lamond (D)	5	15	200	1,617	205	1,632	7	23	400	3,238	407	3,261	612	4,893
Main @ Brightleaf (D)	31	40	175	400	206	440	48	77	400	946	448	1,023	654	1,463
Martin @ State St (R)	7	10	175	315	182	325	3	3	325	603	328	606	510	931
Riddle @ Tobacco (D)	11	26	175	554	186	580	22	64	425	1,579	447	1,643	633	2,223
South btw Salisbury and Wilmington (R)	7	29	175	417	182	446	11	15	350	677	361	692	543	1,138
University @ Chapel (D)	31	57	275	777	306	834	8	14	125	355	133	369	439	1,203
Wilmington @ the Capitol (R)	17	69	175	615	192	684	25	57	400	1,417	425	1,474	617	2,158
Wilmington btw Hargett and Martin (R)	62	124	175	574	237	698	129	225	400	1,208	529	1,433	766	2,131
Grand Total	271	576	1950	6,674	**2221**	**7,250**	518	1,131	4175	14,615	**4693**	**15,746**	**6914**	**22,996**

Note: (D) represents sites in Durham and (R) represents sites in Raleigh

Table 11. Staged crossing analysis results.

	Pre-Enforcement			Post-Enforcement			Hypothesis Testing Statistics			
	# Yielded	Total N	Proportion	# Yielded	Total N	Proportion	% pt. Difference	std. error	z-value	2-tailed p value
Comparison Sites										
Martin @ State St	12	315	3.81%	12	603	1.99%	-1.82%	0.0111	-1.6402	0.1020
Riddle @ Tobacco	82	554	14.80%	159	1,579	10.07%	-4.73%	0.0156	-3.0269	**0.0026**
South btw Salisbury and Wilmington	30	417	7.19%	37	677	5.47%	-1.73%	0.0149	-1.1583	0.2474
Wilmington @ the Capitol	21	615	3.41%	57	1,417	4.02%	0.61%	0.0093	0.6553	0.5125
Wilmington btw Hargett and Martin	77	574	13.41%	142	1,208	11.75%	-1.66%	0.0166	-0.9972	0.3191
Sub-Total	*222*	*2,475*	*8.97%*	*407*	*5,484*	*7.42%*	*-1.55%*	0.0065	-2.3697	**0.0179**
Treatment Sites										
Anderson @ Yearby	64	622	10.29%	89	1,046	8.51%	-1.78%	0.0146	-1.2185	0.2235
Blount btw Hargett and Martin	71	706	10.06%	120	1,685	7.12%	-2.93%	0.0122	-2.4147	**0.0160**
Fayetteville @ Pekoe	11	77	14.29%	185	1,861	9.94%	-4.34%	0.0351	-1.2391	0.2191
Gregson @ Lamond	15	1,617	0.93%	94	3,238	2.90%	1.98%	0.0045	4.3789	**0.0000**
Main @ Brightleaf	72	400	18.00%	149	946	15.75%	-2.25%	0.0221	-1.0181	0.3092
University @ Chapel	174	777	22.39%	92	355	25.92%	3.52%	0.0272	1.2966	0.1952
Sub-Total	*407*	*4,199*	*9.69%*	*729*	*9,131*	*7.98%*	-1.71%	0.0052	-3.2827	**0.0010**
Total	629	6,674	9.42%	1136	14,615	7.77%	-1.65%	0.0041	-4.0548	**0.0001**

Note: ***Bold*** *values are significant at the alpha=.05 level*

Table 12. Natural crossing analysis results.

	Pre-Enforcement			Post-Enforcement			Hypothesis Testing Statistics			
	# Yielded	Total N	Proportion	# Yielded	Total N	Proportion	% pt. Difference	std. error	z-value	2-tailed p value
Comparison Sites										
Martin @ State St	1	10	10.00%	0	3	0.00%	-10.00%	0.1754	-0.5701	0.5826
Riddle @ Tobacco	3	26	11.54%	10	64	15.63%	4.09%	0.0818	0.4998	0.6216
South btw Salisbury and Wilmington	8	29	27.59%	3	15	20.00%	-7.59%	0.1377	-0.5509	0.5861
Wilmington @ the Capitol	5	69	7.25%	5	57	8.77%	1.53%	0.0484	0.3153	0.7535
Wilmington btw Hargett and Martin	46	124	37.10%	86	225	38.22%	1.13%	0.0542	0.2075	0.8360
Sub-Total	63	258	24.42%	104	364	28.57%	4.15%	0.0361	1.1514	0.2506
Treatment Sites										
Anderson @ Yearby	21	66	31.82%	10	54	18.52%	-13.30%	0.0803	-1.6559	0.1026
Blount btw Hargett and Martin	24	119	20.17%	57	317	17.98%	-2.19%	0.0418	-0.5230	0.6019
Fayetteville @ Pekoe	6	21	28.57%	59	282	20.92%	-7.65%	0.0929	-0.8238	0.4197
Gregson @ Lamond	0	15	0.00%	3	23	13.04%	13.04%	0.0895	1.4575	0.1671
Main @ Brightleaf	18	40	45.00%	32	77	41.56%	-3.44%	0.0964	-0.3569	0.7231
University @ Chapel	29	57	50.88%	4	14	28.57%	-22.31%	0.1488	-1.4993	0.1394
Sub-Total	98	318	30.82%	165	767	21.51%	**-9.31%**	0.0286	-3.2557	**0.0013**
Total	**161**	**576**	***27.95%***	**269**	**1,131**	***23.78%***	**-4.17%**	0.0222	-1.8753	0.0613

*Note: **Bold** values are significant at the alpha=.05 level*

Table 13. All crossing yield rates before and after enforcement, by speed limit.

Speed Limit 25-30			Speed Limit 35			Hypothesis Testing Statistics			
# Yielded	Total N	% Yielded	# Yielded	Total N	% Yielded	% pt. Difference	Std. Error	z-value	2-tailed p-value
1118	8,764	12.76%	1077	14232	7.57%	-5.19%	0.0040	-13.0064	**0.0000**

*Note: **Bold** values are significant at the alpha=.05 level*

Table 14. All crossing yield rates before and after enforcement, by crossing location.

Unsignalized Intersections			Midblock Crossings			Hypothesis Testing Statistics			
# Yielded	Total N	% Yielded	# Yielded	Total N	% Yielded	% pt. Difference	Std. Error	z-value	2-tailed p-value
881	11056	7.97%	1314	11,940	11.01%	3.04%	0.0039	7.8296	**0.0000**

*Note: **Bold** values are significant at the alpha=.05 level*

Carrboro-Sub Analysis

Although Carrboro was not included in the original site selection due to project resource constraints, the Carrboro police department provided its own separate statistics for use in the program evaluation. These include the date and location of pedestrian-oriented enforcement operations conducted in the Town since 2010, a summary of citations given to drivers for failure to yield to pedestrians in crosswalks, and a count of the drivers observed and the violation rate, collected by police at the time of the yielding enforcement operation. These data are provided in Table 15.

Table 15. Crosswalk operations and yielding rates provided by Carrboro police department.

Year	# Events	# Sites	# Citations	# Yielded	Total Observed	Average Yield Rate
2010	9 from Feb. to May	4	74	176	249	70.68%
2011	5 from Feb. to Dec.	3	29	85	115	73.91%
2012	14 from Jan. to Dec.	7	69	441	518	85.14%
2013	2 from Jan. to Feb.	2	4	46	52	88.46%

A chi-square test was conducted to compare the proportions of drivers yielding between each year and test the null hypothesis that there was no difference in yielding rates. The chi-square test value was 27.12 (df=3) with a resulting p-value of 0.0001, indicating that there's very little chance of obtaining that test value if the null hypothesis were true. Thus, the changes in driver yielding rates over the years (from 71 percent in 2010 to 88% in 2013) appear to be a significant trend. It must be noted that the data supplied by Carrboro PD is different than the other site data in several ways. First, it was collected by police officers only during active law enforcement operations, which likely affected driver yielding behaviors and may help explain the large difference in driver yielding rates between Carrboro and the Raleigh and Durham sites visited. Second, unlike the HSRC-led data collection, data collection efforts were not primarily intended for use in evaluation and thus did not control for certain factors. This includes factors such as the location of the data collection (which in Carrboro changed over time depending on where enforcement efforts were run), the time, day and month of data collection, the protocols used, and the sample size, which is notably limited. These factors may have influenced the yield rate and potentially confounded the true estimate of driver yielding in Carrboro. However, the data do give some insights into how yielding rates may change over time with sustained, year-round enforcement such as has been conducted in Carrboro.

Other Behaviors Observed

Of the other behaviors observed during field data collection, most were observed rarely and therefore no formal hypothesis testing was performed. Summary statistics are provided in Table 16, aggregating both natural and staged crossing events at both comparison and treatment sites. Attempts by drivers to pass vehicles stopped for pedestrians were reduced in the after period, as were the instances of pedestrians trapped in the median or on the centerline due to drivers failing to yield. However, the instances of hard braking and close stops by drivers (within 10 feet of the crosswalk) both increased, though sample sizes are extremely limited. Only two conflicts were observed during the entire study period. The instances of pedestrians failing to use crosswalks fell 24 percent, from 78 to 48 from pre- to post-enforcement.

Table 16. Other driver and pedestrian behaviors observed before and after enforcement, all sites.

	# Attempted to Pass	# Hard Brake	# Close Stop	# Trapped Ped	# Conflict	# No X-walk use
Pre-Enforcement	8	5	26	4	1	78
Post Enforcement	3	6	40	0	1	48
Grand Total	11	11	66	4	2	126
% Difference	-45%	9%	21%	-100%	0%	-24%

Discussion

Evaluation Summary

Overall, the measures used to evaluate this effort demonstrate both successes and weaknesses of the program delivery to impact pedestrian safety. In regards to the outreach and education component of the program, several conclusions can be drawn. There was a significant use of paid media to spread pedestrian safety messages. These highly visual (and audio) elements were generally perceived to be clear and focused on appropriate behavioral messages. They contributed to brand consistency, which may have helped with campaign recognition and awareness although this was not specifically measured as part of the scope of this study. A targeted approach focusing messaging in high-crash areas (such as bus routes) and at high-crash times (such as peak commutes) maximized the exposure given limited resources. Similarly, the program was successful in gaining large amounts of positive earned media coverage, from radio, TV, and print sources, which resulted in a greater portion of the population being exposed to the messaging. There was some indication of community engagement, though more use of social media and grassroots means to spread information could have supported message dissemination to a broader audience.

In terms of the enforcement component of the program, the successful delivery of a one-day training course to 43 officers resulted in significant improvements in knowledge and self-reported behaviors and capacity to perform enforcement operations to support the campaign. Officers reported conducting 37 operations in Year 1, noteworthy in that nine out of the ten participating agencies had no prior experience with running pedestrian-focused operations before the start of this program. However, the reach of the enforcement in relation to the large population was minimal and more effort is needed in future years to maximize the visibility of the enforcement and plan more routine, sustained efforts throughout the region.

Generally, driver yielding behaviors varied, depending on the site and nature of the person crossing (staged pedestrian or natural pedestrian), but significant changes from the pre-enforcement period to the post-enforcement period were not observed. The exception to this trend was at sites where law enforcement was at its highest intensity, with more than 3 operations conducted at the site in a short time frame, such as at the Gregson and Lamond site in Durham and in Carrboro. In these locations, driver yielding rates improved modestly. Yielding rates appear to be associated with site characteristics such as midblock or intersection crossings as well as posted speed limits, and may also be affected by seasonal trends such as traffic volumes, which could not be controlled for in this study. While data was limited, pedestrian crossing violations (i.e., failure to cross in crosswalk) appeared to decrease by 24 percent over the study period, possibly in connection with the exposure to the messaging and the enforcement outreach efforts.

Evaluation Strengths and Limitations

To date, very few studies exist that demonstrate the effectiveness of education, enforcement, or policy interventions on pedestrian safety. This study is innovative in that it is evaluating a comprehensive effort to impact pedestrian safety at the regional scale. The documentation of the intervention development, implementation and process measures, in combination with outcome data regarding driver behaviors and law enforcement officers self-reports, should be of particular use to transportation and public health practitioners seeking information and guidance regarding intervention planning and evaluation. The scientific approach to collect a large sample of high-quality driver yielding behaviors, in the absence of crash data, should provide a useful model for others seeking to evaluate similar project.

The evaluation was also limited in several ways. Primarily, the intervention evaluated was led by diverse community partners in a real-world setting, and thus it will not be possible to fully control the intervention implementation or use randomization in any analysis approaches to strengthen the study design. Thus, various unmeasured, uncontrolled factors may have impacted the validity of the results to an unknown degree. Second, because pedestrian crashes remain relatively rare for the Triangle region, and data is not available on pedestrian “exposure” to traffic that could support an analysis of crash rates, other behavioral measures served as a substitute for a crash-based evaluation. Ideally, a longer follow-up period would be desired in order to gather enough data to perform a crash-based evaluation. Finally, because this program is only measuring the first year of a fledgling intervention, it may underestimate the programs’ full or long-term impact. Many important elements in pedestrian crash prevention that this intervention aims to accomplish indirectly, such as policy changes and modifications to the built environment, may require more time to achieve.

Intervention Lessons Learned and Recommendations

Several elements proved critical in the delivery of the *Watch for Me NC* program. Takeaway messages from the program successes and failures and described below, along with recommendations for future efforts. A transferability model for program implementation is provided in Appendix J.

Funding: Funding from NHTSA, a total of $451,370 provided from October 2009 to December 2013, was crucial for providing staffing and resources for the intervention development. Without these seed funds, the communities involved in the campaign could never have leveraged the resources to participate. These funds directly supported the program outreach and media purchasing, as well as a range of UNC-HSRC staff activities such as material development, partner coordination and outreach, technical assistance and training, as well as program evaluation efforts. In addition, NCDOT contributed in-kind labor from its Bicycle and Pedestrian Division and Communications Division staff, as well as more than

$100,000 toward the development of print materials and media purchasing. Municipal partners devoted significant in-kind support in the form of labor hours for project coordination meetings, enforcement operations, and community outreach. Unlike other programs, no NHTSA or NCDOT funds were used to provide overtime pay or additional enforcement support. This scenario is reflective of the real-world conditions other community programs may face and can lead to a more sustainable program in the long-term by enabling police departments to pledge commitment due community priorities rather than financial incentives. However, even with the funding available for program operations, this issue of program costs was a constant concern for program leaders. With limited budgets from municipal and State agencies, program coordinators may want to consider other sources such as private foundations or local businesses, particularly when working in large, high-population areas where intense campaign delivery is needed to saturate the target audience with the program messaging.

Program champion: As evidenced by the failure of the project team to work in the initial focus communities of Charlotte and Wilson to implement a comprehensive education and enforcement program, having a stable, long-term community champion is essential. NCDOT, in concert with UNC-HSRC staff, served this purpose in 2012 and has committed to fund the program in 2013, but long-term plans are still uncertain. Not only do the program champions need to have the interest in pedestrian safety and knowledge of effective practices, they also need to be supported by their organization(s) and be given a dedicated role in organizing such an effort in order to implement a successful program. In future efforts, it is recommended that agencies at the State and local level form stronger partnerships with the Governors Highway Safety Program, who may be in a unique position to "house" such a program, as they do with similar efforts like *Click It or Ticket* and *Booze It and Lose It*.

Adherence to promising practices/evidence: With limited funding available, programs need to be as efficient as possible in the allocation of resources. Understanding and adhering to promising practices from the traffic safety and public health field is key to achieving success. This includes developing a program that takes a multi-faceted, multi-level approach, targets specific, "changeable" behaviors, and intervenes in a way and time that is appropriate for the target audience. More research is needed to build this evidence-base, and programs should be encouraged to document their intervention activities, evaluate results, and publish the literature so that more information is available to support future efforts.

Quality data: Having pedestrian crash data and site visit data early in the program was instrumental in "making the case" to potential local partners and in supporting the decision-making throughout the program development. In particular, such quantitative data was useful to bringing law enforcement agencies on board and in helping select sites for targeted enforcement. Stakeholder input on the key safety issues and opportunities for engaging the community in the program was also critical. Not only was baseline data important, but data regarding program outcomes was also key in continuing the program for a second year. Having evidence of positive effects was as important as the ability to show no negative consequences of the program (such as negative media attention, complaints from the public, or the court dismissal of tickets). Again, this underscores the importance of thoroughly evaluating programs so that the necessary data is available.

Partner coordination and commitment: Throughout this effort, UNC-HSRC team members have generated literally hundreds of partner contacts from a variety of organizations. Each partner brought a different set of assets to the project that contributed to the successful development, implementation, and evaluation of the Watch for Me NC intervention (see Table 17).

Table 17. Common community partner assets.

Partner Type	Common Partner Assets
City/ Regional Planners	• Access to meeting space • Knowledge of community calendar • Access to key city officials and city council agendas • Expertise in transportation issues • Access to communication/public affairs staff • Possible source of funding
Advocacy groups or walk/bike clubs	• Knowledge of community leaders • Perspective on key pedestrian issues and danger areas • Access to community listservs and grassroots outreach channels • Source of volunteer support for events and outreach
Public Health Professionals	• Knowledge of best practices in health education and injury prevention • Access to meeting space • Knowledge of community calendar • Access to communication/public affairs staff • Possible source of funding
Law Enforcement Staff	• Ability to perform targeted traffic safety operations • Knowledge of road safety concerns and danger areas • Ability to assist with community education and outreach • Knowledge of community and business leaders
Research or University Staff	• Ability to collect and analyze data • Knowledge of best practices • Connections with students or volunteer support
Local Businesses	• Source of funding for events or campaign activities

In addition to having a diverse set of partners, formal commitments by partner groups helped ensure longevity and a “committee steering committee” helped provide structure and continuity to program activities. In early 2013, NCDOT began formalizing partners for the second year of the program and to date, all 10 Triangle municipalities participating in 2013 have passed formal resolutions through their respective city councils to support the Watch for Me NC program. These formal commitments help lay the groundwork to engage municipal staff in training and program development.

While the combination of funding, leadership, data resources, and local partners helped advance the Watch for Me NC effort, several obstacles or limitations were also noted.

Large scope: Above all, the nature of the Triangle area, a community of more than a million people spread across three counties, was an obstacle to achieving the saturation needed to see significant changes in behaviors and other outcomes. Such a dispersed population and a large geographic coverage area required an immense amount of resources not fully available to the program coordinators. Future programs with limited funds may consider a smaller geographic scope or more closed population group, such as work on a specific campus environment or smaller town. That said, there were economies of scale used by working at the regional level, primarily in the development of a singular program message and theme, and larger-scale operations have the potential to affect a greater number of people, and thus reduce a larger share of pedestrian crashes, in the long-run.

Difficult social conditions: Challenging social and public health issues were apparent in all the communities in which crash analyses and site visits were performed. Significant proportions of the crashes occurred in underserved neighborhoods with high rates of crime, building vacancies, and poor pedestrian infrastructure. Homelessness, domestic violence, and substance abuse were evidenced in many crash report narratives reviewed and at site visits performed. These issues, while larger than pedestrian safety, can often contribute to pedestrian crashes and injuries but are not easily addressed. Future efforts should aim to address the "low hanging fruit" to effectively use limited resources, but should also remain cognizant of larger social issues and consider ways in which to ensure that program delivery is equitable and underlying factors affecting pedestrian crashes are being addressed.

Need for supportive infrastructure: Infrastructure improvements are an important complement to any education and enforcement program. As noted in the evaluation results, the physical conditions of the roadway, including speed limit and crossing facility placement, may influence road user behaviors and strongly impact pedestrian safety. This program was intended to supplement ongoing efforts to improve the infrastructure, but future efforts could be more comprehensive and inclusive in considering infrastructure improvements or the policies that drive such infrastructure decisions.

Conclusion

In conclusion, the incidence and associated costs of pedestrian injuries and fatalities resulting from motor-vehicle collisions is a significant public health burden. This study used a comprehensive set of measures, including intervention implementation records, self-report, and observational behavior, to evaluate a community-wide, evidence-based pedestrian safety program.

The results of this study provide evidence of the effectiveness of community-based, comprehensive pedestrian interventions that will aid decision-makers at both the State and local level in determining the need for further investment in such programs. Ultimately, information about the effectiveness of targeted interventions can assist in guiding future improvements that both prevent unintentional injury and help promote the use of active transportation and the myriad of public health co-benefits that active transportation offers.

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Appendix Overview

Appendices A through I are included in this report as example working documents, data collection or analysis tools, or internal reports that were generated as part of the development or deployment of the Watch for Me NC program. Crash reports, site visits, action plans, and law enforcement protocols were generated for each of the communities that were part of the program, but the appendices (particularly A through D) include only a selection of the documents that were considered the most comprehensive, relevant, or replicable by others. The files appear their original, unedited formats, which sometimes included their own appendices, layouts, and page numbers. The intent for including them is to provide others with real-world examples for how the demonstration communities or the contractor handled a particular issue in the development of the project (e.g., how a community performed or structured a crash report, conducted a site visit, developed an action plan, collected field data, etc.) rather than provide a polished final deliverable. Appendix J is included as a summary of lessons learned from the project that can be transferred to other communities.

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Appendix A: Charlotte Pedestrian Crash Analysis, 2004-2008

February 2011
UNC Highway Safety Research Center

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Introduction

The main objective of the current project is to identify, prioritize and implement enforcement and educational strategies to help reduce pedestrian crashes in the State of North Carolina. Charlotte is one of three model cities in the overall Focus State project which aims to develop processes, actions, and sustainable strategies for pedestrian safety improvement to help reduce pedestrian crashes and injuries in North Carolina. Successful strategies may then be promoted to communities across the State. While the primary focus is on implementing and evaluating appropriate educational and enforcement countermeasures, comprehensive programs that incorporate education, enforcement, engineering, and evaluation have the best chance of succeeding in reducing pedestrian trauma. Even encouraging more walking may reduce the individual risk of a collision according to recent studies and practices in Europe (Fischer et al., 2010). The information developed in these processes can therefore certainly be used, and has been used, to identify areas where engineering improvements may be needed. Additionally, the information may facilitate the discussion of policies and practices, training, data quality, and other initiatives that might be improved to further help pedestrian safety and mobility In Charlotte as well as other communities in the State.

Purpose

The purpose of this document is to provide an overview of pedestrian crash problems and trends as identified through a preliminary analysis of available data from 2004-2008 and to help set priorities for addressing pedestrian safety problem in Charlotte, NC.

Data Source(s) and Methods

Hard copy crash reports were obtained for each crash in the NC DMV-maintained crash files that were indicated to involve either a pedestrian or a bicyclist using either the person or vehicle fields. The reports are reviewed and coded as to the crash type using the Pedestrian and Bicycle Crash Analysis Tool software (Harkey, Tsai, Thomas, and Hunter, 2006). Thus, corrections were made for cases that were incorrectly indicated to involve a pedestrian but actually involved a bicyclist or vice versa. Therefore, the numbers of pedestrian crashes in this database may not precisely match other State and local crash databases. These data were used for descriptive crash analyses provided below. The typed pedestrian crash database was also used to generate a list of pedestrian crashes for spatial analyses. The crashes were geo-coded by HSRC staff, and then linked to the pedestrian crash factors from the crash typed database for spatial analyses in ESRI's ArcGIS 9 ArcMap 9.2™ software. Although occasionally more than one pedestrian is involved in the same crash, the database on which these analyses are based counts each crash one time to avoid over-representing crashes at locations or in other factors. Thus, in tables and data summarizing pedestrian-related factors, only the first pedestrian struck in the crash – the one used to type the crash – is accounted for.

Figure 1 shows the 12-year trend of total Charlotte pedestrian crashes identified as described above. Crashes have fluctuated over the past dozen years, but the trend is generally upward. The numbers for 2007 and 2008 represent an increase from 2005 and 2006.

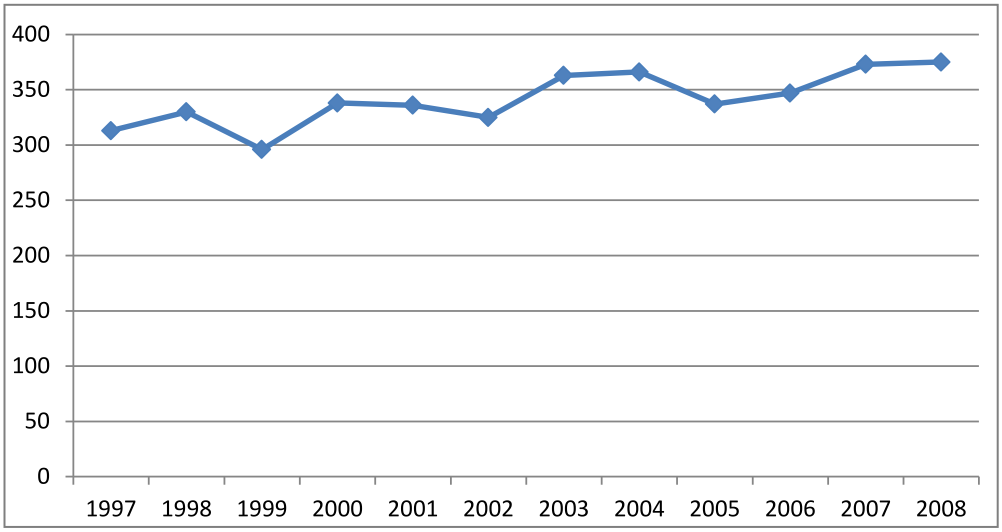


Figure 1. Charlotte Twelve-Year Pedestrian Crash Trend.

City of Charlotte Pedestrian Crash Facts

Table 1 shows a comparison of pedestrian crashes for the top 10 municipalities for crash numbers in North Carolina. While Charlotte ranks first in terms of the municipality in NC with the highest number of pedestrian crashes for the past 5 years, it is 5^{th} in terms of number of crashes per population (although using 2008 population may have skewed the comparisons somewhat). Although population is a very imperfect measure of exposure, it provides some way of leveling crash incidence since accurate and precise measures of walking across different areas are lacking.

Table 1. NC cities with Highest Numbers of Pedestrian Crashes from 2004-2008

Municipality	Number of Crashes (5 yrs)	Percent of NC Total Crashes (12,574)	2008 City pop. estimate	Avg. yearly Crash rate / 10,000 pop.
Charlotte	1797	14.3	683,541	5.3
Raleigh	903	7.2	377,353	4.8
Greensboro	531	4.2	263,268	4.0
Durham	528	4.2	228,480	4.6
Fayetteville	426	3.4	181,481	4.7
Wilmington	290	2.3	101,526	5.7
Asheville	257	2.0	78,313	6.6
Winston-Salem	244	1.9	228,362	2.1
Gastonia	217	1.7	74,518	5.8
High Point	192	1.5	100,645	3.8
Rocky Mount	181	1.4	59,228	6.1
Total	5,556	44.3	2,376,715	4.7

From North Carolina Pedestrian Crash Facts, 2004-2008, prepared for The North Carolina Department of Transportation, Division of Bicycle and Pedestrian Transportation.

Using exposure measures such as counts of pedestrians may help to further target countermeasures toward locations where risk of individual collisions or severe crashes is highest. It should be noted, however, that any pedestrian collision may be severe, particularly if older pedestrians or young children, or higher speeds are involved and so safety efforts should take into consideration all crashes as well as areas with high crash rates.

Fortunately, although total pedestrian crashes have increased over this time period, the proportion killed or receiving disabling type injuries declined from 2004 to 2008, particularly in 2008 (Figure 2).

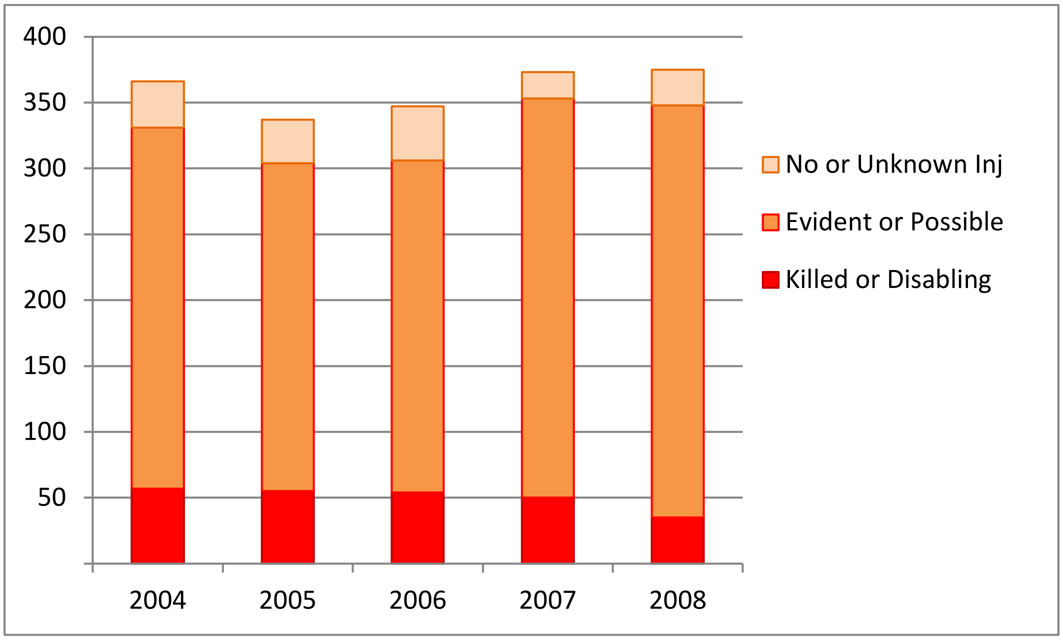


Figure 2. Five-year trend of Charlotte pedestrian injury, 2004-2008.

Nevertheless, the gradual increasing trend in numbers of pedestrian crashes over the past 10 or 12 years suggests that more can be done to improve safety in the City, while simultaneously encouraging more walking.

In 2008, the most recent year when complete pedestrian crash data is available, 389 pedestrians were reported to be involved in 375 crashes in the City of Charlotte. Twelve pedestrians were killed and 23 more were reported to be seriously injured (Table 2).

The cost of these pedestrian crashes, for individuals and the community as a whole, is a significant burden. The North Carolina Department of Transportation estimates the average comprehensive cost of motor-vehicle crashes by injury severity for North Carolina. Applying these costs to the pedestrian crashes that occurred in Charlotte in 2008 alone, the cost of these crashes is nearly $64 million (Table 2). The crash costs are higher when children are involved, as children have more life-years lost in crashes compared to other pedestrians.

Table 2. Charlotte Average Comprehensive Cost (Per Person) by Injury Severity, 2008

Pedestrian Injury	2008 nos.	Average Comprehensive Cost (Per Person) by Injury Severity, 2008 [1]	Total Comprehensive Cost
K Killed	12	$3,982,384	$47,788,608
A Type Injury (disabling)	23	$199,539	$4,589,397
B Type Injury (evident)	144	$51,184	$7,370,496
C Type Injury (possible)	169	$24,352	$4,115,488
O No Injury	21	$5027	$105,567
Unknown	6	-	-
Totals	**375**		**$63,969,556**

[1] Estimates from NCDOT 2008 Standardized Crash Cost Estimates for North Carolina

Educational, engineering, and enforcement measures are crucial to developing an overall safety culture, engendering respect for and compliance with traffic laws, and reducing the severity and incidence of not only pedestrian crashes, but all crashes.

Understanding where, when, how, why, and who is involved in pedestrian collisions can help target appropriate countermeasures to the areas and populations where they are most needed. The following tables highlight some of the characteristics of pedestrian collisions in Charlotte over a recent five year period.

Time of Crashes

Crashes tend to fluctuate by month from year to year, but typically the fall months have somewhat higher numbers of crashes. During this five-year period, the fall months accounted for nearly 29 percent of crashes with proportionally fewer in other seasons (Figure 3). (October to December are also the highest crash months Statewide.) Year-to-year variability in crash proportions by month may reflect weather, special events, or other conditions that affect exposure to collisions as well as just chance variation.

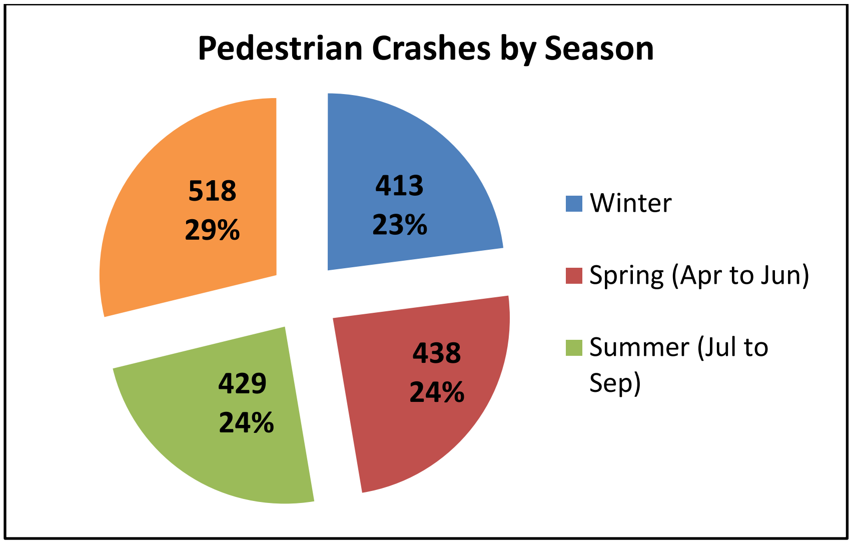


Figure 3. Pedestrian crashes by season of the year, 2004-2008.

Similarly, there are year-to-year fluctuations in crashes by day of the week, but on average, pedestrian crashes have been very evenly distributed across days of the week with all days except Sunday accounting for about 15 percent; Thursdays have accounted for slightly more than other days at 16 percent. Sunday, on average the lowest crash day across the state, has accounted for about 11 percent in Charlotte.

A vast majority, 93 percent, of pedestrian collisions in Charlotte also occur under clear or cloudy (not raining or other precipitation) weather conditions (Figure 4). Rainy weather is present for 6 percent of crashes with other conditions accounting for very small numbers. These factors are also no doubt associated with amounts and timing of precipitation and other conditions year-to-year. Reflecting weather conditions, 11 percent of collisions were associated with wet roads or standing water, with less than 1 percent of other collisions associated with icy and other conditions combined.

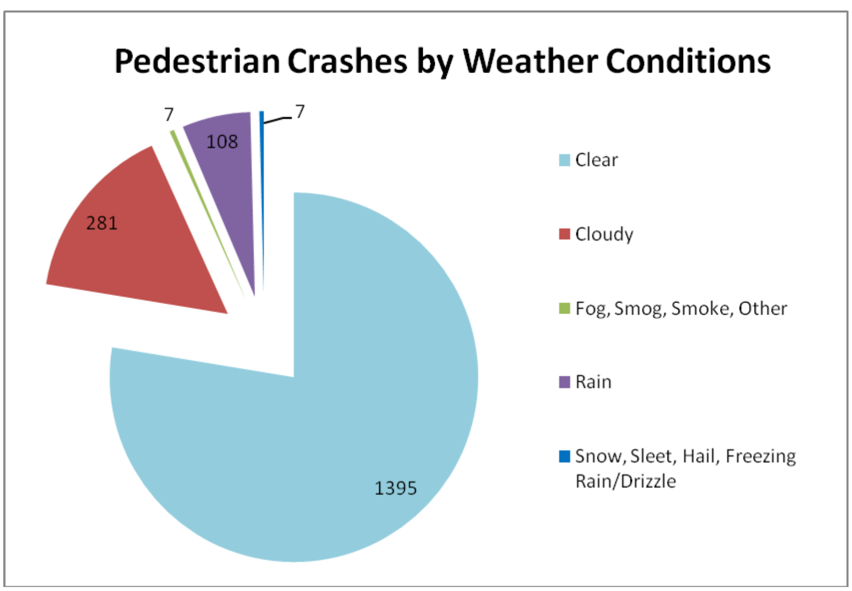


Figure 4. Weather conditions present at time of crash, 2004-2008.

An average of 61 percent of pedestrian collisions occurred during daylight hours (Figure 5). About 34 percent of pedestrian collisions occurred at night, with about three-fourths of these occurring on lighted roadways. A majority of fatalities (75 percent) and 47 percent of disabling type injuries resulted, however, from crashes at night. Thirty-one percent of fatalities were indicated to result from crashes on roadways with no supplemental lighting while 43 percent were on roadways indicated to have lighting present.

Further examinations showed that 12, or 19 percent of all pedestrians killed, were killed at night on Interstate highways – more than half of these were apparently on unlighted segments (data not shown).

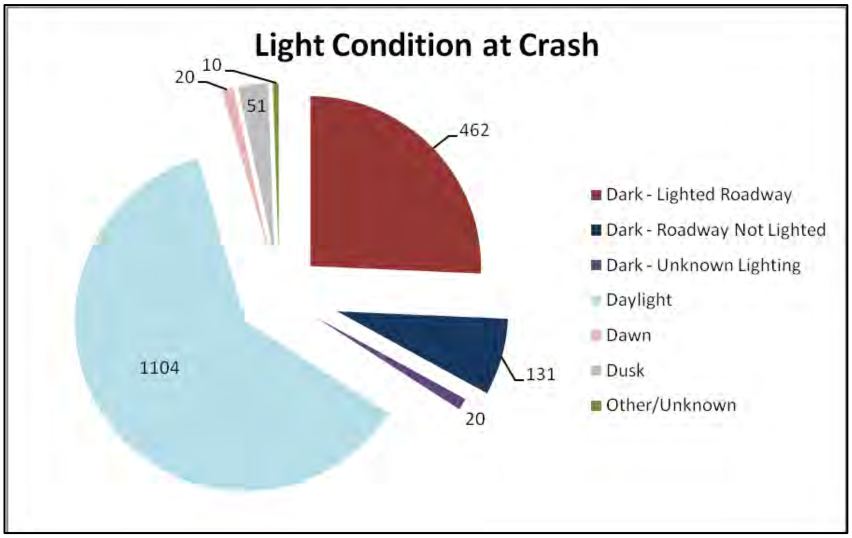


Figure 5. Charlotte Pedestrian Crashes by Light Condition, 2004-2008.

As in most areas, the peak in pedestrian collisions occurs during the afternoon hours to evening hours, especially from 3 to 6 pm (22 percent) and continuing until about 8 pm (Figure 6). The six hours from 3 to 9 pm together account for 40 percent of daily crashes on average (Figure 7). The mid-day period from noon to 3 accounts for another 15 percent. Late night hours from midnight to 6 am account for nearly 11 percent of pedestrian collisions, but 35 percent of fatalities, in keeping with higher night-time fatality rates (data not shown).

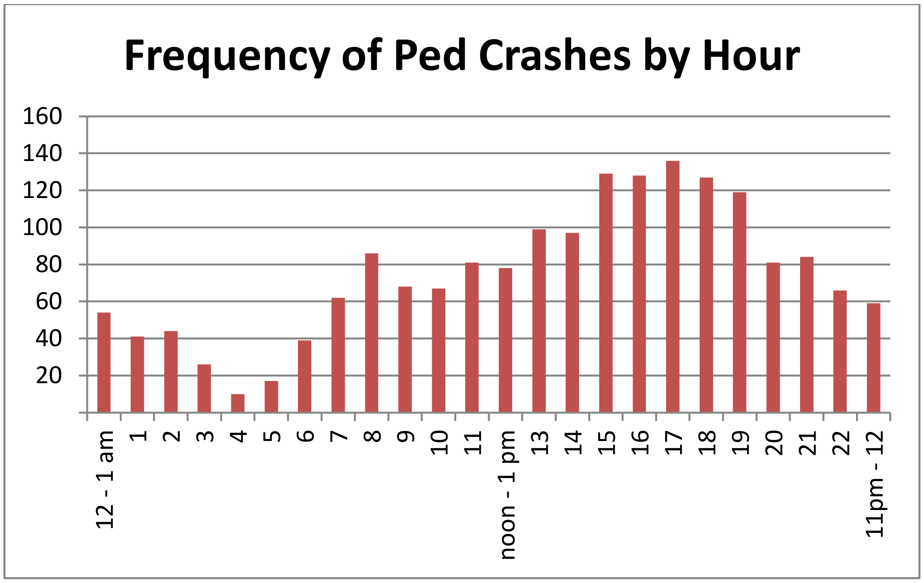


Figure 6. Pedestrian crashes by hour of day, 2004-2008.

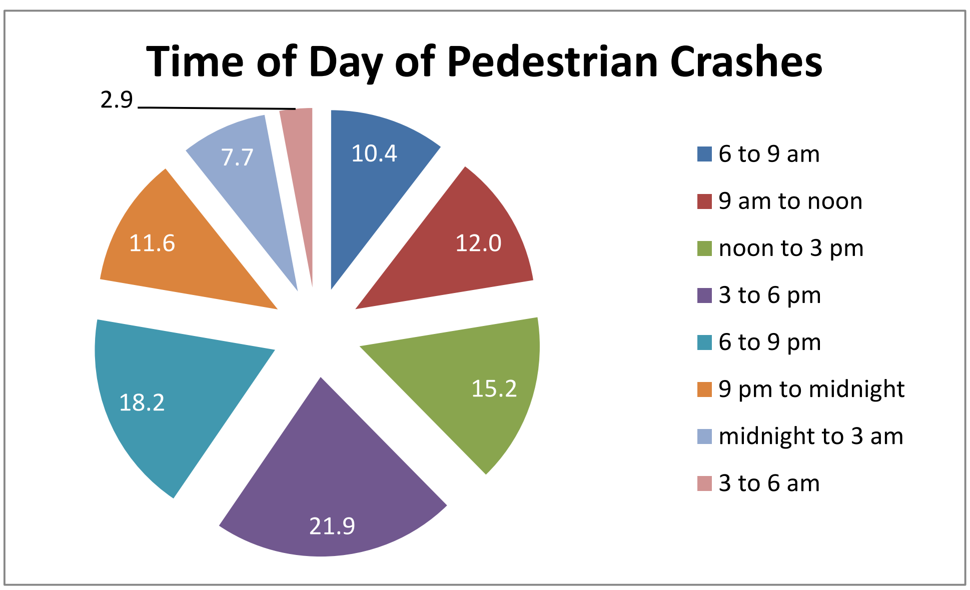


Figure 7. Pedestrian Crash Percentages by Time of Day, 2003-2008.

Pedestrian Characteristics

A total of 63 pedestrians were killed in Charlotte (within the City limits) over this time period (Table 3). These fatalities represent 3.5 percent of the reported pedestrian crashes and about 20 percent of all Charlotte traffic fatalities over the five years. The proportion of struck pedestrians who died as a result of their injuries, however, is somewhat lower in Charlotte than the average for all urban locations in the State (4.4 percent). Another 10 ½ percent of pedestrians were reported to suffer disabling (A-type) injuries resulting from the crashes. After two years in which lower numbers of pedestrians were struck (2005 and 2006), the numbers increased for both 2007 and 2008.

Table 3. Pedestrian injury severity, 2004-2008.

Ped Injury	2004	2005	2006	2007	2008	Total
K: Killed	10	11	17	13	12	63
	2.7%	3.3%	4.9%	3.5%	3.2%	3.5%
A: Disabling Injury	47	44	37	37	23	188
	12.8%	13.1%	10.7%	9.9%	6.1%	10.5%
B: Evident Injury	125	115	125	153	144	662
	34.2%	34.1%	36.0%	41.0%	38.4%	36.8%
C: Possible Injury	149	134	127	150	169	729
	40.7%	39.8%	36.6%	40.2%	45.1%	40.5%
O: No Injury	27	27	32	16	21	123
	7.4%	8.0%	9.2%	4.3%	5.6%	6.8%
Unknown Injury	8	6	9	4	6	33
	2.2%	1.8%	2.6%	1.1%	1.6%	1.8%
Total	366	337	347	373	375	1798
	20.4%	18.7%	19.3%	20.7%	20.9%	100.0%

Although total numbers of pedestrians reported struck were highest in 2007 and 2008, the number of killed or seriously injured pedestrians has declined from the peak combined total of 54 in 2006 to 35 in 2008 (Table 3. Pedestrian injury severity, 2004-2008.). The number of reported crashes with no or unknown injuries also declined since 2006 with the increase accounted for by those reporting evident or possible injuries.

Crash proportions for different age groups fluctuate over the years. (Note that age groups span different numbers of years.) Young adults, including 16 to 19 year olds and those 20 to 24 accounted for nearly 20% (19.7%) of pedestrians involved over the period. Adults 40 to 49 years also comprised about 20% of crash-involved pedestrians over this entire time period, although 30 to 39 year olds accounted for a larger proportion in 2008. It is difficult to say much more about these trends, although the proportion and number accounted for by the 20 to 24 year group seems to have decreased while both the numbers and proportion of crashes involving adults 50 and over seems to be increasing, perhaps reflecting population trends. Indications using earlier years data (2003-2007) suggested that the Charlotte area has a higher rate of crashes involving adult ages (15 and older) per population compared with children younger than 15 (Data not shown). Older pedestrians also seem to have a somewhat lower representation in collisions than average.

Table 4. Pedestrian Age Group, 2004-2008.

	2004	2005	2006	2007	2008	Total
0 to 5 years	14 3.8%	13 3.9%	12 3.5%	8 2.1%	11 2.9%	58 3.2%
6 to 10	11 3.0%	14 4.2%	13 3.7%	8 2.1%	16 4.3%	62 3.4%
11 to 15	26 7.1%	19 5.6%	17 4.9%	27 7.2%	29 7.7%	118 6.6%
16 to 19	32 8.7%	25 7.4%	32 9.2%	30 8.0%	29 7.7%	148 8.2%
20 to 24	47 12.8%	46 13.6%	33 9.5%	41 11.0%	39 10.4%	206 11.5%
25 to 29	39 10.7%	30 8.9%	34 9.8%	48 12.9%	35 9.3%	186 10.3%
30 to 39	64 17.5%	61 18.1%	49 14.1%	57 15.3%	68 18.1%	299 16.6%
40 to 49	72 19.7%	71 21.1%	73 21.0%	73 19.6%	63 16.8%	352 19.6%
50 to 59	29 7.9%	32 9.5%	49 14.1%	40 10.7%	50 13.3%	200 11.1%
60 to 69	11 3.0%	10 3.0%	14 4.0%	18 4.8%	19 5.1%	72 4.0%
70+	12 3.3%	7 2.1%	14 4.0%	18 4.8%	13 3.5%	64 3.6%
Unknown/missing	9 2.5%	9 2.7%	7 2.0%	5 1.3%	3 .8%	33 1.8%
Total	366 20.4%	337 18.7%	347 19.3%	373 20.7%	375 20.9%	1798 100.0%

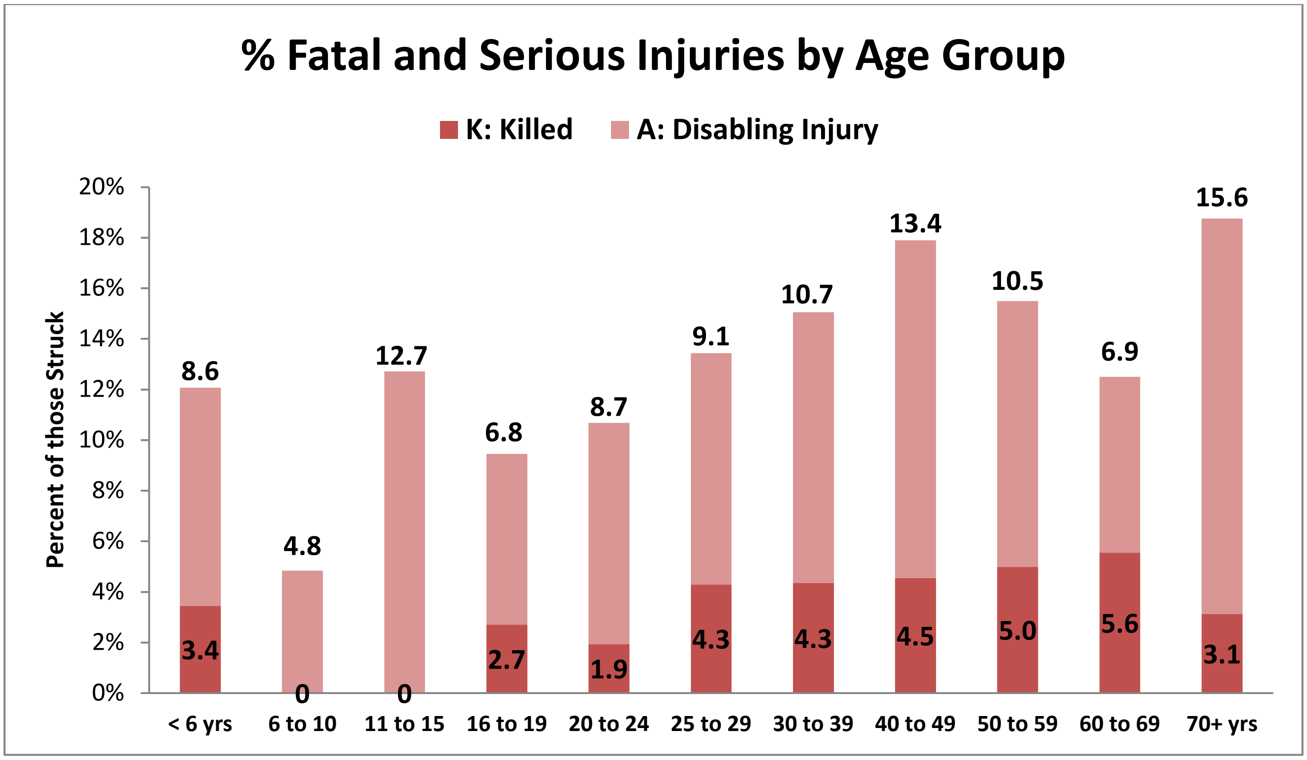


Figure 8. Severe injury proportions by age group, 2004-2008.

In general, older pedestrians and very young children may be more vulnerable to severe injuries or fatalities in a crash. As illustrated in Figure 8, adults 70 and older have the combined highest proportions of fatalities and serious injuries combined for those struck. The youngest children also have much higher rates of disabling and fatal injuries than older children who were struck. However, adults of middle ages have suffered the highest rates of fatalities among those struck in Charlotte. Fatalities may also be higher when alcohol is involved and in night-time crashes, as will be shown later.

Although a bit challenging to examine, Figure 9. Crash involvement by pedestrian age group and time of day. shows the time of day of crashes by age groups of pedestrians involved. This figure indicates that children are particularly most involved between 3 and 6 pm, but that even young children are sometimes struck between the hours of 9 and midnight. Young adults, particularly between the ages of 20 to 24, are most involved during late night hours, with older adults having low to no pedestrian crash involvement during these hours.

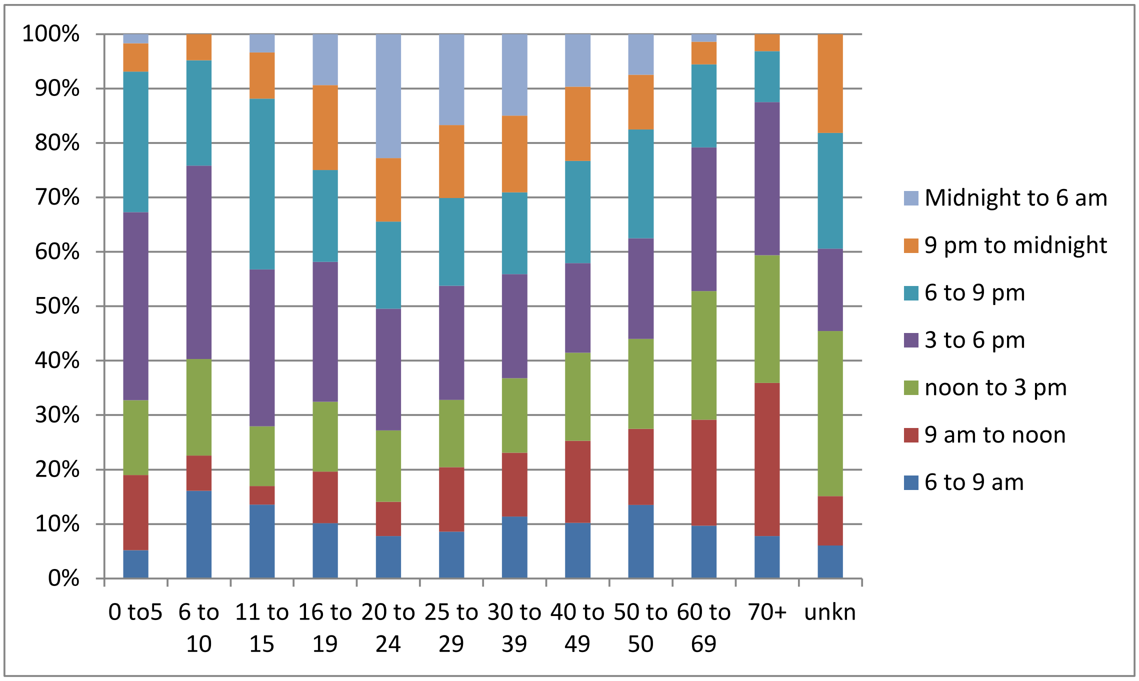


Figure 9. Crash involvement by pedestrian age group and time of day.

No particularly strong trend over the five-year time period is in evidence regarding children, adults, and older adults in crash involvement (Figure 10. Charlotte trends in crash involvement by age group.), although there was a slight increase in 2008 involving children up to age 16.

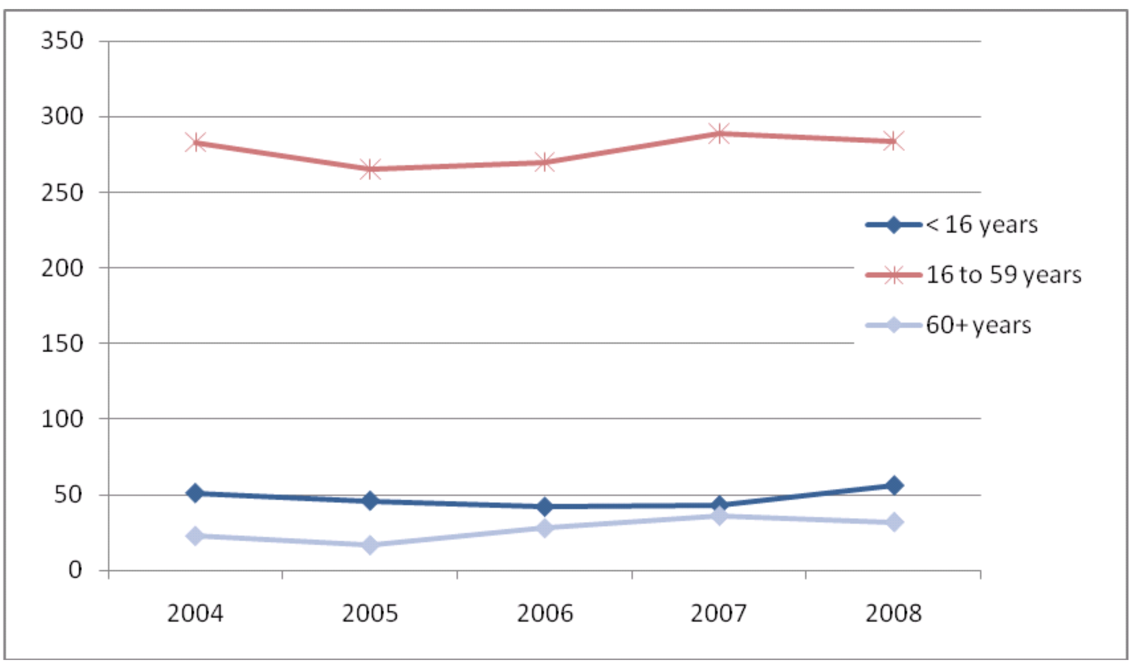


Figure 10. Charlotte trends in crash involvement by age group.

Males account for about 59 percent of pedestrians in crashes in Charlotte, but a slightly lower percentage than for the State as a whole (which is 61 percent, data not shown) (Table 5).

Table 5. Pedestrian Gender, 2004-2008.

	2004	2005	2006	2007	2008	Total
Female	139 38.0%	129 38.3%	137 39.5%	168 45.0%	155 41.3%	728 40.5%
Male	226 61.7%	203 60.2%	205 59.1%	205 55.0%	219 58.4%	1058 58.8%
Unknown	1 .3%	5 1.5%	5 1.4%	.0%	1 .3%	12 .7%
Total	366 20.4%	337 18.7%	347 19.3%	373 20.7%	375 20.9%	1798 100.0%

Blacks/African Americans account for more than half (52 percent) of pedestrians involved in Charlotte collisions for 2004-2008 (Table 6). For comparison, Blacks accounted for approximately 33 percent of Charlotte's population (2000 Census). Hispanics accounted for 10 percent of pedestrians in collisions according to police-crash report data, while Hispanics (all races) accounted for about 7 percent of Charlotte's population in the year 2000. The reporting and capturing of these groups is different on police crash reports than for the Census, and the population numbers are also likely to have changed significantly from 2000. While accounting for about 35 percent of pedestrian collisions from 2003-2007, Non-Hispanic Whites accounted for about 55 percent of Charlotte's population in 2000.

Table 6. Pedestrian Race/Ethnicity, 2004-2008.

	2004	2005	2006	2007	2008	Total
Asian	7 1.9%	4 1.2%	6 1.7%	3 .8%	4 1.1%	24 1.3%
Black	179 48.9%	173 51.3%	190 54.8%	181 48.5%	206 54.9%	929 51.7%
Hispanic	31 8.5%	33 9.8%	33 9.5%	43 11.5%	39 10.4%	179 10.0%
Missing	.0%	.0%	.0%	.0%	1 .3%	1 .1%
Native American	.0% .0%	.0% .0%	1 50.0% .3%	.0% .0%	1 50.0% .3%	2 100.0% .1%
Other	.0%	4 1.2%	3 .9%	3 .8%	6 1.6%	16 .9%
White	145 39.6%	115 34.1%	105 30.3%	143 38.3%	117 31.2%	625 34.8%
Unknown	4 1.1%	8 2.4%	9 2.6%	.0%	1 .3%	22 1.2%
Total	366 20.4%	337 18.7%	347 19.3%	373 20.7%	375 20.9%	1798 100.0%

Alcohol indicators suggest that alcohol use by the pedestrian was noted in about 11 percent of crashes on average (Table 7), and alcohol use by either the pedestrian or driver or both may be a factor in about 14 percent of pedestrian crashes in Charlotte (Table 8). Detection or suspicion of alcohol use prior to the collision does not necessarily indicate impairment.

The reported crash data do not suggest that Charlotte has a worse problem than the rest of the State, which reports alcohol use by one or both parties in about 14 percent of crashes, on average over this period (Table 8). It is not known whether police officers usually indicate alcohol use if it is suspected for pedestrians or how much variation there is by jurisdiction in reporting of alcohol use by either party. Sixteen fatalities (25 percent of the total) apparently involved pedestrian use of alcohol, so alcohol use is clearly over-represented in fatal collisions.

Table 7. Pedestrian Alcohol Use Indication, 2004-2008.

	2004	2005	2006	2007	2008	Total
Yes	43 11.7%	44 13.1%	37 10.7%	36 9.7%	45 12.0%	205 11.4%
No	323 88.3%	293 86.9%	310 89.3%	337 90.3%	329 87.7%	1592 88.5%
Unknown	.0%	.0%	.0%	.0%	1 .3%	1 .1%
Total	366 20.4%	337 18.7%	347 19.3%	373 20.7%	375 20.9%	1798 100.0%

Table 8. Alcohol-Involved Crash Indication (either or both parties), 2004-2008.

	2004	2005	2006	2007	2008	Total
Yes	50 13.7%	51 15.1%	49 14.1%	52 13.9%	52 13.9%	254 14.1%
No	316 86.3%	286 84.9%	298 85.9%	321 86.1%	323 86.1%	1544 85.9%
Total	366 20.4%	337 18.7%	347 19.3%	373 20.7%	375 20.9%	1798 100.0%

Other Driver Characteristics

Nearly 20 percent of the crashes reported were Hit and Run, but the proportion varied from a high of 23 percent in 2006 to 16% in 2008. Fifty-seven percent of drivers whose sex was identified were male; nearly 17 percent of driver’s sex was missing data due to hit and run and other unknowns.
There were no fatalities and only one reported disabling type injury among drivers involved in crashes with pedestrians.

Drivers up to age 16 accounted for less than 6 percent of collisions with pedestrians (Table 9), a smaller proportion than the 8 percent reported for all State urban areas (including Charlotte). Drivers between 20 and 24 accounted for 13 percent, somewhat higher than the average of 12 percent for this age group across all urban areas of the State.

Older drivers 60 and up accounted for about 11 percent of crashes with pedestrians in Charlotte compared with 13 percent for these ages across all urban areas of the State.

Table 9. Pedestrian Crash-Involved Drivers by Age Group, 2003-2007.

Age Grouped	2004	2005	2006	2007	2008	Totals
0 - 19	18 4.9%	18 45.3%	20 5.8%	22 7.3%	24 6.0%	109 5.8%
20 - 24	49 13.4%	41 12.2%	51 14.7%	56 15.0%	37 9.9%	234 13.0%
25 - 29	38 10.4%	35 10.4%	29 8.4%	37 9.9%	48 12.8%	187 10.4%
30 - 39	72 19.7%	49 14.5%	57 16.4%	67 18.0%	69 18.4%	314 17.5%
40 - 49	62 16.9%	52 15.4%	57 16.4%	53 14.2%	54 14.4%	278 15.5%
50 - 59	30 8.2%	42 12.5%	32 9.2%	39 10.5%	51 13.6%	194 10.8%
60 - 69	20 5.5%	18 5.3%	17 4.9%	30 8.0%	23 6.1%	108 6.0%
70+	12 3.3%	12 3.6%	11 3.2%	15 4.0%	17 4.5%	67 3.7%
Unknown	65 14.1%	70 20.9%	73 23.1%	54 22.9%	52 17.0%	314 19.5%
Totals	366 20.4%	337 18.7%	347 19.3%	373 20.7%	375 20.9%	1798 100.0%

Blacks have lower crash involvement as drivers (36 percent) than as pedestrians. This trend is similar for Hispanics (7 percent), while whites have somewhat higher involvement as drivers than as pedestrians (37 percent) (Table 10).

Table 10. Driver Race/Ethnicity.

Driver Race	2004	2005	2006	2007	2008	Total
Asian	10	5	5	3	2	25
	2.7%	1.5%	1.4%	.8%	.5%	1.4%
Black	110	110	129	137	159	645
	30.1%	32.6%	37.2%	36.7%	42.4%	35.9%
Hispanic	20	29	24	36	24	133
	5.5%	8.6%	6.9%	9.7%	6.4%	7.4%
Missing					48	48
	.0%	.0%	.0%	.0%	12.8%	2.7%
Native American	1			1		2
	.3%	.0%	.0%	.3%	.0%	.1%
Other	4	1	4	6	9	24
	1.1%	.3%	1.2%	1.6%	2.4%	1.3%
Unknown	66	68	76	50	1	261
	18.0%	20.2%	21.9%	13.4%	.3%	14.5%
White	155	124	109	140	132	660
	42.3%	36.8%	31.4%	37.5%	35.2%	36.7%
Total	366	337	347	373	375	1798
	20.4%	18.7%	19.3%	20.7%	20.9%	100.0%

Passenger cars accounted for about 53 percent of collisions with pedestrians with sport utility vehicles (15 percent), pickup trucks (10 percent), and vans/minivans (seven percent) accounting for another 31 percent (data not shown). Larger trucks (two axle, six tire and larger) accounted for two percent of collisions. Commercial buses were involved in 20 crashes over this period (amounting to one percent of crashes), school buses and police cars 8 crashes each, taxicabs 10 crashes, other buses 3 crashes, with 11 percent of crashes involving unknown vehicle types (due to missing and hit and run).

Crash Types and Location

All types of crashes are observed in Charlotte with many types accounting for relatively small numbers (Table 11. Pedestrian crash types, 2004-2008). For ease in interpretation, a few of the specific crash types are grouped into related types (denoted by *) in the list of top crash types below.
In descending order, the most common types of crashes observed in Charlotte were:

Pedestrian Failure to Yield	243	(13.5%)
Pedestrian Dart-out or Dash*	226	(12.6%)
Off Roadway – Parking lot	146	(8.1%)
Assault or Dispute-related*	130	(7.2%)
Backing Vehicle – Parking lot	126	(7%)
Motorist Left Turn*	116	(6.5)
Motorist Right Turn*	68	(3.8%)
Motorist Entering or Exiting Driveway or Alley*	64	(3.6%)
Motorist Failed to Yield	58	(3.2%)
Walking Along Roadway with Traffic - From Behind	44	(2.4%)
Multiple Threat	31	(1.7%)
	1252	(69.6%)

The 11 types of crashes above accounted for 70 percent of all pedestrian collisions in Charlotte. These and other related crash types should be the primary focus of countermeasures to reduce crashes. Some countermeasure information is described below, but additional countermeasures information is available from PedSafe, a web-based countermeasure selection tool sponsored by FHWA (www.walkinginfo.org/pedsafe/), Countermeasures That Work (NHTSA, 2010; 6th edition due shortly), the NCHRP Guide for Reducing Collisions Involving Pedestrians (Zegeer, Stutts, Huang, et al., 2004) and other resources that may be found on the Pedestrian and Bicycle Information Center as well as other documents.

The most frequent crash type involved pedestrians crossing a roadway and apparently failing to yield right-of-way (Pedestrian Failure to Yield, 14 percent). Over two-thirds (67.5 percent) of these crashes in Charlotte occurred at mid-block locations, where obvious or implied cross walks likely do not exist. Pedestrians may have failed to detect an adequate gap in traffic or underestimated the speed of approaching vehicles. These types of crashes may occur at locations with large distances between signalized crossings. Another 23 percent occurred at intersections, with an additional 10 percent deemed to be related to / within 50 feet of an intersection. Pedestrians may be walking against signal indications, attempting to cross where pedestrian signals may be lacking, failing to use push-buttons for a pedestrian Walk indication, or attempting to cross away from the crosswalk area (the 10 percent related to intersection).

Table 11. Pedestrian crash types, 2004-2008.

Crash Type	2004	2005	2006	2007	2008	Total
Assault with Vehicle	10 2.7% (1)	11 3.3%	12 3.5%	8 2.1%	3 .8%	44 2.4%
Backing Vehicle - Driveway	5 1.4%	1 .3%	2 .6%	2 .5%	5 1.3%	15 .8%
Backing Vehicle - Driveway / Sidewalk Intersection	1 .3%	1 .3%	2 .6%	2 .5%	3 .8%	9 .5%
Backing Vehicle - Other / Unknown	2 .5%	1 .3%	2 .6%	1 .3%	2 .5%	8 .4%
Backing Vehicle - Parking Lot	26 7.1%	26 7.7%	24 6.9%	23 6.2%	27 7.2%	126 7.0%
Backing Vehicle - Roadway	6 1.6%	4 1.2%	6 1.7%	5 1.3%	10 2.7%	31 1.7%
Commercial Bus-Related	5 1.4%	2 .6%	6 1.7%	6 1.6%	5 1.3%	24 1.3%
Crossing an Expressway	4 1.1%	4 1.2%	5 1.4%	2 .5%	2 .5%	17 .9%
Dart-Out	9 2.5%	13 3.9%	4 1.2%	13 3.5%	6 1.6%	45 2.5%
Dash	35 9.6%	34 10.1%	41 11.8%	44 11.8%	27 7.2%	181 10.1%
Disabled Vehicle-Related	4 1.1%	2 .6%	2 .6%	3 .8%	4 1.1%	15 .8%
Dispute-Related	22 6.0%	18 5.3%	23 6.6%	11 2.9%	12 3.2%	86 4.8%
Driverless Vehicle	1 .3%	1 .3%	3 .9%	5 1.3%	6 1.6%	16 .9%
Emergency Vehicle-Related	1 .3%	1 .3%	.0%	2 .5%	1 .3%	5 .3%
Entering / Exiting Parked Vehicle	1 .3%	.0%	.0%	.0%	.0%	1 .1%
Ice Cream / Vendor Truck-Related	1 .3%	.0%	.0%	.0%	1 .3%	2 .1%
Intersection - Other / Unknown	8 2.2%	4 1.2%	2 .6%	2 .5%	4 1.1%	20 1.1%
Lying in Roadway	1 .3%	1 .3%	3 .9%	1 .3%	2 .5%	8 .4%
Mailbox-Related	1 .3%	1 .3%	.0%	.0%	.0%	2 .1%
Motor Vehicle Loss of Control	.0%	.0%	2 .6%	14 3.8%	17 4.5%	33 1.8%
Motorist Entering Driveway or Alley	3 .8%	.0%	1 .3%	1 .3%	.0%	5 .3%
Motorist Exiting Driveway or Alley	15 4.1%	17 5.0%	9 2.6%	11 2.9%	7 1.9%	59 3.3%

Crash Type	2004	2005	2006	2007	2008	Total
Motorist Failed to Yield	21 5.7%	13 3.9%	5 1.4%	7 1.9%	12 3.2%	58 3.2%
Motorist Left Turn - Parallel Paths	7 1.9%	10 3.0%	24 6.9%	29 7.8%	24 6.4%	94 5.2%
Motorist Left Turn - Perpendicular Paths	10 2.7%	9 2.7%	1 .3%	1 .3%	1 .3%	22 1.2%
Motorist Right Turn - Parallel Paths	2 .5%	5 1.5%	5 1.4%	6 1.6%	4 1.1%	22 1.2%
Motorist Right Turn - Perpendicular Paths	2 .5%	2 .6%	4 1.2%	9 2.4%	5 1.3%	22 1.2%
Motorist Right Turn on Red - Parallel Paths	.0%	.0%	2 .6%	4 1.1%	2 .5%	8 .4%
Motorist Right Turn on Red - Perpendicular Paths	.0%	.0%	3 .9%	9 2.4%	4 1.1%	16 .9%
Motorist Turn / Merge - Other / Unknown	1 .3%	1 .3%	1 .3%	6 1.6%	4 1.1%	13 .7%
Multiple Threat	1 .3%	7 2.1%	6 1.7%	7 1.9%	10 2.7%	31 1.7%
Non-Intersection - Other / Unknown	4 1.1%	3 .9%	3 .9%	8 2.1%	7 1.9%	25 1.4%
Off Roadway - Other / Unknown	14 3.8%	4 1.2%	6 1.7%	15 4.0%	16 4.3%	55 3.1%
Off Roadway - Parking Lot	28 7.7%	35 10.4%	33 9.5%	20 5.4%	30 8.0%	146 8.1%
Other - Unknown Location	1 .3%	.0%	.0%	.0%	1 .3%	2 .1%
Other Unusual Circumstances	1 .3%	3 .9%	3 .9%	2 .5%	5 1.3%	14 .8%
Pedestrian Failed to Yield	50 13.7%	38 11.3%	49 14.1%	44 11.8%	62 16.5%	243 13.5%
Pedestrian Loss of Control	.0%	.0%	6 1.7%	6 1.6%	5 1.3%	17 .9%
Pedestrian on Vehicle	8 2.2%	8 2.4%	2 .6%	4 1.1%	7 1.9%	29 1.6%
Play Vehicle-Related	5 1.4%	3 .9%	1 .3%	5 1.3%	4 1.1%	18 1.0%
Playing in Roadway	.0%	.0%	.0%	3 .8%	.0%	3 .2%
School Bus-Related	4 1.1%	4 1.2%	5 1.4%	.0%	1 .3%	14 .8%
Standing in Roadway	6 1.6%	5 1.5%	5 1.4%	2 .5%	4 1.1%	22 1.2%
Trapped	3 .8%	2 .6%	1 .3%	1 .3%	.0%	7 .4%
Vehicle-Vehicle / Object	12 3.3%	18 5.3%	8 2.3%	14 3.8%	7 1.9%	59 3.3%

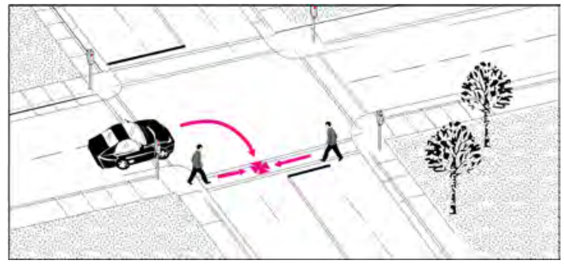
Crash Type	2004	2005	2006	2007	2008	Total
Waiting to Cross - Vehicle Action Unknown	 .0%	1 .3%	 .0%	 .0%	 .0%	1 .1%
Waiting to Cross - Vehicle Not Turning	1 .3%	 .0%	1 .3%	1 .3%	1 .3%	4 .2%
Walking Along Roadway - Direction / Position Unknown	4 1.1%	3 .9%	1 .3%	 .0%	 .0%	8 .4%
Walking Along Roadway Against Traffic - From Behind	1 .3%	2 .6%	 .0%	 .0%	 .0%	3 .2%
Walking Along Roadway Against Traffic - From Front	4 1.1%	2 .6%	2 .6%	2 .5%	1 .3%	11 .6%
Walking Along Roadway With Traffic - From Behind	7 1.9%	10 3.0%	11 3.2%	7 1.9%	9 2.4%	44 2.4%
Walking Along Roadway With Traffic - From Front	 .0%	 .0%	1 .3%	 .0%	1 .3%	2 .1%
Walking in Roadway	3 .8%	3 .9%	4 1.2%	5 1.3%	 .0%	15 .8%
Working in Roadway	5 1.4%	4 1.2%	5 1.4%	 .0%	4 1.1%	18 1.0%
Total	366 20.4% (2)	337 18.7%	347 19.3%	373 20.7%	375 20.9%	1798 100.0%

(1) Row percentage of the column total (2) Column percentage of the total

Combined with Motorist Failed to Yield (and it is often challenging to glean from crash reports and data, which party properly had right-of-way), these two types in which a pedestrian was crossing a roadway and the motorist was going straight ahead, account for nearly 17 percent of collisions and **18 fatalities** (29 percent of all fatalities, 6 percent of this crash type resulted in fatalities). These types of crashes were about evenly divided between light and dark conditions, with adults being more involved in these crash types than children, with the exception of children five and younger (who may be involved as companions with adults). Countermeasures include assessing the need for crossings that are suitably treated for the roadway type and crossing lines of desire (origins and destinations), perhaps additional lighting in areas of night-time crashes, and educating pedestrians to cross where there is lighting and to cross where gaps are provided by signals or to wait for suitable gaps in traffic. Speeding could also be a factor in these types of crashes, as motorist speed and gaps are particularly difficult to discern at night.

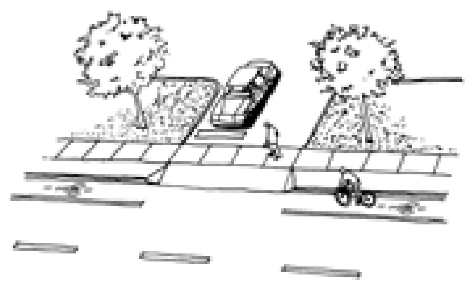
Similar to the above, pedestrian **Dash** (10 percent) and **Dart-out** (2.5 percent) crashes occurred a majority (68 percent) of the time at midblock locations. Dash implies that the pedestrian suddenly entered or ran into the roadway while dart-out means that the pedestrian came suddenly from behind an object, vehicle, or building that obscured the pedestrian from view until the last moment. A majority (63 percent) of these crashes occurred during daylight hours. **Seven fatalities** resulted from these types. More than 50 percent of dash/dart out types of crashes involved children and youth up to age 19 and children are over-represented in these types compared to overall involvement. Countermeasures would include slowing vehicle speeds on neighborhood streets, near schools, parks, and other areas where children are likely to walk; examining sight-distance issues (dart-outs); and behavioral interventions that target this behavior among children and young adults.

Other types of crashes occurring with some frequency involve motorists turning maneuvers. The most prevalent is **Motorist Left Turn** (6.5 percent) across the path of pedestrians walking on a parallel path in the same or opposite direction as the motorist (before the turn). Eighty percent of these occurred at intersections, with the remainder at non-intersection locations. The pedestrians struck at non-intersection locations were usually in a travel lane trying to cross the street when hit by motorists turning out of or into driveways. A variety of engineering (such as signal phasing and timing, signs, pavement markings, and curb radii reductions) and educational measures could be used to target this crash type. Crashes involving **Motorist Right Turn** (3.8 percent) often occur at signalized and stop-controlled locations and involve motorists making right turns across parallel or perpendicular path pedestrians. A frequent scenario includes motorists looking to the left for a gap in traffic and pulling out for a right turn without detecting pedestrians crossing from the right or on a parallel path. More than 1/3 of these crashes involved motorists making right turns on a red signal indication. Again, engineering measures such as tightening curb/turning radii, altering signal phasing, implementing restrictions on right-turn on red, adding warning signs, or other measures may help to reduce these types of crashes.



Crashes involving turning vehicles have resulted in **two fatalities** and eight serious injuries over this time period. These numbers represent lower than average proportions, likely due to the fact that turning vehicles have slowed for their turns. However, when vehicles do not yield to pedestrians when turning, pedestrians may develop the perception that there is no safe time to cross at an intersection and choose to cross at midblock locations instead. This choice could result in more dangerous crossings against higher speed traffic at midblock locations so improving interactions through enforcement and other measures at intersections may have a more widespread beneficial effect.

A majority of **Motorist Entering or Exiting Driveway or Alley** crashes (59 of the 64) involved motorists pulling out at driveways or alleys and striking pedestrians in the area of the driveway sidewalk crossing. Similar to Motorist Right Turns, these types of crashes may involve motorists looking to the left for a gap in traffic and pulling out and striking pedestrians coming from the right. Measures include driveway and crossing design improvements, checking for and correcting sight-distance issues, and reminders to motorists to yield to pedestrian (and bicycle) traffic. These types of crashes have yielded few serious and **no fatal injuries** during this time period, but they can potentially be serious, particularly at driveways with high turning speed designs or free-flow right turn lanes.



Walking Along Roadway with Traffic - From Behind crashes accounted for nearly 2 ½ percent of Charlotte crashes; when all walking along roadway types are combined, the proportion is nearly four percent. These types of crashes may be mitigated most readily by providing space for pedestrians to walk away from the path of motor vehicles. The space may include of sidewalks, paths or paved shoulders, dependent on the context or area type. Sixty-three percent of all Walking Along Roadway crashes occurred under dark conditions, with a significant portion (15 percent) occurring between midnight and 3 am. About 15 percent were reported to possibly involve alcohol. **Three fatalities** (4.4 percent of this type) resulted. Behavioral countermeasures therefore include enhancement and promotion of pedestrian conspicuity through both roadway lighting and personal devices (lights and retroreflective gear), promoting walking facing traffic and moving off the traveled way when cars approach, and for the longer term, providing space to walk, whether sidewalks, paths, or paved shoulders). Half of walking along roadway crashes were also reported to involve hit and run drivers and efforts should be made to investigate and arrest offenders that left the scene.

Interestingly, parking lot crashes (**Off Roadway – Parking Lot** and **Backing Vehicle - Parking Lot**), account for more than 15 percent of Charlotte area crashes. Twelve percent of children five and under collisions were this type. Twenty-eight percent of crashes involving adults 70 and older were this type, compared to 10 – 11 percent for all ages. The youngest two age groups were also highly involved (21 percent and 23 percent of collisions of those 0 – 5 and 6 to 10) in other off-roadway collisions such as in driveways and parking lots. Older adults are also over-represented in other off-roadway crashes, but to a lesser extent than young children. **Two fatalities** resulted from off-roadway collisions (not backing vehicle). These off-roadway crash types may be addressed with parking and commercial driveway planning polies and design, as well as educational measures. Caregivers should particularly be targeted regarding backing vehicles in areas frequented by young children including driveways (15 collisions were this type). In addition to the more "typical" driving-related parking lot crashes, most **Assault and Dispute-Related** crashes occur primarily off the roadway network, in parking lots. Enhanced lighting and security in parking areas, as well as traditional crime enforcement would presumably be needed to reduce these numbers.

Although not in the top tier for numbers of crashes, the **Crossing Expressway** crash type deserves mention since **10** or 16 percent of all **fatalities** occurred when pedestrians were struck while attempting to cross an express-style roadway. The other types of crashes with higher proportions fatalities are more obscure since the particular circumstances or details of the crash are often not known. Higher than average proportions of these obscure types of crashes also involved hit and run drivers (26 to 30 percent compared with 20 percent overall). **Fifteen fatalities** (or 33 percent of all fatalities) occurred under relatively obscure conditions. **Five fatalities** resulted from other Unusual Circumstances including two involving **Pedestrians on** or clinging to **Vehicles**, two resulting from prior **Vehicle to Vehicle or Vehicle to Object** collisions, and one involving a pedestrian standing near or walking to or from a **Disabled Vehicle.** One fatality involved someone **Working in the Roadway.**

The data in Table 12 are also coded during the PBCAT crash typing process. Using this software, "Intersection" location means that the crash was clearly indicated to occur within the intersection proper or within the bounds of the crosswalk area (marked or implied). Beginning with 2006, the Intersection-related category was established, which means that the crash occurred outside of the crosswalk area but within 50 feet of the intersection. Before 2006, these crashes would have been coded to either Intersection or Non-Intersection location. In addition, crashes that occurred along the sidewalk or driveway crossings parallel to the roadway were coded as Non-roadway before 2006, but now are considered roadway crashes since they occur along the road right-of-way.

Thus, the percentage changes over this time period reflect changes in coding as well as actual variability, but on average about 30 percent of (reported) crashes have occurred at or related to an intersection, nearly 40 percent occurred at midblock (non-intersection) locations, and 30 percent at non-roadway locations, primarily parking lots and other public vehicular areas. Charlotte has a slightly higher proportion of crashes occurring at midblock locations compared with all urban areas across the State (38 percent), a slightly lower proportion occurring in non-roadway areas (33 percent for the State urban centers) and essentially the same proportion connected with intersections.

Table 12. Pedestrian Crash Location Type, 2004-2008.

	2004	2005	2006	2007	2008	Total
Intersection	101	96	72	93	81	443
	27.6%	28.5%	20.7%	24.9%	21.6%	24.6%
Intersection-Related			40	25	25	90
	.0%	.0%	11.5%	6.7%	6.7%	5.0%
Non-Intersection	136	127	140	158	152	713
	37.2%	37.7%	40.3%	42.4%	40.5%	39.7%
Non-Roadway	127	114	93	97	116	547
	34.7%	33.8%	26.8%	26.0%	30.9%	30.4%
Unknown	2		2		1	5
	.5%	.0%	.6%	.0%	.3%	.3%
Total	366	337	347	373	375	1798
	20.4%	18.7%	19.3%	20.7%	20.9%	100.0%

Figure 11 shows the map resulting from a spatial analysis of intersection crashes. Thirteen intersections were identified with five or more pedestrian collisions within 100 feet over the 2004-2008 time period (Table 13). Five more were identified with four collisions. These intersections could also warrant investigation of geometrics, operational parameters, pedestrian amenities, and behavioral issues. We can also further explore the characteristics of the crashes that occurred at each location for more information.

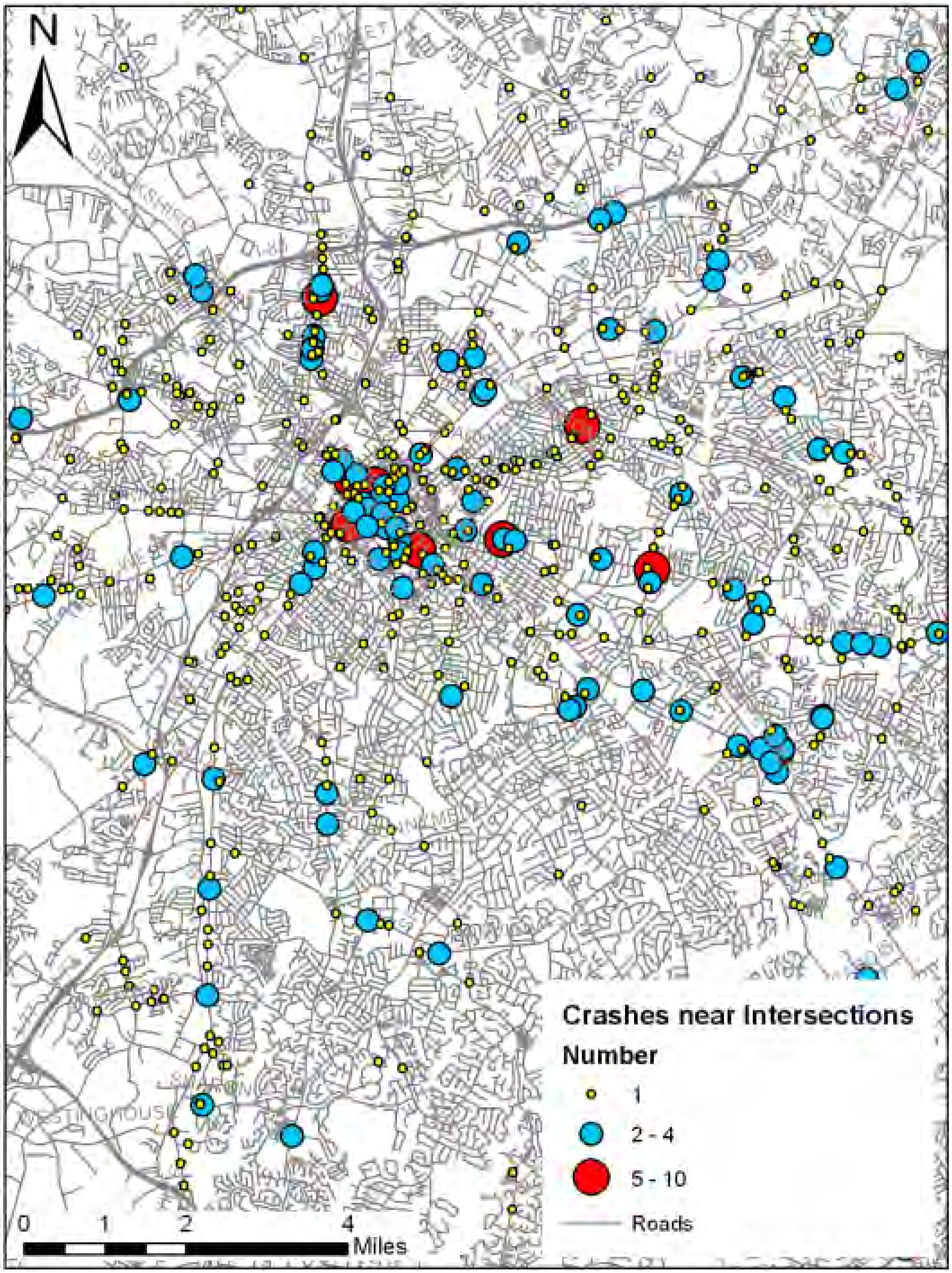


Figure 11. Intersections with pedestrian collisions within 100 feet of center, 2004-2008 (n = 532).

Table 13. Intersections with 4 or More Related Pedestrian Collisions within 100 feet of Center (complete listing available).

Number of Crashes	Description of Intersection
10	E 5TH ST_N TRYON ST_W 5TH ST
9	E TRADE ST_N TRYON ST_S TRYON ST_W TRADE ST
7	E TRADE ST_N COLLEGE ST_S COLLEGE ST
7	E STONEWALL ST_S COLLEGE ST
7	CENTRAL AV_EASTWAY DR
6	BEATTIES FORD RD_LASALLE ST
6	CENTRAL AV_PECAN AV
5	ELECTRA LN_IDLEWILD RD
5	E 36TH ST_THE PLAZA
5	N GRAHAM ST_S GRAHAM ST_W TRADE ST
5	N CHURCH ST_W 6TH ST
5	N CHURCH ST_S CHURCH ST_W TRADE ST
5	ELIZABETH AV_N KINGS DR
4	BEATTIES FORD RD_CATHERINE SIMMONS AV
4	ALLEN ST_BELMONT AV
4	CENTRAL AV_PECAN AV
4	ALBEMARLE RD_REGAL OAKS DR
4	E WOODLAWN RD_SOUTH BV

Analyses of midblock crashes highlights candidate zones (Figure 12) to conduct roadway audits and site-specific analyses to determine whether infrastructure, access, roadway operations, or behavioral issues such as failure to yield, speeding or crossing at night without lights are associated with these areas of higher than average midblock crashes.

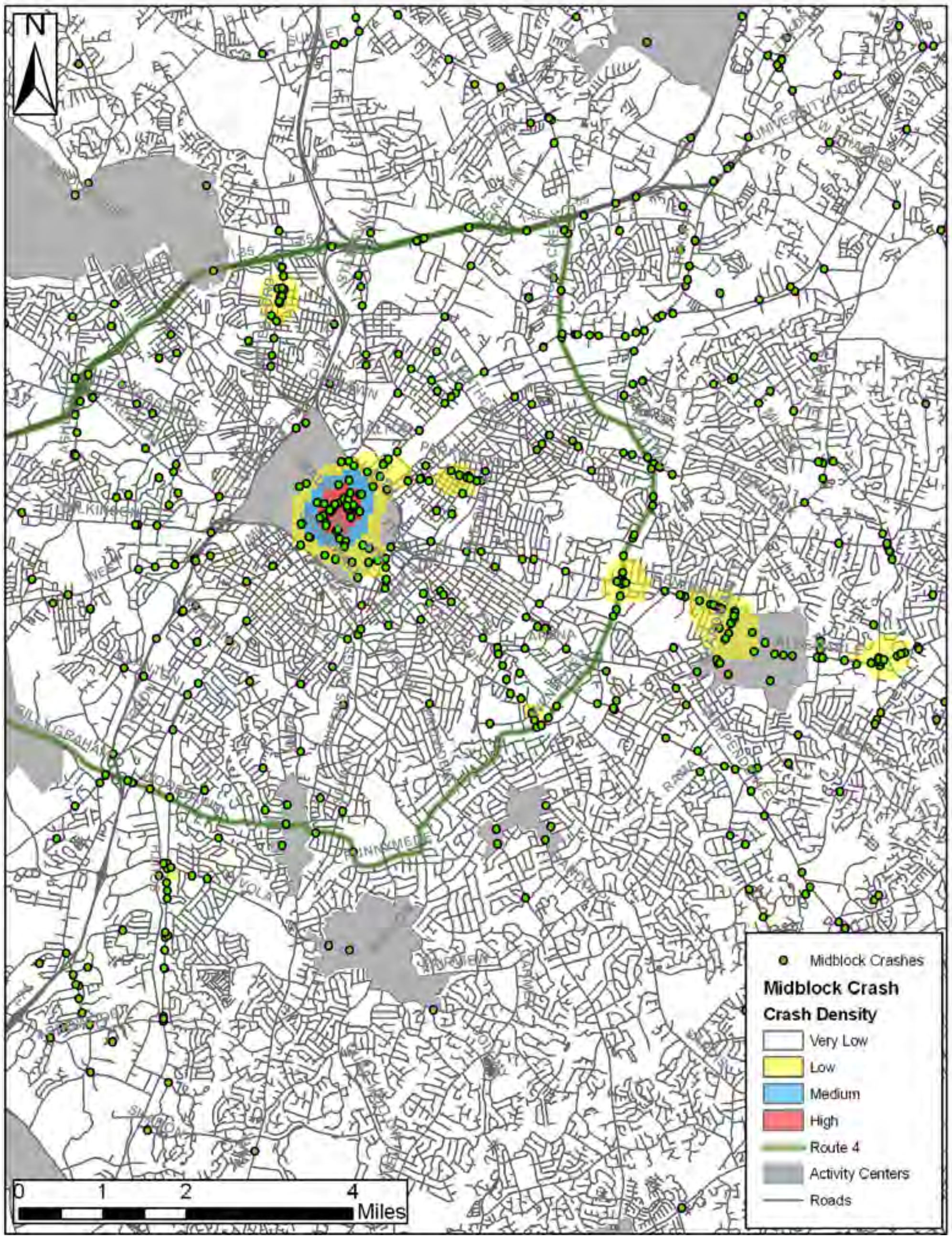


Figure 12. High density zones for midblock pedestrian crashes, Charlotte, 2004-08.

Analyses also identified bus stops where multiple crashes had occurred within 100 feet (Figure 13). These crashes were not necessarily associated with accessing the transit stop or transit stop operations, but could reflect conditions around the transit stop. Table 14. Bus stops with 3+ Pedestrian Crashes within 100 feet of Stop shows the top locations in terms of crash frequency. Again, these locations may be sites for further investigation, or could be part of a corridor wide analysis of conditions focusing on safety and access to transit stops among other conditions.

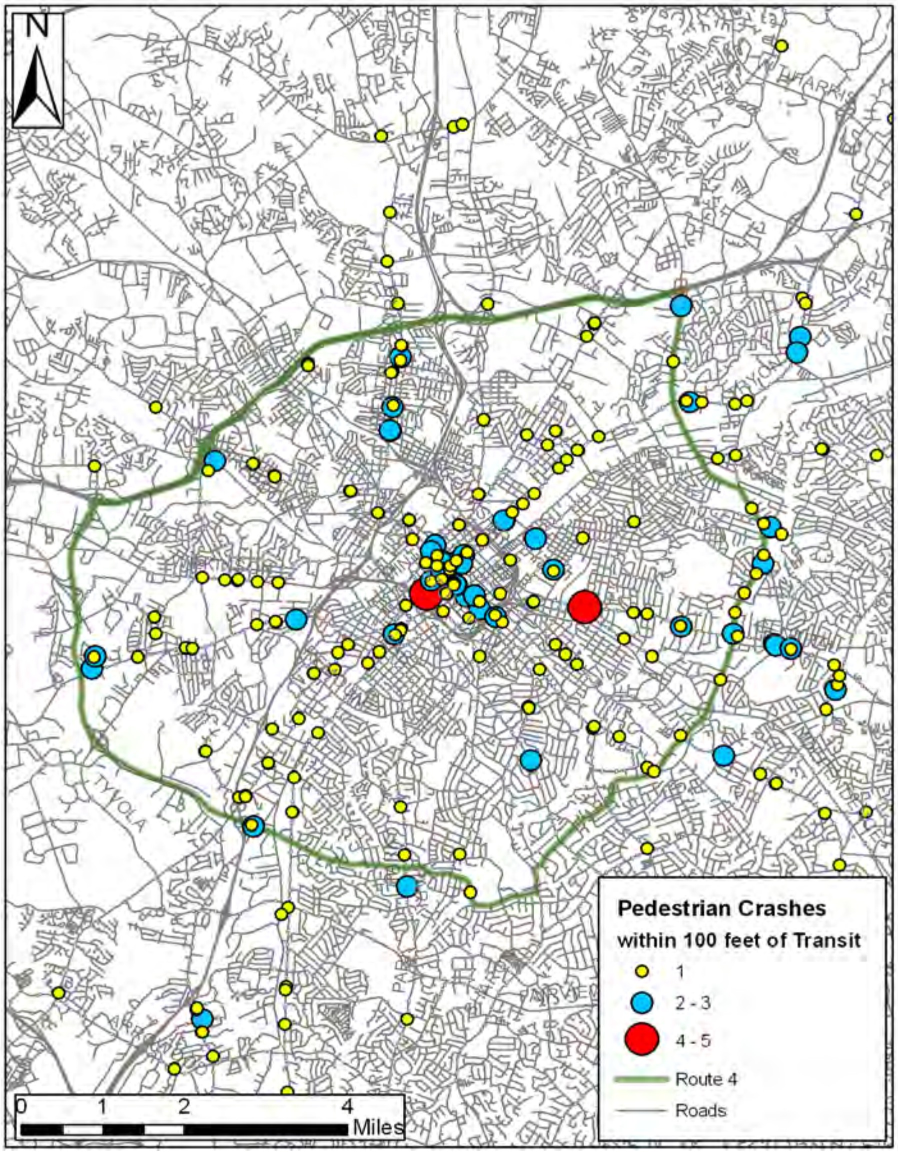


Figure 13. Transit stops with pedestrian collisions within 100 feet of stop, 2004-2008.

Table 14. Bus stops with 3+ Pedestrian Crashes within 100 feet of Stop (complete listing available).

Number of Crashes	StopID	Stop Description	Nearest Intersection
6	45093	Tryon & Trade	TRADE & 4TH
5	45399	College & Stonewall	STONEWALL & HILL
4	05140	Central & Pecan	PECAN & THOMAS
3	02470	Beatties Ford & Sanders	SANDERS & OAKLAWN
3	02530	Beatties Ford & Celia	CELIA & RUSSELL
3	02600	Beatties Ford & Lasalle	LASALLE & CATHERINE SIMMONS
3	02630	Beatties Ford & Keller	KELLER & HOLLY
3	07380	4th á& Davidson	DAVIDSON & ALEXANDER
3	09330	Eastway Dr & Central Ave	BURGIN & CENTRAL
3	18110	Tryon & 5th	5TH & 6TH
3	18710	Tryon & Wellingford	BEECHWAY & WELLINGFORD
3	31080	Sugar Creek & Reagan	WILSON & REAGAN
3	45021	Belmont & Allen	ALLEN & PEGRAM
3	45351	McDowell & 4th	TRADE & 4TH
3	45908	Harris & Hickory Grove	HICKORY GROVE & TRYSTING
3	45909	Harris & Hickory Grove	HICKORY GROVE & TRYSTING
3	45937	Tryon & Arrowhead	AUSTIN & ARROWHEAD

Another method used to identify locations with high midblock crash issues is to identify entire corridors or roadway sections that have a high frequency or a high crash rate per mile. Tables showing specific roadway sections with the highest counts and rates of crashes are included in the Appendices.

Since sections with higher crashes may reflect similar problems along an entire corridor, even if higher numbers of crashes haven't occurred yet along the entire corridor, it may be more prudent and proactive to focus attention corridor-wide. Corridors or entire roads that had the highest counts of pedestrian midblock crashes are shown in Table 15. Roads with high counts of pedestrian non-intersection (midblock) crashes, 2004-08. These corridors could reflect a wide variety of issues warranting further investigation, including long block lengths, lack of crosswalks, or large pedestrians volumes (such as in Uptown). These high crash corridors could also be the focus of countermeasure efforts in order to have a significant impact on pedestrian safety in the City. The entire list of roads that had any pedestrian collisions is also included in the Appendices.

Table 15. Roads with high counts of pedestrian non-intersection (midblock) crashes, 2004-08.

WHOLE ST NAME	Length	Non Inters. Ped Crashes	Avg. Crashes/Mi
N Tryon St	67414.1	54	4.2
Central Av	26865.2	27	5.3
South Bv	49554.0	24	2.6
Beatties Ford Rd	41420.5	22	2.8
Albemarle Rd	53101.3	19	1.9
Eastway Dr	22482.0	18	4.2
The Plaza	37729.3	17	2.4
S Tryon St	70734.9	16	1.2
E W T Harris Bv	58479.6	15	1.4
Monroe Rd	36525.0	15	2.2
N Sharon Amity Rd	32891.9	15	2.4
N I-85 Hy	111640.8	12	0.6
E 7th St	13030.3	10	4.1

Other Roadway factors

Thirty-six percent of Charlotte pedestrian collisions over this time period occurred on roadways with 35 mph speed limits (Figure 14); 35 mph is the urban statutory limit in NC and lower limits require special speed zone ordinances. Another 16 percent each were reported from 20 to 25 mph roads and 40 to 45 mph roads. Nearly 16 percent were also reported from areas with 5 to 15 mph speed limits, but a cross-tabulation reveals that a majority of these were on non-roadway areas such as public vehicular area/commercial driveways. Finally small percentages (< two percent each) were reported on higher speed limit roads. Fourteen percent of cases had no speed limits indicated (not shown in figure), predominantly for non-roadway crash locations.

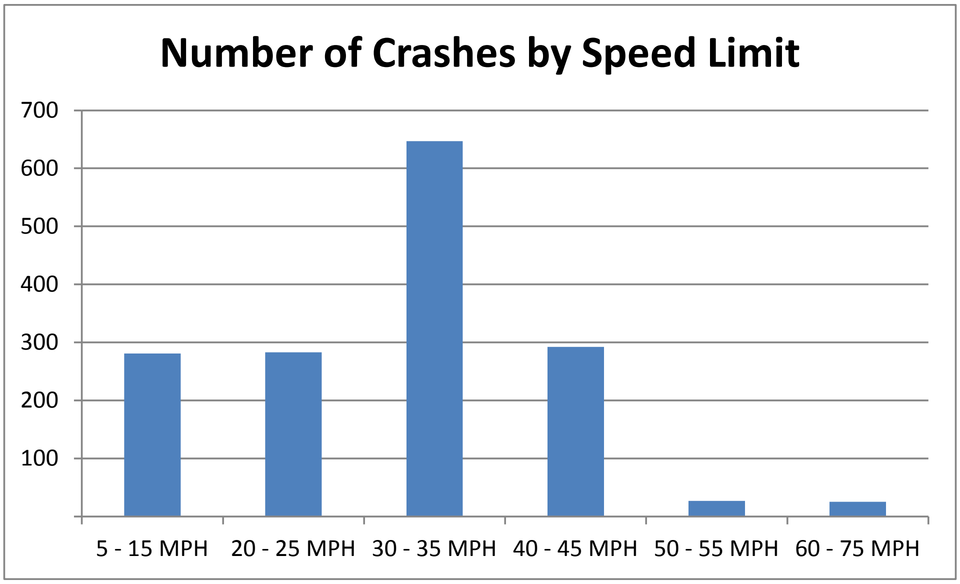


Figure 14. Pedestrian crashes by roadway speed limit, 2004-2008 (speed limits were indicated for roadways and some PVAs).

Although relatively few pedestrian crashes were reported from roadways with speed limits of 50 and higher, 25 percent of people struck on 50 to 55 mph roadways were killed, and 40 percent of those struck at 60 to 75 mph roads were killed (Figure 16). The 17 killed on higher speed roads represent 27% of those killed. Nineteen pedestrians were killed on 30 to 35 mph roads and 20 on 40 to 45 mph roads. Three pedestrians were reported killed on very low-speed roads/driveways. An analysis of killed and disabling injuries (Figure 15: Killed and Disabling Injury Pedestrian Crashes) also indicates that many of these injuries occur along major corridors, which can have high speed limits and even higher travel speeds.

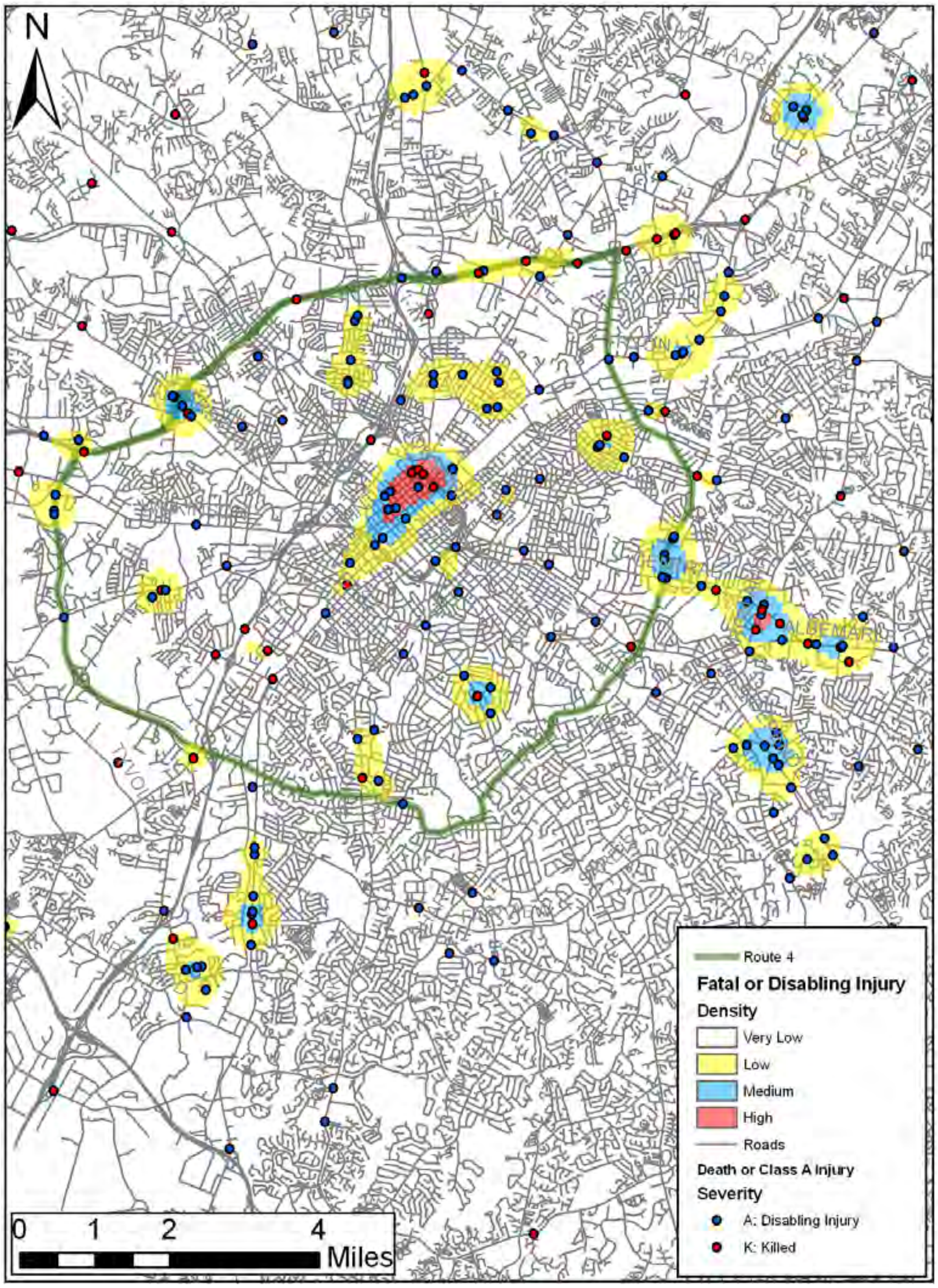


Figure 15: Killed and Disabling Injury Pedestrian Crashes

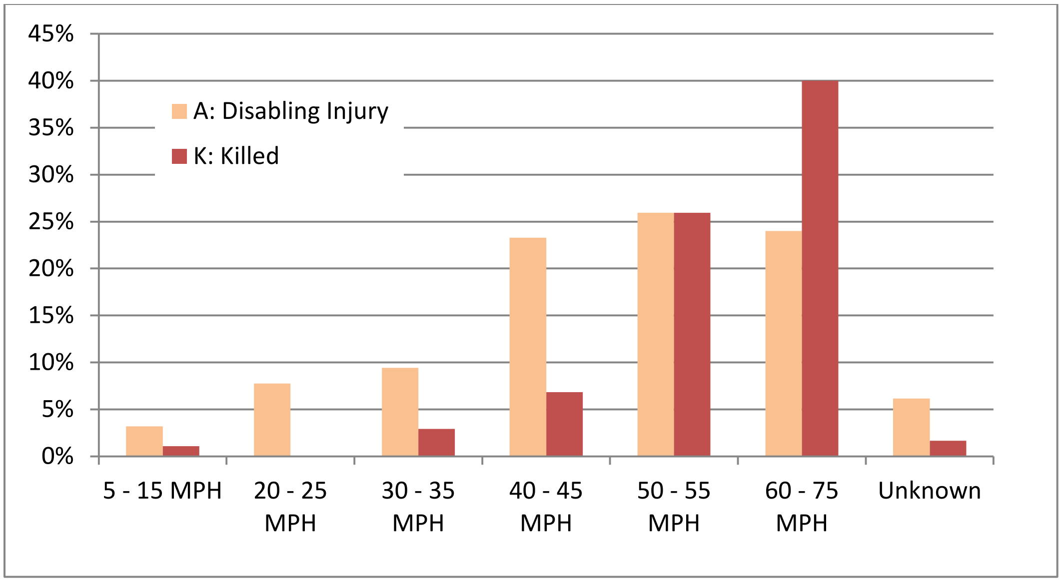


Figure 16. Percentage of pedestrians killed or seriously injured (A-type) by speed limit.

Seventy-one percent of collisions were reported to have occurred at locations with no traffic controls present, while 18 percent were reported to have occurred at locations with Stop and Go traffic signals and 7.5 percent at locations with Stop signs. Small numbers and percentages occurred at locations with various other types of traffic control, with 19 (one percent) of collisions reported at locations with human traffic control in operation. Very few (< three percent) of pedestrian collisions were associated with any sort of roadway or traffic control defects, although the accuracy of these data is unknown. The largest percentages of roadway issues identified were work zone-related, but these accounted for only 11 crashes (0.6 percent).

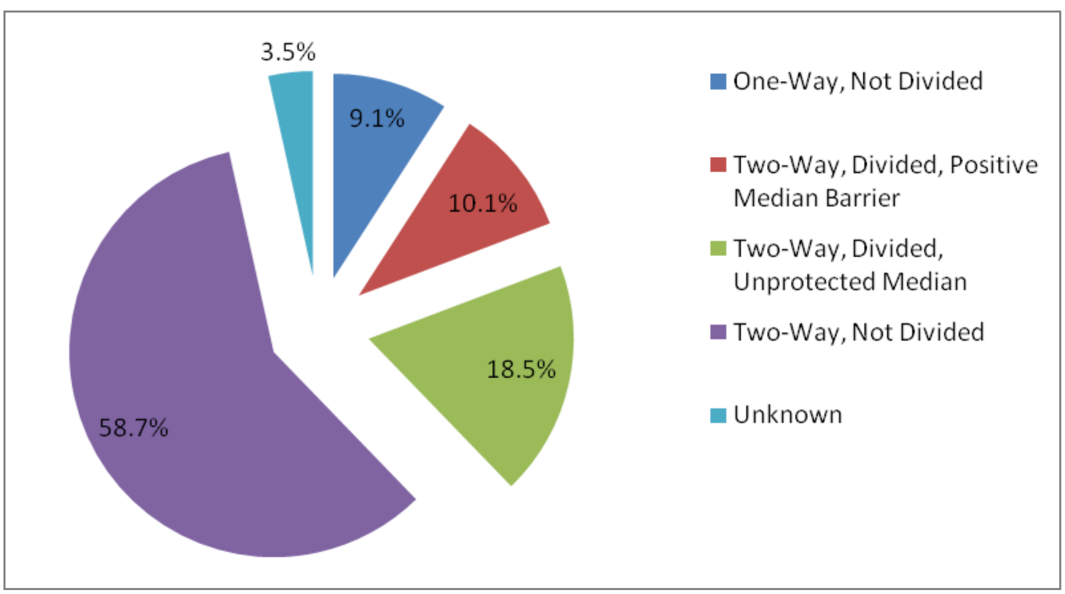


Figure 17. Percentage of pedestrian crashes by Traffic Flow Design.

In terms of Traffic Flow Design (Figure 17. Percentage of pedestrian crashes by Traffic Flow Design.), the majority of pedestrian crashes occur on two-way, undivided roads (58.7 percent), with two-way, divided roads with unprotected medians (18.5 percent), and two-way, divided with a positive median barrier (10.1 percent) following. There is some uncertainly, however, about the accuracy of road factors in crash data.

Thirty-three percent of crashes were also associated with two-lane roads, while 25 percent were reported on 4-lane roads. Another five percent each were reported from 3-lane and 5-lane roadways, seven percent from 6 or more lanes and about three percent from one-lane roadways.

Spatial Analyses

In addition to the intersection, roadway, and transit analyses shown earlier, spatial density analysis of pedestrian crashes was also used in this study. In simple dot maps, multiple crashes might occur at the same location or close enough that the actual density of crashes cannot be easily observed or quantified. Other types of "density" analyses including by population and by areas where also performed. These additional spatial exploration of 2004-2008 pedestrian crash data have further helped to illuminate specific zones where large numbers of crashes suggest that countermeasures might do the most good. Kernel density analysis is useful in examining broad areas where crashes may be more concentrated than in other areas of the City as it is not limited by artificial geographic boundaries; only by the edges of the map and or where crashes occurred. Kernel density also has some limitations as it searches in planar space for nearby crashes as opposed to along the street network, where roadway crashes, at least should be concentrated. However, we incorporated locations for off-roadway collisions in these data, and so the method may be especially useful in finding general concentrations of pedestrian crashes. (Note that some of the earlier maps shown also utilized kernel density analysis.) Figure 18 illustrates the areas overall with greater than average pedestrian crash density. The five zones identified with 25th percentile and above in relative crash density (low to high in the legend) together account for a significant percentage of all pedestrian crashes.

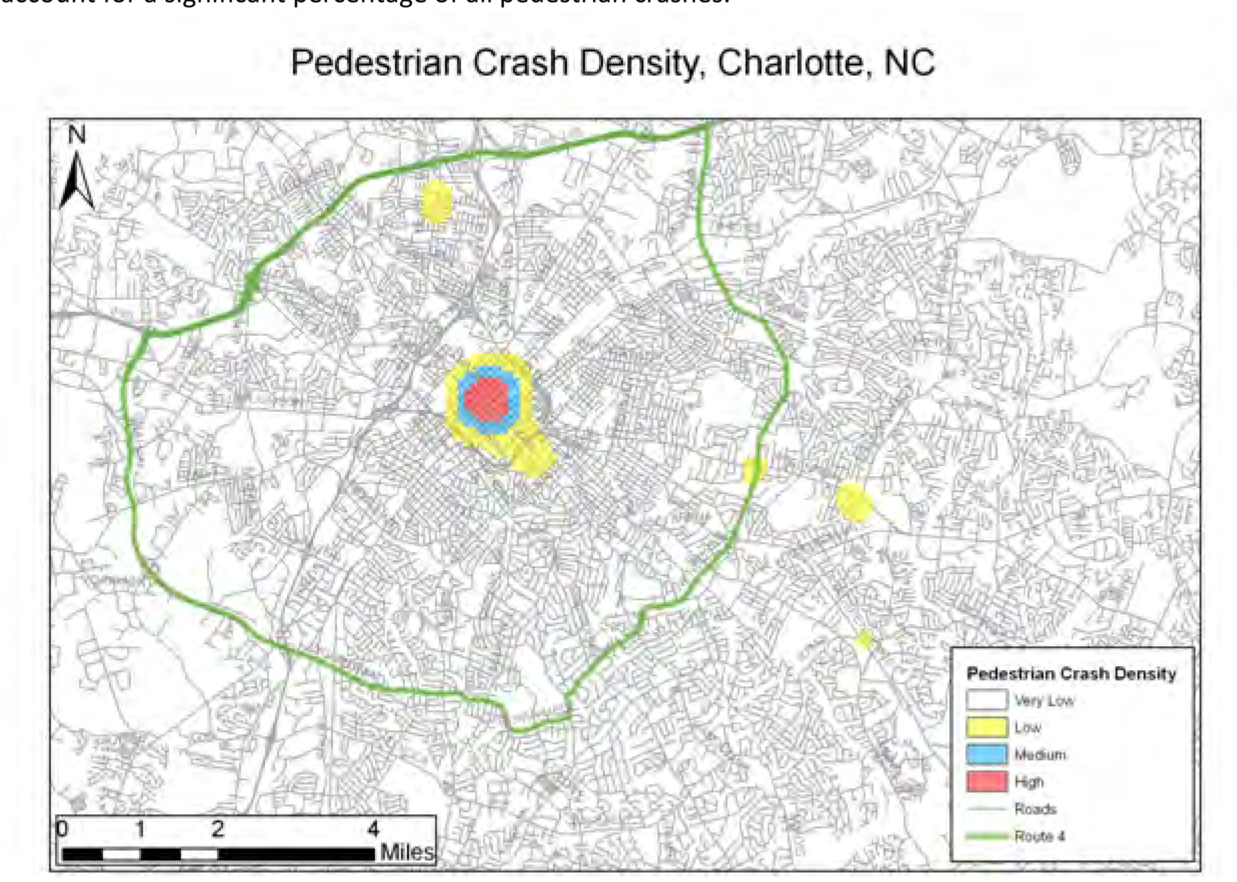


Figure 18. Kernel density analysis of all pedestrian crashes, 2004-2008 (n = 1745).

The next map (Figure 19) shows that these are by no means the only locations with crashes, but also illustrates the challenge in identifying hot spots through "dot maps" since many dots may lie at relatively the same location in the denser crash zones.

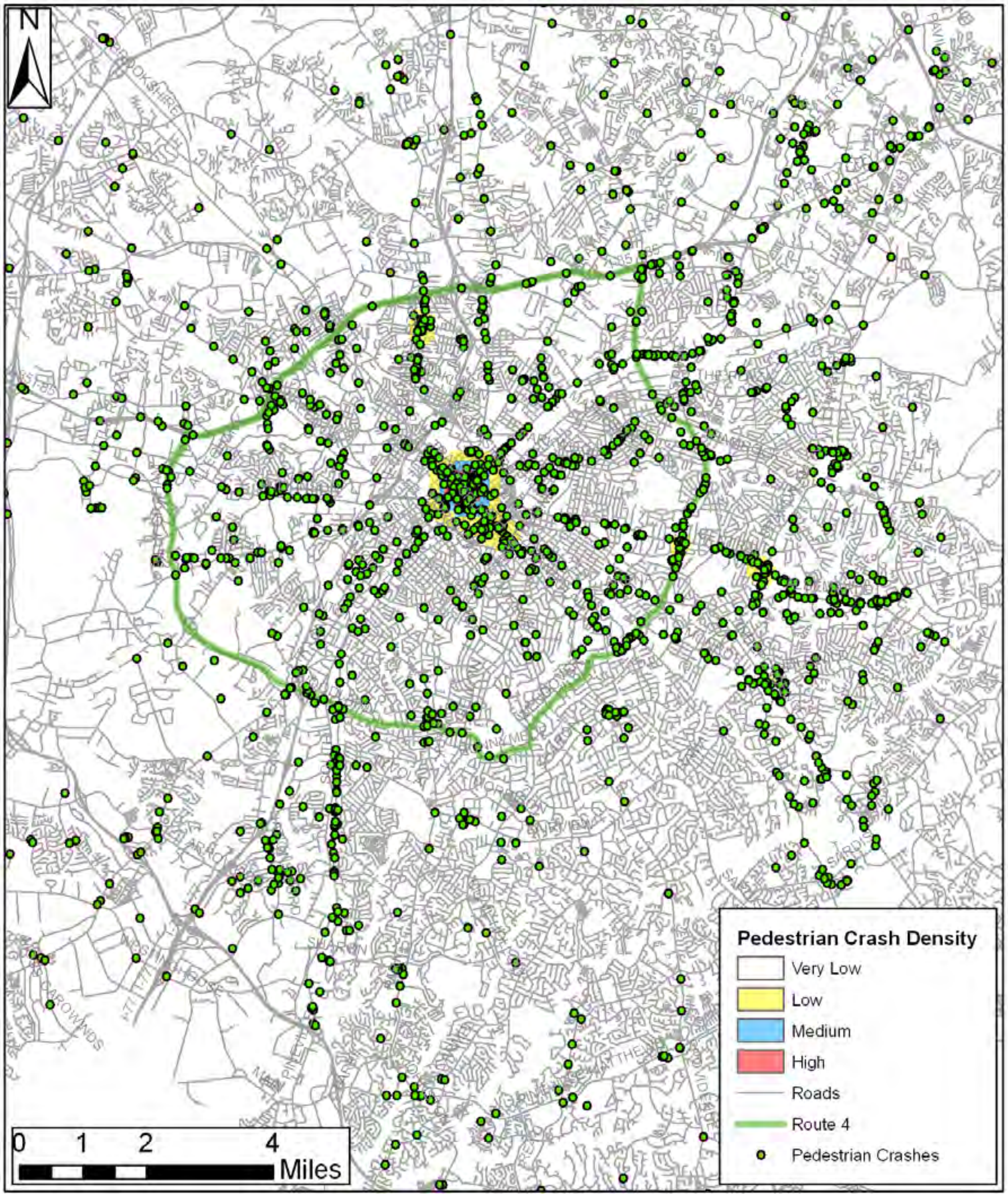


Figure 19. Kernel density of pedestrian crashes, overlaid with dot symbols for each pedestrian crash.

Figure 20 captures hot spots for the significant number of off-roadway only crashes. These areas merit further exploration to determine if environmental factors, lighting or design issues, or pedestrian and driver behaviors may be addressed by countermeasures focused on parking and store lots and driveways or other off-roadway areas.

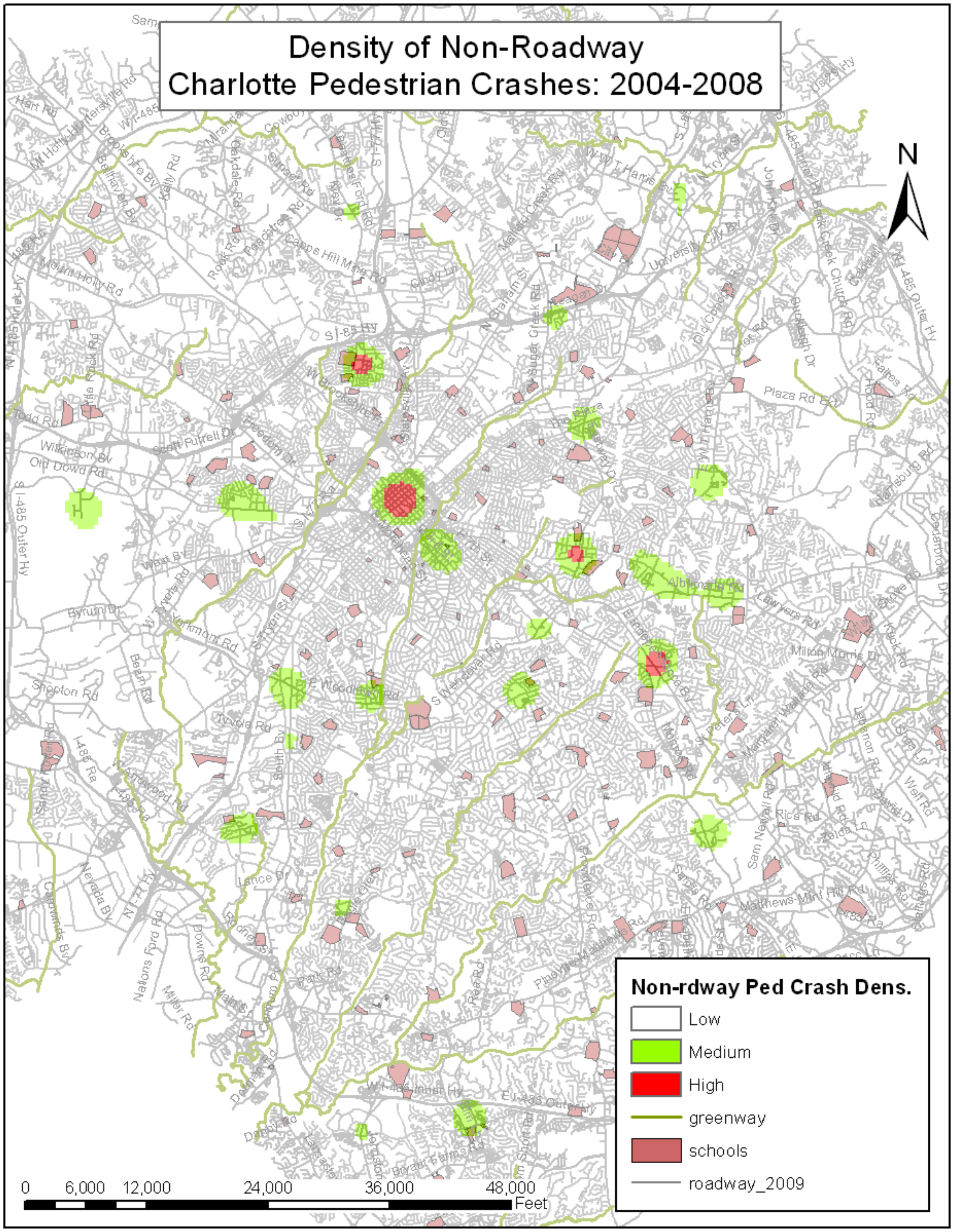


Figure 20. Kernel density analysis of non-roadway (primarily parking lot) crashes, 2004-2008 (n = 510).

Figure 21 shows analysis results to identify areas where collisions involving children 15 and younger were concentrated at higher than average densities. Again, these areas may warrant further investigation.

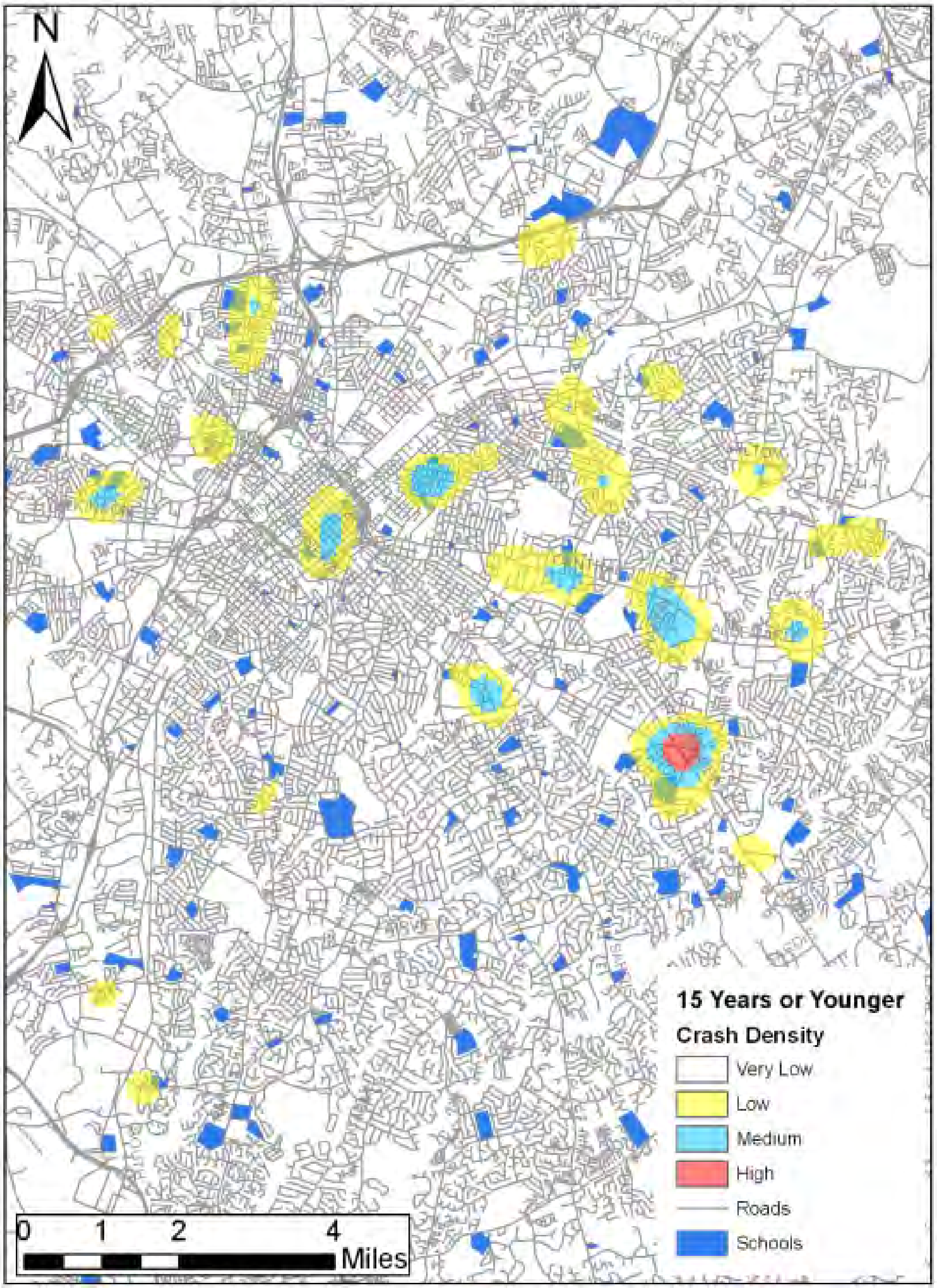


Figure 21. Kernel density of crashes involving pedestrians 15 years and younger, 2004-2008 (n = 238).

Using buffer zones around schools, we also identified schools where crashes involving school-aged children (5 to 15 years) occurred within ¼ mile of school boundaries (map not shown). Presumably these crashes could involve school-related travel, although we did not select by time of day, day of week or other factors. Even so, only three schools were identified that had more than two child pedestrian crashes within ¼ mile (Table 16). At present, we do not know what these results suggest about safety of neighborhood routes to most schools versus numbers of children walking to school.

Table 16. Schools with > 2 School-Aged Child (5 to 15 years) Pedestrian Crashes within ¼ mile of school boundary (complete listing in available).

Number of Child Crashes	NAME	ADDRESS	TYPE
4	Villa Heights Elementary	800 Everett Pl	public
3	West Charlotte High	2219 Senior Dr	public
3	Merry Oaks Elementary	3508 Draper Av	public

A map of areas of higher detection of alcohol involvement in crashes is shown in Figure 22.   These areas could suggest focus areas for enhanced enforcement or other measures targeting alcohol use.

We also analyzed density of a variety of other specific crash factors such as nighttime crashes, the relationship between sidewalk build out and pedestrian crashes (Figure 23), pedestrian race/ethnicity (not shown) and many others. Some of our findings were incorporated into recommendations for site visits and additional assessment, while some of our analyses are included in the Action Plan document and the Site Visit report. Many of these factor concentrations also reflect areas of high crash concentration generally identified in figures 17 – 20.

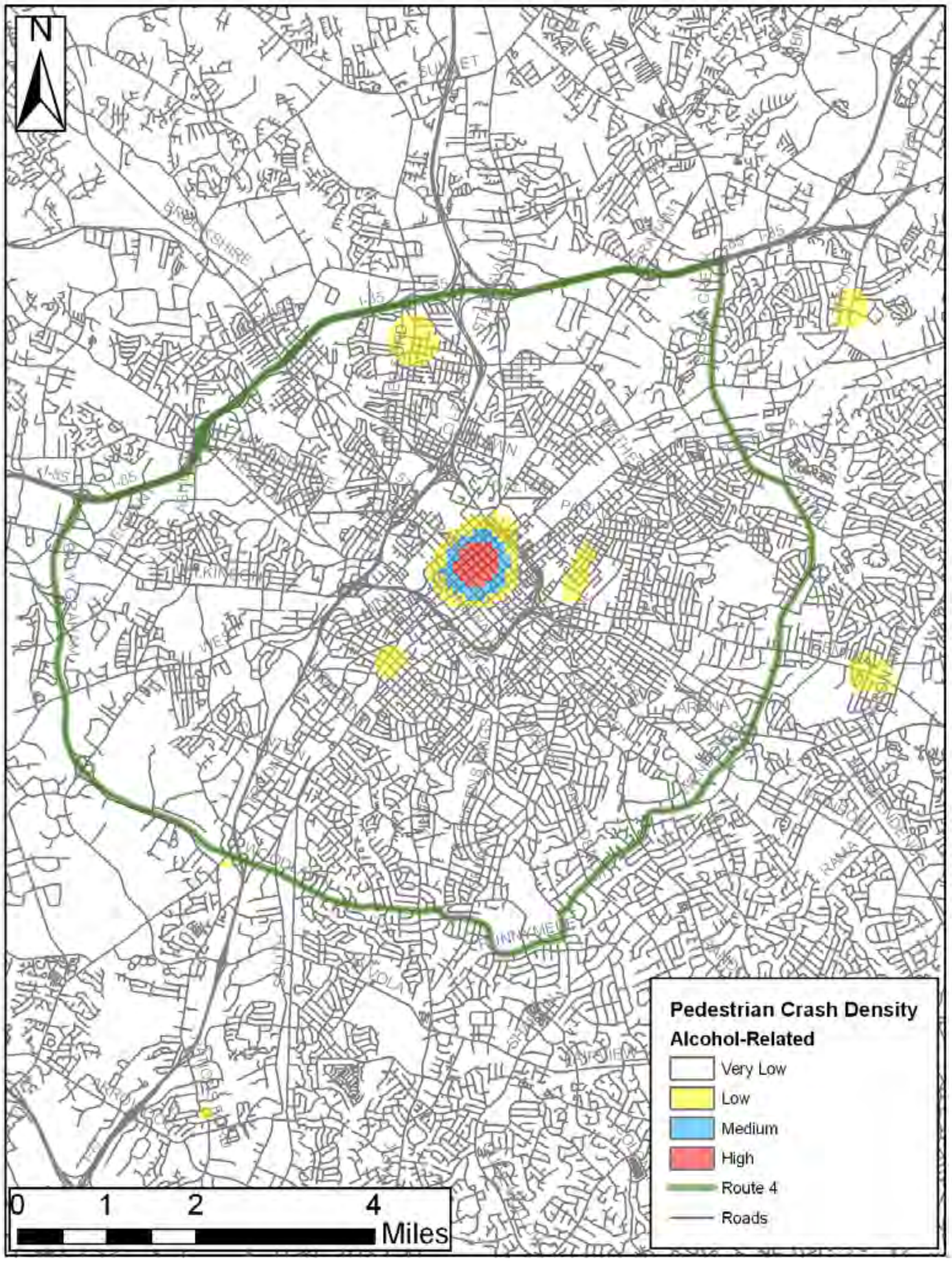


Figure 22. Areas of pedestrian or driver alcohol involvement, 2004-2008 (n =254).

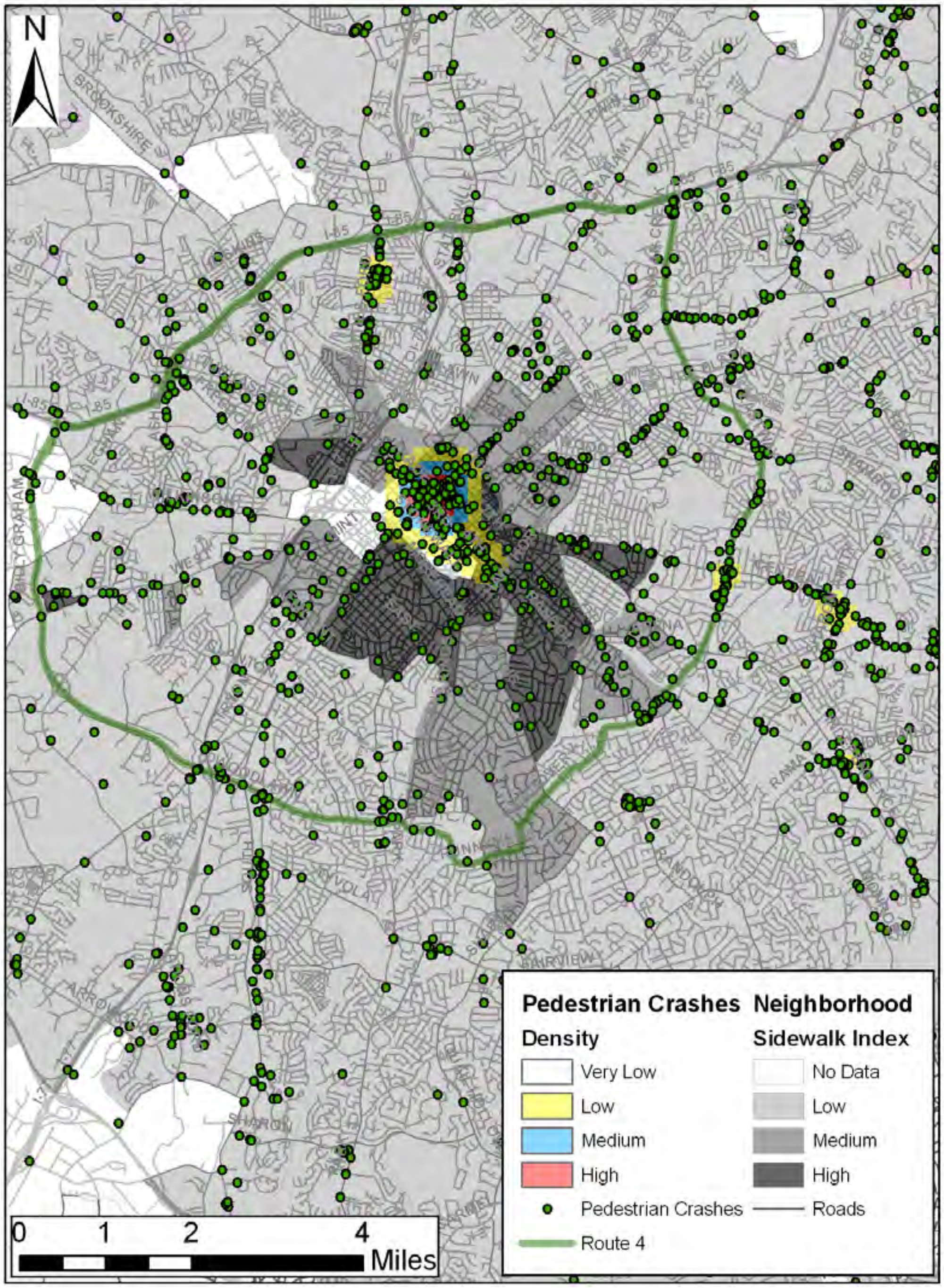


Figure 23. Higher kernel densities of pedestrian crashes overlain with sidewalk build-out index.

By refining our analysis to include neighborhood and census tract level data, we were able to identify additional correlations among high pedestrian crash areas and zones or neighborhoods of Charlotte that may help target pedestrian safety efforts. Figure 24 show where pedestrian crash rates per residential population are higher. These rates do not account for daytime/employment populations and therefore the downtown center shows the highest rate per population. Several other areas of the city have moderately high crash rates per population as well.

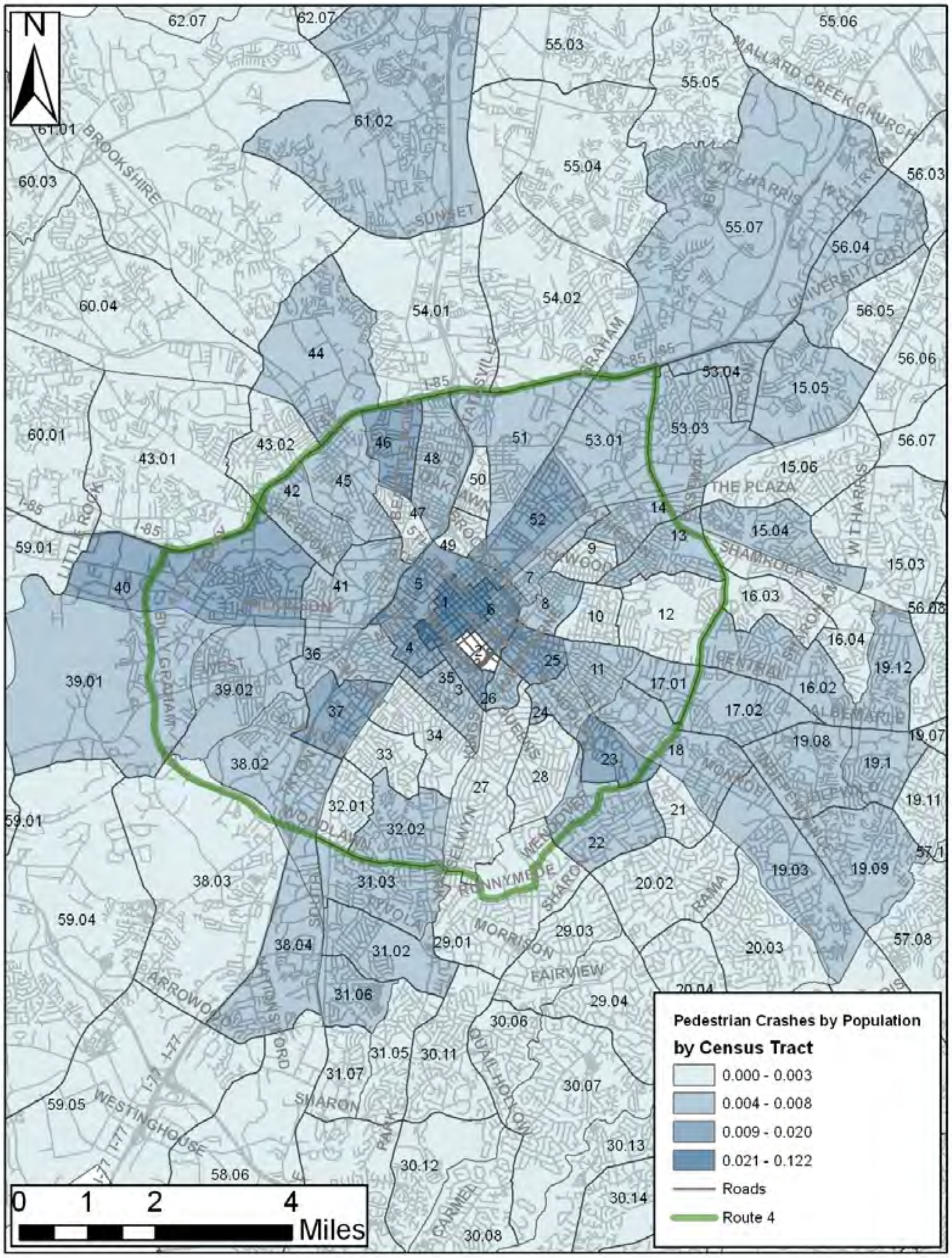


Figure 24. Pedestrian crashes by census tract (Labeled by Number)

Table 17: Census Tracts with High Pedestrian Crash Rates indicates the top ten census tracts with the highest rates of pedestrian crashes based on population. Many of the areas outside Uptown, particularly to the east, north, and west, are areas with high crash rates. A table showing the results for all of the census tracts is included in the Appendix.

Table 17: Census Tracts with High Pedestrian Crash Rates

Census Tract Number	Number of Crashes	Population in 2000	Area	Rate / 1000 population
1	137	1127	20355468	121.6*
25	30	1523	16379424	19.7
3	7	422	8663968	16.6
4	9	672	18735780	13.4
52	36	3056	39229316	11.8
40	52	4574	108847328	11.4
6	19	1755	11705073	10.8
5	25	2351	18074463	10.6
46	30	3162	24356467	9.5
37	19	2148	27404335	8.8

A similar pattern also emerges when crashes are examined on a per area basis, using the City's corridors and wedges shapefile for the area units.

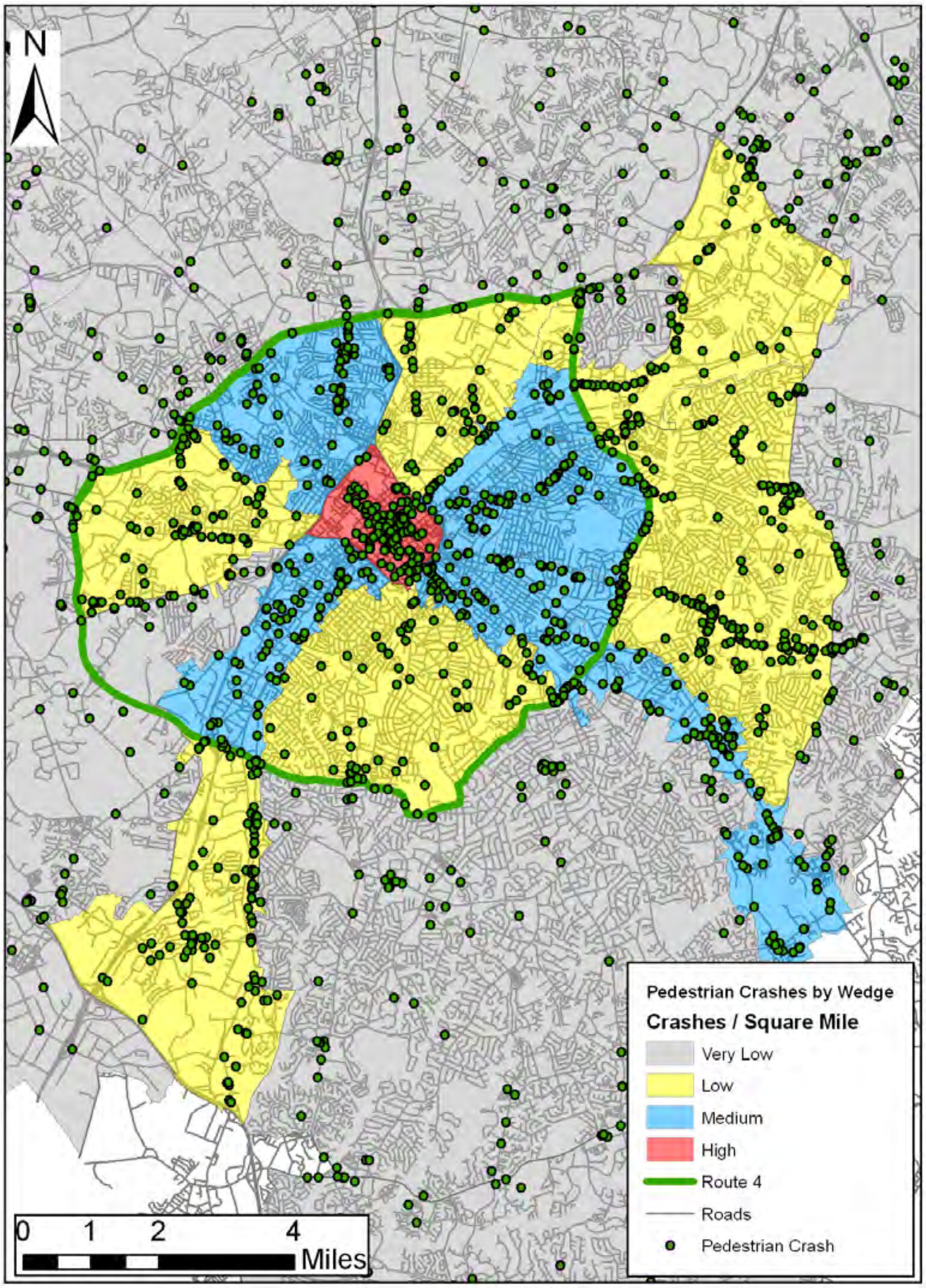


Figure 25. Pedestrian crash levels per area within different corridors and wedges of the City.

In the areas directly to the north and west of Charlotte's downtown, as well as along some eastern corridors, higher densities of pedestrian crashes per area identify these areas as potential priority areas for pedestrian safety initiatives. Several of these areas overlap with high pedestrian crash densities by population as well. For more information about pedestrian crashes by wedge, see Appendix.

In terms of the relationship between crime and pedestrian crashes, Figure 26 shows where crime hotspots overlap with higher pedestrian crash zones. Again, areas directly to the north, east, and west of downtown suffer from both high crime rates and large numbers of pedestrian crashes as well as quality of life rankings of "challenged" and "transitioning" (Figure 27). South Charlotte has low crash density as well as low crime and higher quality of life rankings. By improving pedestrian safety, it is possible that some of the other problems in these areas could also change for the better. It is also possible that partnerships and countermeasure efforts may help to address pedestrian safety along with some of the other issues such as crime, high school drop-out rates, night-time crashes involving teens and young adults, and others.

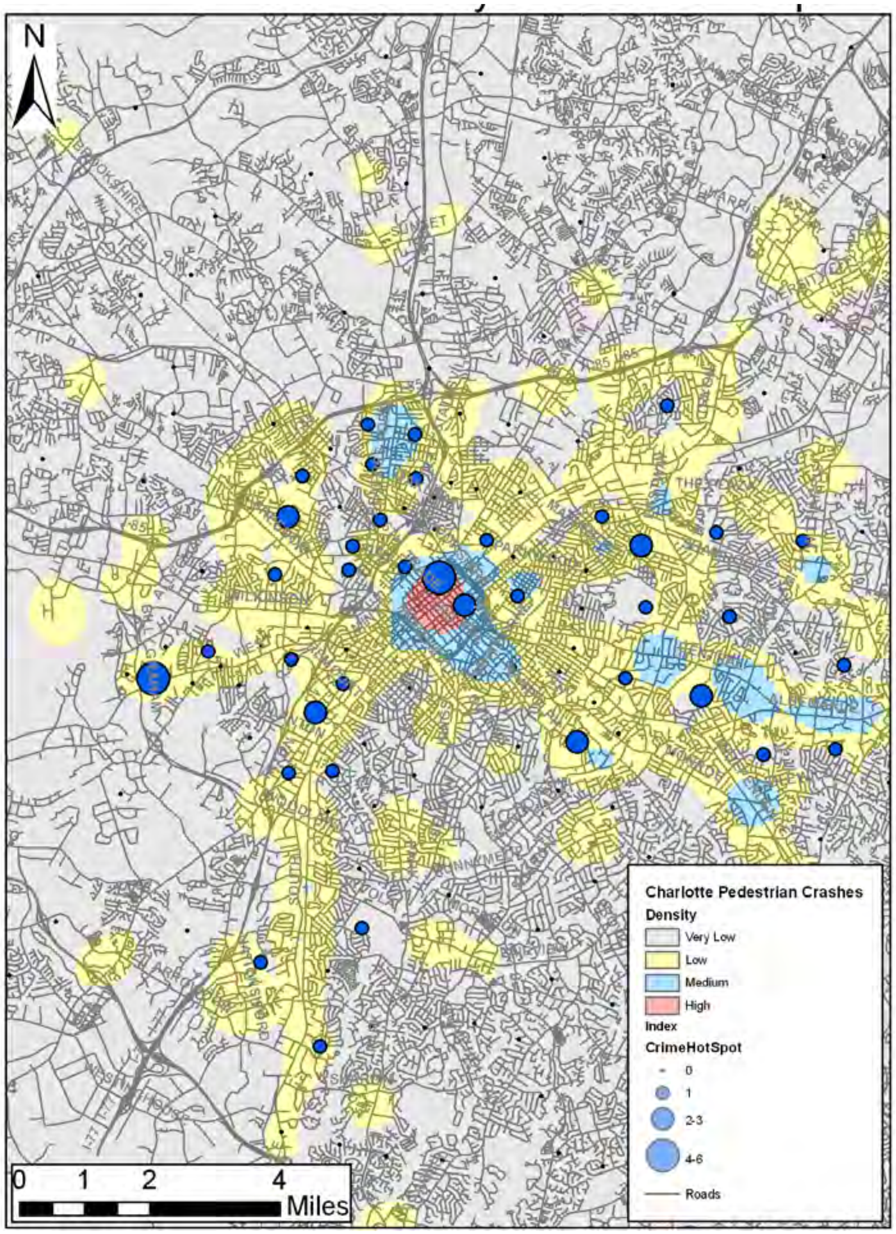


Figure 26. Crime hotspots and pedestrian crash density, 2004-08

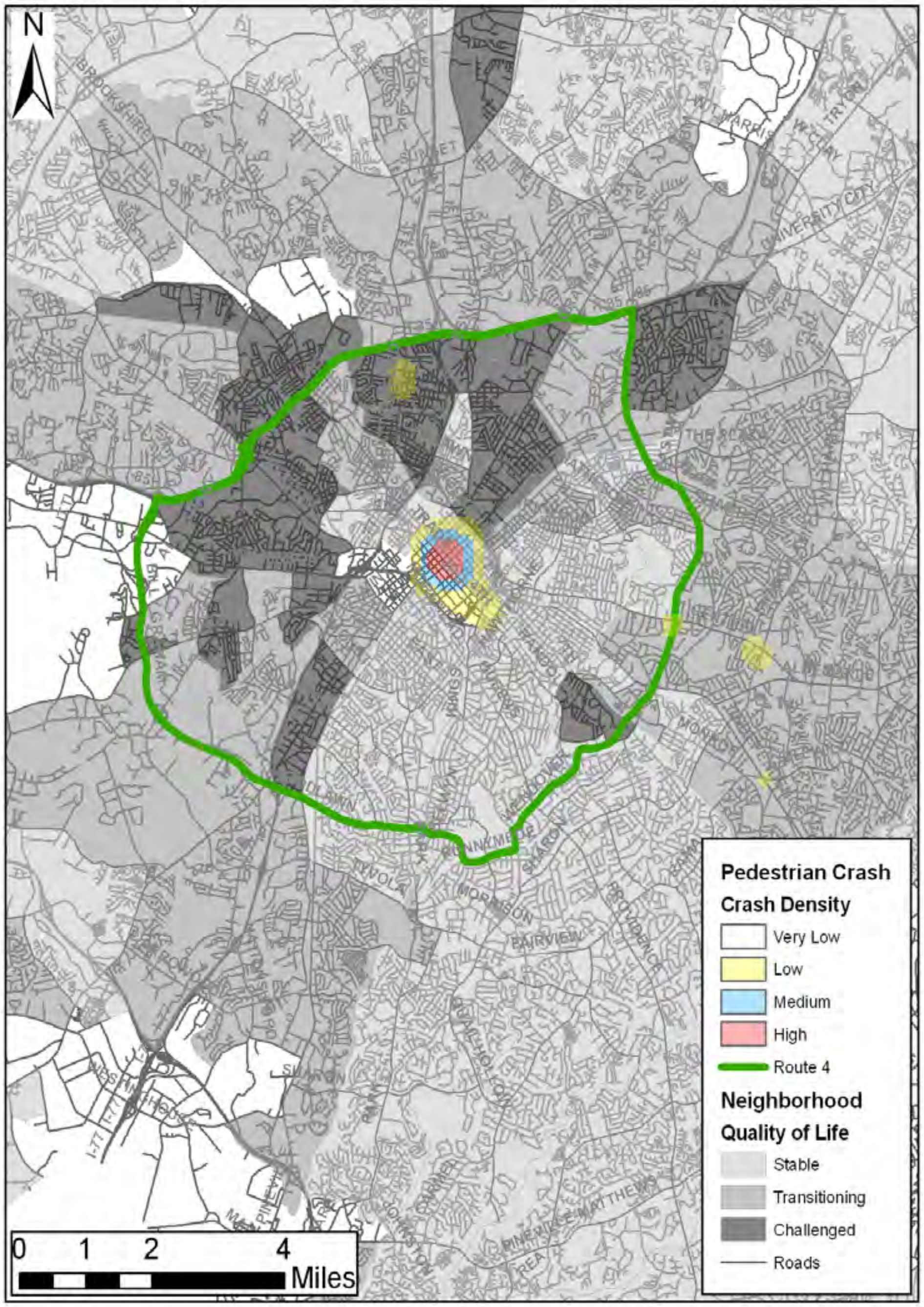


Figure 27. Quality of life index and pedestrian crash density for 2004-08.

Summary of Data Analysis Findings

- Crashes have fluctuated over the past dozen years, but the trend is generally upward and 2007 and 2008 are both up from 2005 and 2006.

- Children up to age 15 accounted for 238 of those struck in reported collisions (~13 percent of the total) over the 2004 to 2008 time period. Children five and under accounted for three percent. By comparison to another large urban area (although one with vastly different characteristics), pedestrians up to age 15 comprised 28 percent of those struck in the City of Chicago.

- The crash problems as characterized by reported collision data suggest that adults of all ages are most involved in collisions, but particularly young adults (16 to 29) who accounted for 30 percent of all pedestrian collisions, with adults 30 to 59 comprising 47 percent and adults ages 60 and up accounting for less than eight percent. The rates based on population suggest that the crash problem in Charlotte at present centers more on adults than on children.

- Males of all ages accounted for about 60 percent of pedestrians involved.

- Persons of black or African American heritage accounted for more than half (52 percent) of the Charlotte area pedestrian collisions. Persons identifying as Hispanic accounted for about 10 percent with whites accounting for 35 percent and Asian and other groups accounting for three percent.

- The afternoon and evening peak travel periods spanning from 3 to 6 pm (22 percent) and 6 to 9 pm (18 percent) accounted for the largest proportion of crashes but a lower than average proportion occurred during later evening and night-time compared with the State on average.

- There were fewer crashes during periods of darkness than typical for the State with proportionally more during morning and mid-day hours. However 75 percent of fatalities occurred at night with 43 percent indicated to be on roadways with no supplemental lighting. Twelve (or 19 percent) of pedestrians killed were struck at night on interstate highways.

- A variety of roadway and off-roadway crash types were observed with a majority of fatalities occurring in collisions where the pedestrian was crossing a roadway and was struck by a through vehicle (18 fatalities), dashed or darted into the roadway (seven fatalities), or was crossing an expressway (10 fatalities). Other fatalities occurred under more obscured conditions where the pedestrian was in the roadway but other factors are unknown, or under unusual circumstances (such as prior crashes). Alcohol use was also over-represented among fatal crashes.

- Crashes overall are fairly evenly divided by location type (midblock, intersection, and off-road). Fatalities, however, are more concentrated at non-intersection locations (75 percent of those killed, although only 40 percent of collisions occurred at such locations). Fatalities are also over-represented on higher speed limit roadways of 5o+ mph (27 percent of fatalities, although only 3 percent of collisions took place on these roads).

- High crash intersections among other high crash areas, could be candidate sites for roadway safety audits and may warrant special enforcement activities as well as engineering and other measures. Motorists making turns without yielding to pedestrians at intersections are a frequent crash type that may affect where pedestrians choose to cross.

- Areas with concentrations of midblock crashes were also identified where additional roadway and behavioral assessments could occur. Motorists often fail to yield to pedestrians when turning in and out at driveways and pedestrians often fail to yield or choose a safe gap when crossing at midblock locations. Specific roadways with high numbers of pedestrian midblock collisions were identified. These corridors could be the focus of additional safety audits, analysis, and identification of appropriate engineering, enforcement and educational countermeasures. Transit stops with pedestrian crashes occurring nearby were also identified. Both mid-block and transit areas could represent segments with inadequate infrastructure and access, operational issues, as well as potential behavioral issues such as speeding, failure to yield, or lack of conspicuity at night. Further site assessments are warranted and these may in turn help to identify appropriate countermeasures such as enforcement or targeted educational measures, along with potential engineering remedies.

A variety of spatial analyses show that crashes appear to be concentrated downtown, and in some areas northwest, southwest, and east sides of Charlotte. We also identified overlapping issues such as neighborhoods in transition, low sidewalk buildout, crashes involving Hispanic youth (not shown), alcohol involvement, off-roadway crashes, and crime hotspots.

Discussion

The development and examination of crash data is an important first step in developing a plan to address pedestrian safety problems in the City of Charlotte and prioritizing pedestrian safety measures (Zegeer, Sandt, Scully, et al., 2008). Overall crash issues were described in tables analyzing the pedestrian safety issues City-wide and including demographics, pedestrian and driver behaviors, and location and environmental factors associated with crashes. Some of these factors may be useful for targeting countermeasures City-wide including enforcement, educational, lighting and other issues. In addition issues characterized may be useful when reviewing and developing plans, development guidance, and other policies and inter-departmental and agency cooperative efforts.

Further examination of crash types may also help to identify areas of concern for particular types of problems that might be addressed by countermeasures. For example, Walking Along Roadway collisions could be examined to determine where and why pedestrians are struck while walking along the roadway. Are there gaps or a lack of facilities or space to walk, or are other issues present? For night-time collisions, are there gaps in lighting resulting in dark zones, poor maintenance of lighting, or roadways or segments where no lighting exists but may be needed.

High crash areas at various scales and areas with different types of crash issues were also identified through a variety of spatial analyses. Intersections and corridors with high counts (and for corridors – rates per mile) of pedestrian crashes were identified. Such locations may also be targeted for further assessment of more location-specific (intersection, corridor, segment) crash problems. Once specific locations are identified, more detailed examination of crash factors may be incorporated into on-site assessments of roadway geometry and operations, and observations of pedestrian-motorist interactions such as in roadway safety audits. See Nabors et al., (2007) for more information on conducting roadway safety audits and prompt lists for focusing on pedestrian issues. In addition, more detailed examinations could incorporate neighborhood population and built environment characteristics in conjunction with traffic crash and demographic factors. Such analyses should aid efforts to develop and target enforcement and educational countermeasures as well as policy and engineering treatments to the specific problems and target audiences in each area. Tools such as PEDSAFE (Harkey and Zegeer, 2004), Countermeasures That Work (NHTSA, 2010; 6th edition due shortly), the NCHRP Guide for Reducing Collisions Involving Pedestrians (Zegeer, Stutts, Huang, et al., 2004), NCHRP Report 622, Effectiveness of Behavioral Highway Safety Countermeasures (Presseur, Williams, Nichols, Tison, and Chaudhary, 2008), and other references provide help in identification of potentially suitable countermeasures. ***All countermeasures and locations should be thoroughly assessed by qualified traffic safety officials before implementation.***

Analyses have not yet incorporated pedestrian or motor vehicle volumes or other exposure measures, apart from population density, area, or linear roadway miles. Although the analyses reported on herein do not account for relative risk or crash rates per individual, identifying areas with significant numbers of pedestrian collisions is still a valid way to prioritize where both engineering and behavioral improvements might be focused to help bring down numbers of crashes, especially when supplemented by additional information gleaned from site visits and roadway audits to assess specific problems.

Finally, in developing a safety action plan, it should be considered that crash data suffer from inaccuracies and incomplete reporting (Zegeer, et al. 2008). Although every effort has been made to code the crashes in the analysis database correctly with respect to type and location, these fields and the other reported crash factors undoubtedly contain some errors. In addition, pedestrian falls and mishaps due to maintenance issues or other factors are not reported in State crash data. It is also the case, that crashes may increase at one location and decrease at others even if nothing is done – a well-documented statistical phenomenon known as regression toward the mean. Thus, in an effort to be more proactive, one might identify areas with similar issues to those with current crash problems and treat them in a similar fashion. City-wide improvements such as measures to slow vehicle speeds, improve visibility and lighting and others may also be undertaken (Zegeer et al 2006, pp 13-17).

Other Data Issues

We have obtained an intersection database from Charlotte with a number of attributes on signalized intersections, including physical and geometric site characteristics, traffic and pedestrian volume data, and land use variables. An earlier version of this data was compiled as part of the NCHRP 17-26 project. We have made limited explorations of this database to determine how these data might best be used to evaluate safety conditions for pedestrians in Charlotte that incorporate the effects of traffic and pedestrian volumes, particularly at intersections.

Next Steps

These data analyses will be combined with additional contextual information and observations from City staff and stakeholders to identify high crash target areas. These target areas will be further examined through field visits and additional analysis. With stakeholder input, analysis data, and site visit observations in place, a targeted pedestrian safety action plan will be developed. This action plan will be reviewed by a wide variety of Charlotte stakeholders and revised with their input. This action plan will serve as the basis for the project intervention and evaluation efforts for the subsequent 3 years, but will be regularly updated as new issues and opportunities arise.

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ESRI. ArcMap™ 9.2. ArcInfo. Copyright 1999-2006 ESRI Inc., All rights reserved.

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Supporting Material: Pedestrian Crashes

Table 18: Charlotte Intersections with Pedestrian Collisions between 2004-2008

Number of Ped Crashes	Description of Intersection
10	E 5TH ST_N TRYON ST_W 5TH ST
9	E TRADE ST_N TRYON ST_S TRYON ST_W TRADE ST
7	E TRADE ST_N COLLEGE ST_S COLLEGE ST
7	E STONEWALL ST_S COLLEGE ST
7	CENTRAL AV_EASTWAY DR
6	BEATTIES FORD RD_LASALLE ST
6	CENTRAL AV_PECAN AV
5	ELECTRA LN_IDLEWILD RD
5	E 36TH ST_THE PLAZA
5	N GRAHAM ST_S GRAHAM ST_W TRADE ST
5	N CHURCH ST_W 6TH ST
5	N CHURCH ST_S CHURCH ST_W TRADE ST
5	ELIZABETH AV_N KINGS DR
4	BEATTIES FORD RD_CATHERINE SIMMONS AV
4	ALLEN ST_BELMONT AV
4	CENTRAL AV_PECAN AV
4	ALBEMARLE RD_REGAL OAKS DR
4	E WOODLAWN RD_SOUTH BV
3	E ARROWHEAD DR_N TRYON ST_W ARROWHEAD DR
3	AUSTIN DR_N TRYON ST
3	BEATTIES FORD RD_KELLER AV
3	N TRYON ST_WELLINGFORD ST
3	BEATTIES FORD RD_CELIA AV
3	BEATTIES FORD RD_SANDERS AV
3	E LIDDELL ST_N TRYON ST
3	CENTRAL AV_LOUISE AV
3	SUTHER RD_UNIVERSITY CITY BV
3	COTTONWOOD ST_N GRAHAM ST_REAGAN DR
3	E INDEPENDENCE BV_VILLAGE LAKE DR
3	E ARROWOOD RD_SOUTH BV_STARBROOK DR
3	E 6TH ST_N COLLEGE ST
3	E 7TH ST_N BREVARD ST
3	E 3RD ST_S TRYON ST_W 3RD ST
3	E 3RD ST_S COLLEGE ST
3	E 4TH ST_S BREVARD ST
3	E 4TH ST_S DAVIDSON ST

Number of Ped Crashes	Description of Intersection
3	E 10TH ST_LOUISE AV
3	E 4TH ST_S MCDOWELL ST
3	REMOUNT RD_WEST BV
3	E 7TH ST_N CASWELL RD_PECAN AV
3	CENTRAL AV_ROSEHAVEN DR
3	CENTRAL AV_N SHARON AMITY RD
3	NATIONS FORD RD_S TRYON ST_YORKMONT RD
2	JOHN KIRK DR_VAN LANDINGHAM RD
2	REAGAN DR_TOM HUNTER RD
2	BEATTIES FORD RD_KELLER AV
2	BROOKSHIRE BV_N CRIGLER ST
2	LAMBETH DR_N TRYON ST
2	BEATTIES FORD RD_TATE ST
2	BEATTIES FORD RD_RENNER ST
2	DOGWOOD AV_NORRIS AV
2	E 27TH ST_N TRYON ST_W 27TH ST
2	JOYCE DR_MILTON RD
2	MILTON RD_VILLAGE GREEN DR
2	MILTON RD_SUNRIDGE LN
2	E 16TH ST_N DAVIDSON ST
2	EASTWAY DR_MAGNOLIA HILL DR
2	CENTRAL AV_WEMBLEY DR
2	RENSSELAER AV_SOUTH BV
2	EASTWAY DR_MEDFORD DR
2	HOLABIRD LN_WEST BV
2	E INDEPENDENCE BV_E INDEPENDENCE/BRIAR CREEK RA
2	CLEARMONT AV_N SHARON AMITY RD_SPANISH QUARTER CR
2	CHIPPENDALE RD_MONROE RD
2	BEAL ST_N WENDOVER RD
2	MANDARIN BV_MONROE RD
2	AMITY PL_BOSTON AV
2	BOSTON AV_SPRINGFIELD DR
2	CEDARS EAST CT_IDLEWILD RD
2	CITY VIEW DR_E INDEPENDENCE BV
2	CAMERON VALLEY PY_PHILLIPS PLACE CT
2	CORONATION BV_SARDIS RD NORTH_TOWER POINT DR
2	SHARON RD WEST_WINTER OAKS LN
2	E I-485 OUTER HY_PLEASANT PLAINS RD
2	ARDREY KELL RD_COMMUNITY HOUSE RD
2	N I-85 EXIT 41 RA_W SUGAR CREEK RD

Number of Ped Crashes	Description of Intersection
2	BROOKSHIRE BV_N HOSKINS RD
2	MORETZ AV_N GRAHAM ST_W 28TH ST
2	SHANNONHOUSE DR_THE PLAZA
2	E 28TH ST_N TRYON ST_W 28TH ST
2	ASHLEY RD_TUCKASEEGEE RD
2	MULBERRY CHURCH RD_QUEEN CITY DR
2	ABBEY PL_PARK RD
2	EMERYWOOD DR_SOUTH BV
2	FAIRVIEW RD_PARK SOUTH DR
2	S TRYON ST_W ARROWOOD RD
2	IDLEWILD RD_MONROE RD_RAMA RD
2	N CEDAR ST_W 5TH ST
2	S CEDAR ST_W 4TH ST
2	N GRAHAM ST_W 5TH ST
2	E 9TH ST_N COLLEGE ST
2	E 7TH ST_N TRYON ST_W 7TH ST
2	E 5TH ST_N COLLEGE ST
2	E 4TH ST_S TRYON ST_W 4TH ST
2	E 4TH ST_S COLLEGE ST
2	E MARTIN LUTHER KING JR BV_S TRYON ST_W MARTIN LUTHER KING JR BV
2	E TRADE ST_S BREVARD ST
2	E MARTIN LUTHER KING JR BV_S BREVARD ST
2	E TRADE ST_N ALEXANDER ST_S ALEXANDER ST
2	CENTRAL AV_THE PLAZA
2	E BLAND ST_S TRYON ST_W BLAND ST
2	E 3RD ST_E JOHN BELK RA
2	E STONEWALL ST_S MCDOWELL ST
2	CHARLOTTETOWNE AV_ELIZABETH AV
2	EAST BV_SOUTH BV
2	ALBEMARLE RD_COPPER CREEK CT_LAKE FOREST RD EAST
2	ALBEMARLE RD_FARM POND LN
2	ALBEMARLE RD_WINTERHAVEN DR
2	CHEROKEE RD_PROVIDENCE RD
2	MARVIN RD_N WENDOVER RD
2	E INDEPENDENCE BV_IDLEWILD RD
2	BUICK DR_CONFERENCE DR_E INDEPENDENCE BV
2	HEATHER LN_PARK RD
2	PARK RD_SMITHFIELD CHURCH RD_THURINGER CT
2	HOME DEPOT DR_N WENDOVER RD

Number of Ped Crashes	Description of Intersection
2	CEDARS EAST CT
2	BAXTER ST_METROPOLITAN AV_S KINGS DR
2	J W CLAY BV_N TRYON ST
1	CEDARWILD RD_NUTCRACKER PL
1	BRIABEND DR_SOUTH BV
1	BROOKINGS DR_TAUTEN CT
1	BEAUVISTA DR_HIGHLAND CREEK PY
1	DUSTY CEDAR CT_SAXONBURY WY
1	HARRIS HOUSTON RD_HUNTERS TRACE CT
1	I-485 RA_N TRYON ST
1	CALLABRIDGE CT_MT HOLLY-HUNTERSVILLE RD
1	BRICKLEBERRY LN_W MALLARD CREEK CHURCH RD
1	CAMPUS CONNECTION DR_PAVILION BV
1	EDGEVALE DR_FELDBANK DR
1	HARRINGTON WOODS RD_W W T HARRIS BV
1	COCHRAN FARM LN_OAK PASTURE LN
1	KILEY LN_MCINTYRE RIDGE DR
1	HAGERSTONE WY_MCINTYRE RIDGE DR
1	CHIDLEY DR_HUBBARD RD
1	DELSING CT_PINE MOUNTAIN RD
1	OAK LEIGH DR_UNIVERSITY CITY BV
1	J M KEYNES DR_J W CLAY BV_OLMSTED DR
1	J M KEYNES DR
1	BLUE MOSS POINT DR_NORTHWOODS FOREST DR
1	MT HOLLY-HUNTERSVILLE RD_PAWLEY DR
1	CLOONEY LN_VERNON WOOD LN
1	CAMERON BV_UNIVERSITY RD
1	LEGACY WALK LN_UNIVERSITY WALK CR
1	BARNVIEW CT_STEPHENS FARM LN
1	STATESVILLE RD_SUNSTONE DR
1	CAMERON BV_UNIVERSITY CITY BV_UNIVERSITY PROFESSIONAL DR
1	HAMPTON CHURCH RD_N TRYON ST
1	ALLEN RD SOUTH_IRISH MOSS LN
1	FAIRGLEN RD_HEWITT DR
1	FAIRES FARM RD_KATHERINE KIKER RD
1	HATHSHIRE DR_NEAL RD_WELL SPRING DR
1	BEATTIES FORD RD_SLATER SPRINGS DR
1	MINT ST_SUMMERVILLE RD
1	N TRYON ST_STETSON DR
1	OAKWOOD DR_STATESVILLE RD

Number of Ped Crashes	Description of Intersection
1	BRADEN DR_TALLWOOD CT
1	POPLAR ST_WALES ST
1	N GRAHAM ST_ONEIDA RD
1	N GRAHAM ST_ONEIDA RD
1	WOODSTONE DR
1	GRAHAM MEADOW DR_LOVE RIDGE LN
1	WYNBROOK WY
1	BRANTLEY DR_JUSTIN MEADOWS RD
1	N TRYON ST_OWEN BV
1	BLACKHAWK RD_COUNTRYSIDE DR
1	AMBLE DR_N GRAHAM ST
1	FLINTROCK RD_LITTLE ROCK RD
1	HICKORY LN_STATESVILLE AV
1	BEATTIES FORD RD_GILBERT ST_MONTANA DR
1	RIDGELEY DR_SARENA PL
1	BRANCH HILL CR_OLD CONCORD RD
1	EQUITABLE PL_GRIER RD
1	CINDERELLA RD_W SUGAR CREEK RD
1	MCDANIEL LN
1	HONEYWOOD AV_TENNESSEE AV
1	BLACK BEAR CT_HUNTERS GLEN DR
1	FAIRHAVEN DR_OLD CONCORD RD
1	LASALLE ST_TAYLOR AV
1	HOSKINS MILL LN
1	N TRYON ST_OLD CONCORD RD
1	BROWNSTONE ST_LASALLE ST
1	DARBY AV_HONEYWOOD AV
1	BEATTIES FORD RD_ST MARK ST
1	HATERAS AV_NEWCASTLE ST
1	BRADFORD DR_ROWAN ST
1	BEECHWAY CR_N TRYON ST
1	DORTON ST_N TRYON ST
1	FREW RD_W CRAIGHEAD RD
1	BEATTIES FORD RD_RUSSELL AV
1	BINGHAM DR_N TRYON ST
1	BARRINGTON DR_BRIDLEWOOD LN
1	BANCROFT ST_ENNIS AV
1	CELIA AV_ROSETTA ST
1	FREEDOM DR_WESTSTONE DR
1	GRANT ST_LAKEWOOD AV

Number of Ped Crashes	Description of Intersection
1	BRADFORD DR_HOOVER ST
1	HUNTERS CROSSING LN_THE PLAZA
1	MORETZ AV_STATESVILLE AV
1	BEATTIES FORD RD_DUNDEEN ST
1	QUIET COVE CT_RANDOM PL
1	COLORADO AV_GRIMES ST
1	CENTERGROVE LN_S I-85 SERVICE RD_SAM WILSON RD
1	MORETZ AV_RACHEL ST
1	DRUID CR_STATESVILLE AV
1	AMADO ST_PENNWOOD LN
1	BROWNS AV_FREEDOM DR
1	FAIRMONT ST_RENNER ST
1	FAIRMONT ST_RENNER ST
1	GRIMES ST_WINSTON ST
1	EASTWAY DR_HOWIE CR
1	BUNGALOW RD_CLYDE DR
1	PARK LN_PARK LN WEST
1	FREEDOM DR_S I-85 RA
1	FRANK DR_THE PLAZA
1	COVECREEK DR_THE PLAZA
1	CATALINA AV_W 28TH ST
1	CONDON ST_PATTON AV
1	DINGLEWOOD AV_EASTWAY DR
1	THE PLAZA_VICKERY DR
1	FARRIOR DR_THE PLAZA
1	ANNISA CT_HASHEM DR
1	E SUGAR CREEK RD_NORTHMORE ST
1	KANIMBLA DR_TUCKASEEGEE RD
1	OAKLAWN AV_RUSH WIND DR
1	N TRYON ST_W 29TH ST
1	N PINE ST_W 26TH ST
1	AVALON AV_GLENWOOD DR
1	THE PLAZA_TREMBETH DR
1	AVALON AV_KARENDALE AV
1	N I-85 RA_TUCKASEEGEE RD
1	FERN AV_TUCKASEEGEE RD
1	RAVENCROFT DR
1	E SUGAR CREEK RD_MCMILLAN ST
1	ENDERLY RD_TUCKASEEGEE RD
1	AVALON AV_PARKWAY AV

Number of Ped Crashes	Description of Intersection
1	E SUGAR CREEK RD_TERRYBROOK LN
1	MILTON RD_PERTH CT
1	S I-85 HY_S LITTLE ROCK RDXS I85 RA SB
1	N I-85 HY_N I85XLITTLE ROCK RD RA NB
1	GRAND LAKE DR_QUEEN CITY DR
1	ACADEMY ST_THE PLAZA
1	BRICK YARD RD_OLD DOWD RD
1	S I-77 EXIT 11 RA_S I-77 HY
1	BELLE PLAINE DR_MILTON RD
1	FINCHLEY DR_MIRAMAR DR
1	S BRUNS AV_SUMTER AV
1	OLIVER ST_STATESVILLE AV
1	S I-77 EXIT 10C RA_S I-77 EXIT 11 RA
1	N TRYON ST_SYLVANIA AV
1	CHIPOLA DR_PURSER DR
1	DOWNS AV_THE PLAZA
1	E 34TH ST_THE PLAZA
1	SHAMROCK DR_THE PLAZA
1	ERSKINE DR_PATIO CT
1	AUDREY ST_EASTWAY DR
1	BILLY GRAHAM PY_SCOTT FUTRELL DR
1	FLAMINGO AV_SHAMROCK DR
1	W TRADE ST_WESLEY HEIGHTS WY
1	ASHLEY RD_LIGGETT ST
1	CONNECTICUT AV_SHAMROCK DR
1	S I-77 EXIT 10B RA_W TRADE ST
1	N TRYON ST_W 15TH ST
1	ASHLEY RD_BULLARD ST
1	BARRINGTON DR_MILTON RD
1	N IRWIN AV_W 5TH ST
1	W BROOKSHIRE FR_W BROOKSHIRE RA
1	N TRYON ST_WADSWORTH PL
1	DRUMMOND AV_THE PLAZA
1	N CLARKSON ST_W 5TH ST
1	E W T HARRIS BV_MEADOW ROSE LN_MILTON RD
1	HERRIN AV_SHAMROCK DR
1	N TRYON ST_W LIDDELL ST
1	W BROOKSHIRE FR_W BROOKSHIRE RA
1	BROOK RD_DANIEL ST_VIRGINIA AV
1	ALLEGHANY ST_MCKINLEY DR

Number of Ped Crashes	Description of Intersection
1	PARKWOOD AV_SEIGLE AV
1	GRACE ST_PARSON ST
1	GRACE ST_UNION ST
1	MARGUERITE AV_THE PLAZA
1	GRACE ST_LYDIA AV
1	GRACE ST_THE PLAZA
1	EAST FORD RD_STONEYBROOK RD
1	PARKWOOD AV_PEGRAM ST
1	COLLEGE-TRYON ST_N COLLEGE ST
1	PARKWOOD AV_UMSTEAD ST
1	N CHURCH ST_W 10TH ST
1	N CHURCH ST_W 10TH ST
1	AMITY POINTE RD_SHARON POINTE RD
1	E 17TH ST_N ALEXANDER ST
1	LITTLE ROCK RD_OLD DOWD RD
1	E 15TH ST_N DAVIDSON ST
1	AMITY POINTE RD_SHARON POINTE RD
1	BERRYHILL RD_FLEETWOOD DR
1	N TRYON ST_W 10TH ST
1	E 17TH ST_SEIGLE AV
1	SHARON CHASE DR
1	ALLEN ST_E 18TH ST
1	KENNON ST_PEGRAM ST
1	E 18TH ST_PEGRAM ST
1	EASTWAY DR
1	DENSMORE DR_WINEDALE LN
1	MARLOWE AV_WEYLAND AV
1	E 15TH ST_SEIGLE AV
1	KIMMERLY GLEN LN_N SHARON AMITY RD
1	BLESSING ST_PRUITT ST
1	E W T HARRIS BV_WINDSOR GATE LN
1	JOSH BIRMINGHAM PY_RENTAL CAR RD
1	LOUISE AV_PAMLICO ST
1	EASTWAY DR_SANDHURST DR
1	E 8TH ST_N DAVIDSON ST
1	DONALD ROSS RD_WILKINSON BV
1	WEYLAND AV_WILKINSON BV
1	HIGHLAND ST_WILKINSON BV
1	CAMP GREENE ST_WILKINSON BV
1	S MINT ST_W JOHN BELK FR

Number of Ped Crashes	Description of Intersection
1	PENCE GROVE RD_PENCE RD
1	E W T HARRIS BV_LAWSON LN
1	RENTAL CAR RD
1	CENTRAL AV_E 10TH ST
1	GAYNELLE DR_HICKORY GROVE RD
1	ARNOLD DR_EASTWAY DR
1	MONTEZUMA TL_ROCKSHIRE DR
1	E TRADE ST_N MYERS ST
1	CENTRAL AV_PIEDMONT ST
1	PLATO CR_SEYMOUR DR
1	LARCH ST_MERRIMAN AV
1	S TRYON ST_S TRYON/COLLEGE CONNECTOR ST
1	TWISTED OAKS RD_VERNEDALE RD
1	CENTRAL AV_TIPPAH PARK CT
1	MERRIMAN AV_W KINGSTON AV
1	CENTRAL AV_IRIS DR
1	BURGIN ST_EASTWAY DR
1	COMMONWEALTH AV_THOMAS AV
1	BIEDERBECK DR_CRAIGWOOD DR
1	SPRUCE ST_WEST BV
1	N I-77 RA_WEST BV
1	EASTLAND CT_HANNA CT
1	E 4TH ST_E JOHN BELK FR
1	E MOREHEAD ST_S CALDWELL ST
1	FORDHAM RD_WEST BV
1	ELIZABETH AV_PEASE LN
1	S TRYON ST_WINONA ST
1	HOLLY KNOLL DR_IVY HOLLOW DR
1	E JOHN BELK FR_E JOHN BELK RA
1	CENTRAL AV_GLENN ST
1	ELIZABETH AV_N TORRENCE ST
1	IRIS DR_MCCLINTOCK RD
1	COMMONWEALTH AV_HANOVER ST
1	ELIZABETH AV_TRAVIS AV
1	NORWICH PL_WALTON RD
1	E 5TH ST_LAMAR AV
1	MARKLAND DR_PARKMONT DR
1	N SHARON AMITY RD_WILORA LAKE RD
1	ELMIN ST_MORNING DR_WEST BV
1	CENTRAL AV_PROGRESS LN

Number of Ped Crashes	Description of Intersection
1	BALDWIN AV_E 3RD ST
1	CENTRAL AV_WILLOW PARK DR
1	NOBLES AV_VILMA ST
1	BURNETTE AV_NOBLES AV
1	CLARICE AV_E 7TH ST
1	KENHILL DR_WEST BV
1	BROOKHILL RD_VILLAGE CT
1	ASHLEY CR_EATON CR
1	SHADY LN_W TYVOLA RD
1	CENTRAL AV_WINTERFIELD PL
1	REMOUNT RD_TOOMEY AV
1	E 7TH ST_N LAUREL AV
1	DUNAVANT ST_S TRYON ST
1	CHESTERFIELD AV
1	N COLONIAL AV_RANDOLPH RD_S COLONIAL AV
1	MCDONALD AV_SOUTH BV
1	REMOUNT RD_REMUS RD
1	BASIN ST_S TRYON ST
1	N SHARON AMITY RD_SPANISH QUARTER CR
1	WALLACE AV_WALLACE GLEN DR
1	BAXTER ST_MAIN ST
1	BAXTER ST_ELI ST
1	BALTIMORE AV_REMOUNT RD
1	ALBEMARLE RD_PINE GROVE AV
1	BALDWIN AV_S KINGS DR
1	ALBEMARLE RD_LAKE LESLIE LN
1	BRIAR CREEK RD_E INDEPENDENCE BV
1	CHICAGO AV_MILLER ST
1	JOHNSON AND WALES WY_W TRADE ST
1	E W T HARRIS BV_HARRIS PARK BV
1	BENJAMIN ST_S TRYON ST
1	DUNN AV_GENE AV
1	LEEDS DR_TARRINGTON AV
1	TELEVISION PL_WASHBURN AV
1	COPPER CREEK CT
1	BLYTHE BV_MEDICAL CENTER DR
1	CAMPBELL DR_N SHARON AMITY RD
1	E INDEPENDENCE BV_FUGATE AV
1	ALBEMARLE RD_CENTRAL AV
1	DRESDEN DR EAST_ROANOKE AV

Number of Ped Crashes	Description of Intersection
1	ARDSLEY RD_PROVIDENCE RD
1	FOSTER AV_S TRYON ST
1	OLD LAWYERS RD
1	HERMAN AV_S TRYON ST
1	LATROBE DR_PROAM DR
1	FARM POND LN_WOODBEND DR
1	PACES GLEN AV_REDDMAN RD
1	CLANTON RD_ST VARDELL LN
1	CORTON DR_SCOTT AV
1	EAST BV_LOMBARDY CR
1	GREEN FOREST DR_REDDMAN RD
1	MARNEY AV_SAM DRENAN RD
1	BURKLAND DR_RODMAN ST
1	DEXTER ST_DOVER AV
1	HARTFORD AV_WESTON ST
1	LAWYERS RD_ROLLING OAK LN
1	CHEROKEE RD_LOCKLEY DR
1	LAWYERS RD_SPLIT OAK DR
1	N SHARON AMITY RD_UNAKA AV
1	BILLINGSLEY RD_MARVIN RD
1	S TRYON ST_W CAMA ST
1	E W T HARRIS BV_EASTHAVEN DR
1	MONROE RD_SUMMEY AV
1	BEAM RD_PINE OAKS DR
1	FLINTRIDGE DR_IDLEWILD RD
1	PARK RD_TOWNES RD
1	BAINBRIDGE RD_MONROE RD
1	FLORENCE AV_RAMA RD
1	N I-77 EXIT 6B RA_W WOODLAWN RD
1	CHILTON PL_SHARON RD
1	MORGENSE PL_REDSTONES RD
1	MANOR RD_TRANQUIL AV
1	LORENE AV_SELWYN AV
1	CONNECTING RD_E WOODLAWN RD
1	KINGMAN DR_S TRYON ST
1	BERNEWAY DR_OBERWALD PL
1	BURLEIGH ST_HADRIAN WY
1	REDCOAT DR_WHEELER DR
1	BRIARDALE DR_SHARON FOREST DR
1	MICHAEL BAKER PL_RUNNYMEDE LN

Number of Ped Crashes	Description of Intersection
1	COLONY RD_FERNCLIFF RD
1	GLENHAM DR_TYVOLA RD
1	CHASEWOOD DR
1	CHASEWOOD DR_MONROE RD
1	PEBBLESTONE DR_VILLAGE LAKE DR
1	MEADOWOOD LN_PROVIDENCE RD
1	BEACON RIDGE RD_SOUTH BV
1	ASHLEY FARM DR_MARGARET WALLACE RD
1	LITTLE STREAM CT_SUMMERFIELD RIDGE LN
1	OLDE WHITEHALL RD_S TRYON ST
1	MONROE RD_TIMBER SPRINGS DR
1	E INDEPENDENCE BV_WOODWAY HILLS DR
1	CHARLESTON PLACE LN
1	ASHLEY FARM DR_WALSINGHAM CT
1	BUGLE CT_FALLOW LN
1	COLONY RD_MORRISON BV
1	ASSEMBLY ST_FAIRVIEW RD
1	SOUTH BV_WICKER DR
1	SOUTH BV_WISTERIA DR
1	SANDY PORTER RD_TARAGATE DR
1	FARMHURST DR_FOREST POINT BV_NATIONS FORD RD
1	EDGEWATER DR_SOUTH BV
1	I-485 HY_S TRYON ST
1	NATIONS FORD RD_SHORT HILLS DR
1	COLONY ACRES DR_HILARY CR_NATIONS FORD RD
1	E ARROWOOD RD_LODGE SOUTH CR
1	E ARROWOOD RD_GRAND METIS DR
1	ALLEGIANCE DR_LADY LIBERTY LN
1	FAWNBROOK LN_W ARROWOOD RD
1	HILL RD_SOUTH BV
1	ANTLERS LN
1	SHARON LAKES RD_WATERFORD LAKES DR
1	SHADY OAK TL_SHARON LAKES RD
1	EL VERANO CR_SHARON LAKES RD
1	MAGNOLIA BRIDGE RD_QUAIL HOLLOW RD
1	SHARON RD WEST_SHARONBROOK DR
1	KODY MARIE CT_SHARON RD WEST
1	LOBLOLLY LN_LONGLEAF DR
1	BEVERLY CREST BV_CANDLEWYCK LN_PROVIDENCE RD
1	MICKLETON RD_WAKEHURST RD

Number of Ped Crashes	Description of Intersection
1	MICHAEL LYNN RD_WRIGHT'S FERRY RD
1	I-485 RA_SOUTH BV
1	MACANDREW DR_REA RD
1	HOUSTON BRANCH RD_PROVIDENCE BRANCH LN
1	PLANTATION RD_WEDDINGTON RD
1	MCMULLEN CREEK PY_PINEVILLE-MATTHEWS RD
1	CARMEL COMMONS BV_PINEVILLE-MATTHEWS RD
1	CARY RIDGE DR_PINEVILLE-MATTHEWS RD
1	BAYBROOK LN_REAFIELD DR
1	FISHER'S FARM LN_FISHER'S POND DR
1	CARMEL RD_ROCK CANYON DR
1	BEACON FOREST DR_WEDDINGTON RD
1	FOUR MILE CREEK RD_GOLF RIDGE DR
1	ALEXANDER VALLEY DR_PROVIDENCE RD
1	E I-485 OUTER HY_I-485 RA
1	FORBES DR_PROVIDENCE RD
1	ELMSTONE DR_HASTINGS MILL LN
1	BALLANTYNE TRACE CT_ELM LN
1	CARDINAL WOODS DR_LANCASTER HY
1	BRIARWICK LN_MOSS MILL LN
1	DELBERRY LN_WALSHAM DR
1	COCHRANE DR_PAWPAW LN
1	DISPLAY DR_WESTLAKE DR
1	E ARROWOOD RD_SYCAMORE CREEK DR
1	N CALDWELL ST_PARKWOOD AV
1	W CAMA ST_WIESTLING ST
1	S I-85 EXIT 39 RA_STATESVILLE RD
1	TAUTEN CT
1	COPPERPLATE RD
1	CEDAR CLIFF DR
1	DOWNPATRICK PL
1	CRAPE MYRTLE LN
1	OLD STATESVILLE RD
1	STONE CANYON LN
1	BRANCHVIEW DR
1	E W T HARRIS BV_N TRYON ST_W W T HARRIS BV
1	IBM DR_NEAL RD_VINOY VIEW DR
1	MALLARD CREEK RD_W SUGAR CREEK RD
1	BEATTIES FORD RD_CINDY LN_GRIERS GROVE RD
1	RILEY AV_STARITA RD_STATESVILLE RD

Number of Ped Crashes	Description of Intersection
1	N TRYON ST_TOM HUNTER RD
1	REAGAN DR_W SUGAR CREEK RD
1	A AV EAST_BEATTIES FORD RD_N HOSKINS RD
1	S I-85 EXIT 39 RA_STATESVILLE RD
1	BEATTIES FORD RD_S I-85 EXIT 37 RA_SIR BAILEY DR
1	BEATTIES FORD RD_N I-85 EXIT 37 RA
1	JEFF ADAMS DR_STATESVILLE AV_TIPTON DR
1	E W T HARRIS BV_GRIER RD
1	ATANDO AV_N GRAHAM ST
1	E W T HARRIS BV_THE PLAZA
1	E CRAIGHEAD RD_N TRYON ST_W CRAIGHEAD RD
1	EASTWAY CROSSING DR_EASTWAY DR
1	BRADFORD DR_EDGEWOOD RD_FREEDOM DR
1	EASTWAY DR_THE PLAZA
1	N GRAHAM ST_W 24TH ST
1	EDGEWOOD RD_QUEEN CITY DR_TUCKASEEGEE RD
1	E 36TH ST_N DAVIDSON ST
1	ASHLEY RD_FREEDOM DR_TUCKASEEGEE RD
1	GLENWOOD DR_TUCKASEEGEE RD
1	E SUGAR CREEK RD_THE PLAZA
1	BEATTIES FORD RD_DIXON ST
1	PARKWAY AV_TUCKASEEGEE RD
1	E WOODLAWN RD_RUNNYMEDE LN_SELWYN AV
1	E INDEPENDENCE BV_E W T HARRIS BV
1	SOUTH BV_TYVOLA RD
1	E INDEPENDENCE BV_MARGARET WALLACE RD
1	LUMARKA DR_MONROE RD_THERMAL RD
1	ARCHDALE DR_OLD PINEVILLE RD
1	FAIRVIEW RD_PARK RD_TYVOLA RD
1	BARCLAY DOWNS DR_FAIRVIEW RD
1	I-485 RA_S TRYON ST
1	COLONY RD_SHARON VIEW RD
1	E ARROWOOD RD_NATIONS FORD RD_W ARROWOOD RD
1	SHARON LAKES RD_SOUTH BV_SWEDEN RD
1	ALLEGHANY ST_FREEDOM DR
1	DALTON AV_N GRAHAM ST
1	DALTON AV_N TRYON ST
1	BILLY GRAHAM PY_SCOTT FUTRELL DR
1	LITTLE ROCK RD_WILKINSON BV
1	EASTWAY DR_FRONTENAC AV_SHAMROCK DR

Number of Ped Crashes	Description of Intersection
1	BROOK RD_CLEMSON AV_THE PLAZA
1	MILTON RD_N SHARON AMITY RD
1	HARLEE AV_WILKINSON BV
1	N GRAHAM ST_W 10TH ST
1	N IRWIN AV_W TRADE ST
1	BERRYHILL RD_FREEDOM DR
1	E 11TH ST_N TRYON ST_W 11TH ST
1	HAWTHORNE LN_PARKWOOD AV
1	E 9TH ST_N TRYON ST_W 9TH ST
1	BILLY GRAHAM PY_BOYER ST
1	E 12TH ST_N BREVARD ST
1	E 8TH ST_N TRYON ST_W 8TH ST
1	S GRAHAM ST_W 4TH ST
1	N POPLAR ST_W 5TH ST
1	E W T HARRIS BV_ROBINSON CHURCH RD
1	N PINE ST_S MINT ST_W TRADE ST
1	E 12TH ST_N DAVIDSON ST
1	E 6TH ST_N TRYON ST_W 6TH ST
1	E 7TH ST_N COLLEGE ST
1	S POPLAR ST_W 4TH ST
1	S MINT ST_W 3RD ST
1	S CHURCH ST_W 4TH ST
1	MORRIS FIELD DR_WILKINSON BV
1	EASTWAY DR_KILBORNE DR
1	E 6TH ST_N BREVARD ST
1	S GRAHAM ST_S MINT ST_W STONEWALL ST
1	E 7TH ST_N DAVIDSON ST
1	ASHLEY RD_WILKINSON BV
1	S MINT ST_W MOREHEAD ST
1	E 10TH ST_SEIGLE AV
1	E 4TH ST_S CALDWELL ST
1	E 7TH ST_N MCDOWELL ST
1	S CHURCH ST_W MOREHEAD ST
1	E W T HARRIS BV_HICKORY GROVE RD
1	E MOREHEAD ST_S TRYON ST_W MOREHEAD ST
1	E 3RD ST_S MCDOWELL ST
1	E MARTIN LUTHER KING JR BV_S MCDOWELL ST
1	CENTRAL AV_EASTCREST DR
1	E 3RD ST_E JOHN BELK RA
1	E MOREHEAD ST_EUCLID AV

Number of Ped Crashes	Description of Intersection
1	E BLAND ST_SOUTH BV
1	E 7TH ST_HAWTHORNE LN
1	3RD-4TH CONNECTOR ST_CHARLOTTETOWNE AV_E 3RD ST
1	ELIZABETH AV_HAWTHORNE LN
1	S TRYON ST_W TREMONT AV
1	OLD STEELE CREEK RD_WEST BV
1	E 5TH ST_N CASWELL RD
1	E TREMONT AV_SOUTH BV
1	ALBEMARLE RD_HARRISBURG RD
1	BILLY GRAHAM PY_WEST BV
1	EASTWAY DR_WOODLAND DR
1	E MOREHEAD ST_HARDING PL
1	ALBEMARLE RD_WILGROVE-MINT HILL RD
1	MONROE RD_WASHBURN AV
1	IDEAL WY_REMOUNT RD_SOUTH BV
1	ALBEMARLE RD_EXECUTIVE CENTER DR_JENKINS DR
1	ALBEMARLE RD_LAWYERS RD
1	EAST BV_SCOTT AV
1	ALBEMARLE RD_E W T HARRIS BV
1	CLANTON RD_N I-77 EXIT 7 RA
1	EASTOVER RIDGE DR_RANDOLPH RD_SAM DRENAN RD
1	PROVIDENCE RD_QUEENS RD
1	E INDEPENDENCE BV_N SHARON AMITY RD
1	LATROBE DR_N WENDOVER RD
1	E W T HARRIS BV_IDLEWILD RD
1	BILLY GRAHAM PY_S TRYON ST_W WOODLAWN RD
1	HILLSIDE AV_PARK RD
1	EAGLEWOOD AV_MONROE RD
1	E HEBRON ST_SOUTH BV
1	CAROWINDS BV_JOHN PRICE RD_S TRYON ST
1	I-485 RA_WESTINGHOUSE BV
1	CRESSIDA DR_E WESTINGHOUSE BV_SOUTH BV
1	ECHO FOREST DR_PINEVILLE-MATTHEWS RD
1	CEDAR CREEK LN_JOHNSTON RD_MCMULLEN CREEK PY
1	JOHNSTON RD_PINEVILLE-MATTHEWS RD
1	KUYKENDALL RD_PROVIDENCE RD
1	BELLSOUTH DR_CENTRAL AV
1	CAROLINA PAVILION DR N_SOUTH BV
1	CHARLOTTETOWNE AV_E 7TH ST_E INDEPENDENCE BV
1	FABER ST_SEYMOUR DR

Number of Ped Crashes	Description of Intersection
1	W MOREHEAD ST_WALNUT AV
1	HEMPHILL ST_OLD STEELE CREEK RD
1	CEDARS EAST CT
1	PARK RD_PARK RD SHOPPING CENTER DR
1	JONES ST
1	S SHOPPING CENTER DR
1	ROCKMOOR RIDGE RD_ROYAL FERN LN
1	BEATTIES FORD RD_BOOKER AV_OAKLAWN AV
1	BEATTIES FORD RD_MONTGOMERY GARDENS DR
1	DAVIDSON-CONCORD RD_POPLAR TENT CHURCH RD
1	EASTWAY DR_MAJEED DR
1	SHARON HILLS RD_ST JOHN LN
1	HARTFORD AV_SOUTH BV
1	PROSPERITY CHURCH RD_WHITE CASCADE DR
1	ASHLEY PARK LN_BROAD ST
1	E JOHN BELK RA

Table 19: Charlotte Transit Stops with Pedestrian Collisions

Number of Ped Crashes	StopID	Stop Description
6	45093	Tryon & Trade
5	45399	College & Stonewall
4	05140	Central & Pecan
3	02470	Beatties Ford & Sanders
3	02530	Beatties Ford & Celia
3	02600	Beatties Ford & Lasalle
3	02630	Beatties Ford & Keller
3	07380	4th á& Davidson
3	09330	Eastway Dr & Central Ave
3	18110	Tryon & 5th
3	18710	Tryon & Wellingford
3	31080	Sugar Creek & Reagan
3	45021	Belmont & Allen
3	45351	McDowell & 4th
3	45908	Harris & Hickory Grove
3	45909	Harris & Hickory Grove
3	45937	Tryon & Arrowhead
2	00230	Albemarle & Winterhaven
2	02480	Beattis Ford & Sanders
2	03990	Burnette @ 1618
2	04000	Burnette Ave. & Midblock @ 1623
2	04030	Burnette á& Nobles
2	05350	Central & Wembley Dr.
2	05470	Central & Kilborne
2	05500	Central & Norland
2	05510	Central & Progress
2	08530	600E Trade St. & áS. Alexander St.
2	09110	Eastway Dr & Kilborne Dr
2	09720	1000Elizabeth Ave. & N. Kings Dr.
2	11070	Freedom & Ashley
2	14700	John Kirk & University City Blvd.
2	15980	Monroe Rd & Chippendale
2	17330	Davidson & 16th St.
2	17340	Davidson & 16th
2	17670	Graham & 5Th
2	18140	400N Tryon St. & W. 7th St.
2	18300	Tryon & Wadsworth
2	18340	Tryon & Wadsworth
2	18650	Tryon & Austin

Number of Ped Crashes	StopID	Stop Description
2	19070	Tryon & JW Clay
2	20830	Park & Abbey
2	22320	Providence & Cherokee
2	25310	N. College & 6Th
2	25330	College á& 4th
2	25660	Tryon & á3rd
2	25700	Tryon á& áá3rd
2	25720	S Tryon St. & E. á2nd St.
2	27310	Shamrock @ 3042
2	27840	Sharon Amity & Clearmont
2	29060	Sharon Road West & Kody Marie CT
2	29300	S Blvd & Rensselaer Ave
2	33570	Trade & Tryon
2	33640	W Trade St. & N. Church St
2	34160	West & Fordham
2	34720	West & Holabird
2	35570	Woodlawn & Nations Crossing
2	44045	Trade & Church
2	45052	Transit Center- Bay E
2	45075	Transit Center- 4th & Brevard
2	45221	Albemarle & Farm Pond
2	45355	Tryon & 4th
2	45720	Trade St. & Graham St.
2	46239	Farmhurst & Nations Ford
1	00210	Albemarle & Farm Pond
1	00290	Albemarle & Lawyers
1	00300	Albemarle & Lake Forest
1	00930	Arrowood á& Fawnbrook
1	01190	Ashley Rd & Tuckaseegee Rd.
1	02140	Barrington & Rosecran
1	02540	Beatties Ford @ 1416
1	02610	Beatties Ford & LaSalle
1	02620	Beatties Ford & Keller
1	02660	Beatties Ford & Gilbert
1	02670	Beatties Ford á& Holly
1	02730	Beatties Ford Rd & Hoskins Rd
1	02790	Beatties Ford & Griers Grove
1	02870	Beatties Ford & Slater Springs
1	02880	Beatties Ford & Slater Springs
1	02990	Bellefonte & 30Th
1	03000	Bellefonte & 30th

Number of Ped Crashes	StopID	Stop Description
1	03030	Bellmont & Allen
1	03038	Statesville & Oliver
1	04040	Burnette @ 1800 & Nobles Ave.
1	04730	Carmel & Harrowfield
1	04990	Central & Piedmont
1	05000	Central & Piedmont
1	05240	Central & Firth
1	05250	Central & Iris
1	05280	Central & Club
1	05360	Central & Eastcrest
1	05520	Central & Progress
1	05560	Central @ 4908
1	05570	Central & Winterfield
1	05810	Clanton & St Vardell
1	06310	Commonwealth & Green Oak
1	06390	Commonwealth & Hanover
1	06440	Commonwealth & Rockway
1	07100	Dogwood & Norris
1	07110	Dogwood & Norris
1	07280	Dublin & Ashley
1	07920	7Th & Mcdowell
1	08010	E 7th @ 1920
1	08030	E 7Th Ave & Caswell
1	08070	E 7Th St & N Laurel Ave
1	08420	Trade & Tryon
1	08590	Trade St & Myers St
1	08950	Eastway & The Plaza
1	09030	Eastway & Audrey
1	09100	Eastway & Dunlavin Way
1	09220	Eastway & Burgin
1	09270	Eastway & Sandhurst
1	09290	Eastway Dr & Arnold Dr
1	09790	Elizabeth & Pease @ CPCC
1	10630	Farm Pond & Huntington Park Apartments ááMB
1	11350	Graham & 10th
1	11550	Griffith Ave. & Tryon
1	11560	Griffith Ave. & Tryon
1	11650	Harris & Robinson Church
1	11920	Hickory Grove & Gaynelle
1	12550	Idlewild & Independence

Number of Ped Crashes	StopID	Stop Description
1	12630	Idlewilde & Cedars East
1	12950	Independence @ 5401(Town and Country)
1	13070	Independence & Village Lake
1	13770	Kings Dr & Baxter St
1	13910	Lasalle & Taylor
1	14055	Lawyers & Rolling Oak
1	14060	Lawyers & Rolling Oak
1	14430	1501 Longleaf & Loblolly
1	14880	Marvin & Billingsley @ 3800
1	15410	Milton & Village Green
1	15460	Milton & Barrington
1	15900	Monroe Rd & Wendover Rd
1	16150	Monroe & Bainbridge
1	16240	Monroe Rd & Eaglewood
1	16360	Monroe Rd & Lumarka Dr
1	16370	Monroe Rd & Thermal
1	16400	Monroe Rd & Village Lake
1	16410	Monroe Rd & Village Lake
1	16430	Monroe Rd & Timber Springs Dr
1	17270	Davidson & 12th St.
1	17840	Graham & Moretz
1	17970	Graham & W.Craighead
1	17980	Graham & Amble
1	17990	Graham & Amble
1	18040	Kings & Elizabeth
1	18070	Tryon & 5th
1	18150	Tryon & 8th
1	18350	Tryon & E.16Th
1	18400	Tryon & Dalton
1	18420	Tryon & Keswick
1	18490	Tryon & 27th St.
1	18500	Tryon & 28th
1	18520	N. Tryon & 30th
1	18530	Tryon & 30Th
1	18570	Tryon & Atando
1	18720	Tryon & Wellingford
1	18730	Tryon & Dorton
1	18790	Tryon & Lambeth
1	18800	Tryon & Eastway
1	18950	Tryon & Brookside
1	19090	Tryon & JW Clay

Number of Ped Crashes	StopID	Stop Description
1	19340	Nations Ford á& Red Roof Dr
1	19350	Nations Ford & Farmhurst (2nd ent)
1	19380	Nations Ford & Short Hills
1	19390	Nations Ford & Short Hills
1	19440	Nations Ford & Huntsmoor
1	19810	3200Nobles Ave. & Leake St.
1	20310	Old Steel Crk & Hemphill
1	20690	Parkroad @ YWCA
1	20700	Parkroad & Townes
1	20770	Park & Woodlawn
1	21030	Park & Archdale
1	21220	Park & Hamlin Park
1	21770	Pegram & Parkwood
1	21970	Presley & Tryon
1	22130	Pressley & Barringer
1	22180	Pressley & Barringer
1	22190	Providence & Ardsley
1	22210	Providence & Cherokee
1	23600	Randolph á& Colonial
1	23991	Randolph Rd & Sam Drenan
1	24030	Randolph Rd & Sharon Amity Rd
1	24290	Rea & McAndrew
1	24470	Remount & Baltimore
1	24480	Remount & Remus
1	24490	Remount & S Tryon
1	24500	Remount & Remus
1	25220	Runnymede Ln & Barclay Downs Dr
1	25270	S Brevard St & E 2Nd St
1	25530	McDowell St & E Third St @ Adams Mark
1	25730	Tryon & 2nd
1	25815	South Tryon & Carson
1	25930	Tryon & Dogget
1	25960	South Tryon & Tremont Ave.
1	25980	S Tryon & Dunavant
1	26050	South Tryon & Herman
1	26130	Tryon & Cama
1	26140	South Tryon & Cama
1	26210	South Tryon & Pressley
1	26220	South Tryon & Pressley
1	26500	Sam Drenan & Marney
1	27000	Selwyn Ave & Tranquil Ave

Number of Ped Crashes	StopID	Stop Description
1	27100	Seymour Dr & Faber St
1	27290	Shamrock & Eastway
1	27320	Shamrock @ 3218
1	27820	Sharon Amity & Albemarle
1	27850	Sharon Amity & Clearmont
1	27870	Sharon Amity & Central
1	28120	Sharon Amity & Milton
1	28170	Sharon Lakes & Shady Oak
1	29280	S Blvd & Bland
1	29290	S Blvd & Bland St
1	29310	S Blvd & Rensselaer Ave
1	29370	S Blvd & Tremont Ave
1	29540	S Blvd @ 3114 (Carolina Marble)
1	29640	S Blvd & Scaleybark
1	29690	S Blvd & Briarbend
1	29700	S Blvd & Briarbend
1	29840	S.Blvd & Tyvola
1	29900	S.Blvd & Emerywood
1	29950	S Blvd & Wicker
1	29960	S.Blvd & Wicker Dr
1	30000	S.Blvd & Edgewater
1	30070	S.Blvd & Hill
1	30080	S.Blvd & Hill
1	30290	State St & Mahopac St
1	30300	State St & Mahopac St.
1	30390	Statesville & Oliver
1	30690	Statesville & I-85
1	31010	Sugarcreek & Sofley
1	31180	Sunset & Millhaven
1	31210	Sunset @ 5214
1	31290	Tennessee & Honeywood
1	31340	Plaza & Brook
1	31500	The Plaza & Trembeth
1	31690	The Plaza & Shannonhouse Dr.
1	31700	The Plaza & Shannonhouse Dr.
1	31790	The Plaza & Quiet Cove
1	31840	The Plaza @ 6301 (car wash)
1	32450	Tom Hunter & Tryon
1	32550	Transit Center- Bay X
1	32610	Tuckaseegee Rd & McQuay St.
1	32620	Tuckaseegee Rd & Enderly

Number of Ped Crashes	StopID	Stop Description
1	32660	Tuckaseegee Rd & Glenwood
1	32670	Tuckaseegee Rd & Glenwood Dr.
1	32850	28Th & Catalina
1	33150	W 5T St & Irwin Ave
1	33151	W 5Th St & Irwin Ave
1	33680	W Trade St. & N. Pine St.
1	33831	Trade & Frazier
1	34190	West & Fordham
1	34200	West & Fordham @ 1400
1	34250	West & Remount
1	34480	West & Elmin
1	34500	West Boulevard & Ross
1	34650	West & Kenhill
1	35170	Wilkinson & Remount
1	35200	Wlikinson & Westerly Hills/Old Steele Creek
1	35260	Wilkinson & Midland
1	36288	Mint & 3rd Street
1	36620	Orr Rd @ 7120
1	36810	Norris & Dogwood
1	37340	Tuckaseegee & Mulberry Church
1	37460	Monroe Rd & Sardis Rd N
1	37465	Monroe Rd & Sardis Rd N @ Eckerd Drugs
1	38010	Carmel & Harrowfield
1	38030	Carmel & Timber Hills
1	38035	Carmel & Rock Canyon North
1	38400	Albemarle & Lake Forest
1	38420	4th & Poplar
1	38620	Central & Eastway
1	39730	Lasalle & Brownstone
1	40825	Cedar St & 4th St
1	42340	Monroe Rd & Summey
1	42510	Trinity @ 9110
1	42515	Trinity @ 9115
1	42655	Beatties Ford & Sunset
1	43160	E Harris & Allister
1	43330	Sharon Amity & Monroe
1	43340	Monroe Rd. & Sharon Amity
1	43345	Monroe & Sharon Amity
1	43925	LaSalle & Taylor
1	44020	Tryon & 11Th
1	44080	Wilkinson & Ashley

Number of Ped Crashes	StopID	Stop Description
1	44085	Wilkinson & Weyland
1	45011	3rd & College
1	45045	Transit Center- Bay L
1	45046	Transit Center- Bay U
1	45047	Transit Center- Bay G
1	45048	Transit Center- Bay F
1	45056	Transit Center- Bay C
1	45074	Eastway & The Plaza
1	45077	N Tryon & 5th
1	45082	Brookshire & Hoskins (farside)
1	45113	University Place Shopping Ctr.
1	45137	Wendover & Beal
1	45323	Sam Drenan & Randolph
1	45329	Stonewall & Davidson
1	45348	Woodlawn & Wallingford
1	45354	Mallard Creek Park and Ride
1	45408	Wilkinson & Berryhill
1	45409	Wilkinson & Highland
1	45412	Wilkinson & Weyland
1	45431	Eastway & Woodland
1	45605	Freedom & Weststone
1	45650	4th & Torrence
1	45680	Tuckaseegee & Little Rock
1	45743	Statesville & Druid
1	45765	Honeywood & Tennessee
1	45800	E. Independence & Krefield Dr
1	45947	Tryon & Tom Hunter
1	46025	Tyvola Station
1	46169	South Tryon & Arrowood
1	46190	Johnston & McMullen Creek
1	46342	University City Blvd & John Kirk
1	46416	Tryon & Ashby
1	46498	East Blvd & South Blvd

Table 20: Charlotte Roadway Sections with Highest Frequencies

OBJECTID	WHOLESTNAM	LL_ADD	UL_ADD	LR_ADD	UR_ADD	Ped Non-Inters Crash Count	Crashes per Mi
3088	E W T Harris Bv	7101	7399	7100	7398	6	21.63
13118	Central Av	4801	5099	4800	5098	5	22.02
24460	N Tryon St	101	199	100	198	5	59.13
29922	Beatties Ford Rd	2101	2199	2100	2198	5	57.31
1210	Elizabeth Av	1201	1399	1200	1398	4	21.48
1290	N Sharon Amity Rd	3701	3931	3700	3930	4	14.04
12089	E 7th St	201	399	200	398	4	24.84
14469	Albemarle Rd	6301	6455	6300	6454	4	17.14
406	South Bv	6901	7099	6900	7098	3	20.09
485	South Bv	6301	6499	6300	6498	3	16.13
531	Eastway Dr	2757	2999	2756	2998	3	11.36
2035	N Tryon St	4401	4431	4400	4430	3	34.33
2494	N I-85 Hy	20201	21721	20200	21720	3	2.36
11215	E 6th St	201	399	200	398	3	18.63
11583	Shamrock Dr	3101	3399	3100	3398	3	9.02
12310	S Church St	501	599	500	598	3	42.99
12325	Central Av	3801	3815	3800	3814	3	39.75
13616	Burnette Av	1601	1899	1600	1898	3	10.91
22462	Central Av	4401	4499	4400	4498	3	13.60
24367	N Tryon St	6001	6133	6000	6132	3	12.31
26385	W 5th St	101	199	100	198	3	33.86
29904	Albemarle Rd	7001	7199	7000	7198	3	12.07
39372	E Trade St	101	199	100	198	3	32.93

Table 21: Charlotte Schools with nearby Child (15 and under) Pedestrian Crashes (within ¼ mi.)

Number of Child Ped Crashes	NAME	ADDRESS
4	Villa Heights Elementary	800 Everett Pl
3	West Charlotte High	2219 Senior Dr
3	Merry Oaks Elementary	3508 Draper Av
2	University Park Elementary	2400 Hildebrand St
2	Northwest High-School of the Arts	1415 Beatties Ford Rd
2	Garinger High	1100 Eastway Dr
2	Bruns Ave Elementary	501 S Bruns Av
2	Ashley Park Elementary	2401 Belfast Dr
2	Spaugh Middle	1946 Herbert Spaugh Ln
2	Hawthorne Middle	1411 Hawthorne Ln
2	First Ward Elementary	401 E Ninth St
2	Midwood High	1817 Central Av
2	Metro School	700 E Second St
2	Barringer Elementary	1546 Walton Rd
2	Albemarle Rd Middle	6900 Democracy Dr
2	Idlewild Elementary	7101 Idlewild Rd
2	McClintock Middle	2101 Rama Rd
2	East Mecklenburg High	6800 Monroe Rd
2	Keys of Carolina	1715 Sharon Rd West
2	Kennedy Charter	1717 Sharon Rd West
2	Charlotte Catholic High	7702 Pineville-Matthews
2	St Matthew Catholic	11525 Elm Ln
1	David Cox Rd Elementary	4215 David Cox Rd
1	Coulwood Middle	500 Kentberry Dr
1	Zebulon Vance High	7600 IBM Dr
1	Ranson Middle	5850 Statesville Rd
1	James Martin Middle	7800 IBM Dr
1	Brisbane Academy	5901 Statesville Rd
1	Paw Creek Elementary	1300 Cathey Rd
1	Northside Christian Academy	333 Jeremiah Blvd
1	Allenbrook Elementary	1430 Allenbrook Dr
1	Martin Luther King Middle	5209 Springview Rd
1	Crossroads Charter High	5500 N Tryon St
1	Sugar Creek Charter	4101 N Tryon St
1	Druid Hills Elementary	2801 Lucena St
1	New Life Christian Academy	1337 Samuel St
1	Thomasboro Elementary	538 Bradford Dr
1	Briarwood Elementary	1001 Wilann Dr
1	Plaza Rd Elementary	1000 Anderson St

Number of Child Ped Crashes	NAME	ADDRESS
1	Berry Academy of Technology	1430 Alleghany St
1	Shamrock Gardens Elementary	3301 Country Club Dr
1	Our Lady of Assumption Catholic	4225 Shamrock Dr
1	Hickory Grove Elementary	6300 Highland Av
1	Trinity Episcopal	750 E 9th St
1	Piedmont Middle	1241 E Tenth St
1	Hickory Grove Baptist Christian	6050 Hickory Grove Rd
1	Student First Academy	2300 McClintock Rd
1	Heritage Christian	3001 Kilborne Dr
1	Eastway Middle	3333 Biscayne Dr
1	Reid Park Elementary	4108 Tyvola Rd West
1	Billingsville Elementary	124 Skyland Av
1	Albemarle Rd Elementary	7800 Riding Trail Rd
1	Park Rd Elementary	3701 Haven Dr
1	Cotswold Elementary	300 Greenwich Rd
1	Myers Park High	2400 Colony Rd
1	Evelyn Mack Academy	6850 Monroe Rd
1	Selwyn Elementary	1900 Runnymede Ln
1	Alexander Graham Middle	1800 Runnymede Ln
1	Garr Christian Academy	7700 Wallace Rd
1	Steele Creek Elementary	4100 Gallant Ln
1	Alexander Childrens Center	6220 Thermal Rd
1	Kennedy Middle	4000 Gallant Ln
1	Sterling Elementary	9701 China Grove Church
1	Chesterbrook Academy	7801 Ballantyne Commons Pkwy
1	Omni Montessori Center	9536 Blakeney Heath Rd
1	Ardrey Kell High	10220 Ardrey Kell Rd

Table 22: Charlotte Roads with Non-intersection Pedestrian Crashes

Ped Crashes	WHOLESTNAM	Length	Crashes /Mile	Number Lanes*	Road Configuration*	Speed Limit*
54	N Tryon St	67414.13	4.23	4 lanes	Two-Way, Divided, Unprotected Median	40 - 45 MPH
27	Central Av	26865.15	5.31	4 lanes	Two-Way, Divided, Unprotected Median	30 - 35 MPH
24	South Bv	49553.99	2.56	5 lanes	Two-Way, Divided, Unprotected Median	40 - 45 MPH
22	Beatties Ford Rd	41420.46	2.80	3 lanes	Two-Way, Not Divided	Unknown
19	Albemarle Rd	53101.26	1.89	5 lanes	Two-Way, Not Divided	40 - 45 MPH
18	Eastway Dr	22482.01	4.23	Unknown	Unknown	Unknown
17	The Plaza	37729.31	2.38	5 lanes	Two-Way, Divided, Unprotected Median	30 - 35 MPH
16	S Tryon St	70734.89	1.19	4 lanes	Two-Way, Not Divided	40 - 45 MPH
15	E W T Harris Bv	58479.57	1.35	4 lanes	Two-Way, Divided, Unprotected Median	40 - 45 MPH
15	Monroe Rd	36525.03	2.17	4 lanes	Two-Way, Not Divided	40 - 45 MPH
15	N Sharon Amity Rd	32891.93	2.41	5 lanes	Two-Way, Divided, Unprotected Median	40 - 45 MPH
12	N I-85 Hy	111640.77	0.57	4 lanes	Two-Way, Divided, Positive Median Barrier	60 - 75 MPH
10	E 7th St	13030.28	4.05	3 lanes	Two-Way, Not Divided	30 - 35 MPH
8	E Independence Bv	47904.61	0.88	9 or more	Two-Way, Divided, Positive Median Barrier	50 - 55 MPH
8	Shamrock Dr	19031.25	2.22	2 lanes	Two-Way, Not Divided	30 - 35 MPH
7	Freedom Dr	32668.59	1.13	6 lanes	Two-Way, Divided, Positive Median Barrier	40 - 45 MPH
7	Nations Ford Rd	36260.13	1.02	4 lanes	Two-Way, Not Divided	30 - 35 MPH
7	W Sugar Creek Rd	35035.84	1.05	1 lane	One-Way, Not Divided	5 - 15 MPH
7	West Bv	32981.17	1.12	4 lanes	Two-Way, Not Divided	30 - 35 MPH

Ped Crashes	WHOLESTNAM	Length	Crashes /Mile	Number Lanes*	Road Configuration*	Speed Limit*
6	Elizabeth Av	3914.80	8.09	3 lanes	Two-Way, Divided, Positive Median Barrier	20 - 25 MPH
6	Statesville Rd	35846.19	0.88	2 lanes	Two-Way, Not Divided	40 - 45 MPH
6	Wilkinson Bv	45992.44	0.69	6 lanes	Two-Way, Divided, Positive Median Barrier	40 - 45 MPH
5	E Trade St	3462.78	7.62	4 lanes	Two-Way, Not Divided	30 - 35 MPH
5	Milton Rd	7407.76	3.56	4 lanes	Two-Way, Divided, Positive Median Barrier	30 - 35 MPH
5	N Graham St	27160.06	0.97	4 lanes	Two-Way, Not Divided	30 - 35 MPH
5	Park Rd	48025.28	0.55	4 lanes	Two-Way, Divided, Unprotected Median	30 - 35 MPH
5	Pineville-Matthews Rd	41510.52	0.64	4 lanes	Two-Way, Divided, Unprotected Median	30 - 35 MPH
5	S I-77 Hy	104887.19	0.25	8 lanes	Two-Way, Divided, Positive Median Barrier	50 - 55 MPH
5	Tuckaseegee Rd	34040.85	0.78	2 lanes	Two-Way, Not Divided	30 - 35 MPH
5	Tyvola Rd	15832.31	1.67	4 lanes	Two-Way, Not Divided	30 - 35 MPH
5	W Trade St	14100.40	1.87	4 lanes	Two-Way, Not Divided	20 - 25 MPH
4	E 4th St	8175.10	2.58	4 lanes	One-Way, Not Divided	30 - 35 MPH
4	I-485 Ra	210283.22	0.10	7 lanes	Two-Way, Divided, Positive Median Barrier	60 - 75 MPH
4	Lawyers Rd	7015.78	3.01	2 lanes	Two-Way, Not Divided	40 - 45 MPH
4	N I-77 Hy	105342.85	0.20	3 lanes	Two-Way, Divided, Positive Median Barrier	50 - 55 MPH
4	N Wendover Rd	9744.37	2.17	Unknown	Unknown	5 - 15 MPH
4	Parkwood Av	7193.24	2.94	4 lanes	Two-Way, Divided, Positive Median Barrier	30 - 35 MPH

Ped Crashes	WHOLESTNAM	Length	Crashes /Mile	Number Lanes*	Road Configuration*	Speed Limit*
4	Randolph Rd	22649.18	0.93	4 lanes	Two-Way, Not Divided	30 - 35 MPH
4	S Church St	6251.46	3.38	3 lanes	One-Way, Not Divided	20 - 25 MPH
4	S I-85 Hy	111597.17	0.19	8 lanes	Two-Way, Divided, Unprotected Median	60 - 75 MPH
4	Statesville Av	12560.92	1.68	4 lanes	Two-Way, Divided, Unprotected Median	30 - 35 MPH
4	W W T Harris Bv	44747.24	0.47	6 lanes	Two-Way, Divided, Unprotected Median	40 - 45 MPH
3	Ashley Rd	9012.73	1.76	2 lanes	Two-Way, Not Divided	30 - 35 MPH
3	Burnette Av	1451.27	10.91	2 lanes	Two-Way, Not Divided	20 - 25 MPH
3	Carmel Rd	38961.04	0.41	5 lanes	Two-Way, Divided, Unprotected Median	30 - 35 MPH
3	Clanton Rd	10466.87	1.51	3 lanes	Two-Way, Not Divided	30 - 35 MPH
3	Commonwealth Av	12356.39	1.28	2 lanes	Two-Way, Not Divided	30 - 35 MPH
3	E 5th St	11564.03	1.37	4 lanes	Two-Way, Not Divided	20 - 25 MPH
3	E 6th St	4138.62	3.83	6 lanes	One-Way, Not Divided	20 - 25 MPH
3	Gibbon Rd	11790.91	1.34	2 lanes	Two-Way, Not Divided	40 - 45 MPH
3	Idlewild Rd	18611.07	0.85	4 lanes	Two-Way, Not Divided	30 - 35 MPH
3	Keller Av	2008.64	7.89	5 lanes	Two-Way, Not Divided	30 - 35 MPH
3	Little Rock Rd	17825.11	0.89	2 lanes	Two-Way, Not Divided	40 - 45 MPH
3	Marvin Rd	17348.72	0.91	2 lanes	Two-Way, Not Divided	30 - 35 MPH
3	Old Concord Rd	25954.97	0.61	2 lanes	Two-Way, Not Divided	30 - 35 MPH
3	Providence Rd	68416.68	0.23	4 lanes	Two-Way, Divided, Unprotected Median	30 - 35 MPH
3	Rea Rd	42134.72	0.38	6 lanes	Two-Way, Divided, Positive Median Barrier	40 - 45 MPH

Ped Crashes	WHOLESTNAM	Length	Crashes /Mile	Number Lanes*	Road Configuration*	Speed Limit*
3	S College St	4241.20	3.73	3 lanes	One-Way, Not Divided	30 - 35 MPH
3	S I-85 Ra	16272.75	0.97	3 lanes	Two-Way, Divided, Positive Median Barrier	50 - 55 MPH
3	W 5th St	7122.66	2.22	4 lanes	Two-Way, Not Divided	20 - 25 MPH
3	W Woodlawn Rd	2236.22	7.08	4 lanes	Two-Way, Not Divided	30 - 35 MPH
2	Archdale Dr	18434.69	0.57	4 lanes	Two-Way, Divided, Unprotected Median	Unknown
2	Belmont Av	3939.56	2.68	2 lanes	Two-Way, Not Divided	20 - 25 MPH
2	Billy Graham Py	31453.70	0.34	4 lanes	Two-Way, Divided, Unprotected Median	40 - 45 MPH
2	Burkland Dr	1189.51	8.88	2 lanes	Two-Way, Not Divided	20 - 25 MPH
2	E 16th St	4422.42	2.39	2 lanes	Two-Way, Divided, Unprotected Median	30 - 35 MPH
2	E 3rd St	8265.42	1.28	3 lanes	One-Way, Not Divided	30 - 35 MPH
2	E Arrowood Rd	4768.27	2.21	4 lanes	Two-Way, Divided, Positive Median Barrier	Unknown
2	E John Belk Fr	15854.17	0.67	2 lanes	Two-Way, Divided, Positive Median Barrier	50 - 55 MPH
2	E Stonewall St	4570.66	2.31	4 lanes	Two-Way, Divided, Unprotected Median	30 - 35 MPH
2	E Sugar Creek Rd	7653.52	1.38	4 lanes	Two-Way, Divided, Unprotected Median	Unknown
2	E Woodlawn Rd	13317.34	0.79	4 lanes	Two-Way, Not Divided	30 - 35 MPH
2	Farm Pond Ln	9494.48	1.11	2 lanes	Two-Way, Not Divided	Unknown
2	Farmhurst Dr	4476.93	2.36	2 lanes	Two-Way, Not Divided	30 - 35 MPH
2	Grimes St	4989.10	2.12	2 lanes	Two-Way, Not Divided	20 - 25 MPH
2	Hickory Grove Rd	9809.28	1.08	4 lanes	Two-Way, Not Divided	30 - 35 MPH
2	Home Depot Dr	580.14	18.20	Unknown	Unknown	5 - 15 MPH

Ped Crashes	WHOLESTNAM	Length	Crashes /Mile	Number Lanes*	Road Configuration*	Speed Limit*
2	Jeff Adams Dr	9199.47	1.15	8 lanes	Two-Way, Divided, Positive Median Barrier	60 - 75 MPH
2	Louise Av	4265.90	2.48	2 lanes	Two-Way, Not Divided	20 - 25 MPH
2	McClintock Rd	3692.35	2.86	1 lane	Two-Way, Not Divided	20 - 25 MPH
2	Mulberry Church Rd	5883.24	1.79	4 lanes	Two-Way, Divided, Positive Median Barrier	30 - 35 MPH
2	N Alexander St	7290.06	1.45	2 lanes	Two-Way, Not Divided	Unknown
2	N Caldwell St	6973.00	1.51	2 lanes	Two-Way, Not Divided	20 - 25 MPH
2	N College St	4679.30	2.26	3 lanes	One-Way, Not Divided	30 - 35 MPH
2	N Davidson St	18296.88	0.58	2 lanes	Two-Way, Divided, Unprotected Median	30 - 35 MPH
2	N I-485 Inner Hy	66593.12	0.16	8 lanes	Two-Way, Divided, Positive Median Barrier	60 - 75 MPH
2	N I-85 Ra	19530.55	0.54	4 lanes	Two-Way, Divided, Unprotected Median	30 - 35 MPH
2	N Kings Dr	1924.37	5.49	4 lanes	Two-Way, Divided, Unprotected Median	30 - 35 MPH
2	N Mcdowell St	7162.61	1.47	Unknown	Two-Way, Not Divided	5 - 15 MPH
2	N Poplar St	6455.94	1.64	2 lanes	Two-Way, Not Divided	20 - 25 MPH
2	Nobles Av	2680.40	3.94	2 lanes	Two-Way, Not Divided	30 - 35 MPH
2	Pressley Rd	7391.67	1.43	2 lanes	Two-Way, Not Divided	30 - 35 MPH
2	Queen City Dr	13286.29	0.79	2 lanes	Two-Way, Not Divided	40 - 45 MPH
2	Reagan Dr	15934.63	0.66	2 lanes	Two-Way, Not Divided	30 - 35 MPH
2	Remount Rd	13068.97	0.81	Unknown	Unknown	Unknown
2	S Brevard St	2143.40	4.93	3 lanes	One-Way, Not Divided	30 - 35 MPH
2	S Kings Dr	8154.44	1.29	4 lanes	Two-Way, Not Divided	30 - 35 MPH

Ped Crashes	WHOLESTNAM	Length	Crashes /Mile	Number Lanes*	Road Configuration*	Speed Limit*
2	Selwyn Av	12555.96	0.84	4 lanes	Two-Way, Not Divided	30 - 35 MPH
2	Sunset Rd	21113.04	0.50	5 lanes	Two-Way, Not Divided	Unknown
2	Taylor Av	1637.65	6.45	2 lanes	Two-Way, Not Divided	20 - 25 MPH
2	Tom Hunter Rd	8079.27	1.31	2 lanes	Two-Way, Not Divided	Unknown
2	Village Lake Dr	3949.65	2.67	4 lanes	Two-Way, Not Divided	30 - 35 MPH
2	W 24th St	2822.11	3.74	2 lanes	Two-Way, Not Divided	30 - 35 MPH
2	W 28th St	3128.08	3.38	4 lanes	Two-Way, Not Divided	30 - 35 MPH
2	W Arrowood Rd	21564.64	0.49	4 lanes	Two-Way, Not Divided	30 - 35 MPH
2	Weddington Rd	12577.03	0.84	2 lanes	Two-Way, Not Divided	30 - 35 MPH
2	Westinghouse Bv	28580.21	0.37	5 lanes	Two-Way, Not Divided	40 - 45 MPH
2	Weyland Av	3170.10	3.33	2 lanes	Two-Way, Not Divided	20 - 25 MPH
1	Abbey Pl	2802.99	1.88	2 lanes	Two-Way, Not Divided	20 - 25 MPH
1	Alleghany St	10467.62	0.50	4 lanes	Two-Way, Not Divided	30 - 35 MPH
1	Allegiance Dr	2010.15	2.63	2 lanes	Two-Way, Not Divided	20 - 25 MPH
1	Allen St	4655.23	1.13	2 lanes	Two-Way, Not Divided	20 - 25 MPH
1	Amay James Av	3765.14	1.40	2 lanes	Two-Way, Not Divided	20 - 25 MPH
1	Amity Springs Dr	2821.71	1.87	2 lanes	Two-Way, Not Divided	20 - 25 MPH
1	Annisa Ct	194.42	27.16	2 lanes	Two-Way, Not Divided	Unknown
1	Antlers Ln	1848.20	2.86	Unknown	Two-Way, Not Divided	20 - 25 MPH
1	Ardrey Kell Rd	30113.56	0.18	4 lanes	Two-Way, Not Divided	40 - 45 MPH
1	Arrowcreek Dr	1320.58	4.00	1 lane	Two-Way, Not Divided	20 - 25 MPH
1	Ashmore Dr	1463.28	3.61	2 lanes	Two-Way, Not Divided	20 - 25 MPH

Ped Crashes	WHOLESTNAM	Length	Crashes /Mile	Number Lanes*	Road Configuration*	Speed Limit*
1	Bainbridge Rd	1320.24	4.00	4 lanes	Two-Way, Not Divided	40 - 45 MPH
1	Baldwin Av	3420.60	1.54	4 lanes	Two-Way, Not Divided	30 - 35 MPH
1	Barrington Dr	10454.16	0.51	2 lanes	Two-Way, Not Divided	30 - 35 MPH
1	Beacon Ridge Rd	3022.07	1.75	Unknown	Two-Way, Not Divided	5 - 15 MPH
1	Bellsouth Dr	338.58	15.59	2 lanes	Two-Way, Divided, Unprotected Median	Unknown
1	Belmeade Dr	15188.73	0.35	2 lanes	Two-Way, Not Divided	30 - 35 MPH
1	Berneway Dr	2859.84	1.85	2 lanes	Two-Way, Divided, Unprotected Median	20 - 25 MPH
1	Berryhill Rd	7775.88	0.68	2 lanes	Two-Way, Not Divided	30 - 35 MPH
1	Billingsley Rd	3643.04	1.45	4 lanes	Two-Way, Not Divided	20 - 25 MPH
1	Blythe Bv	2509.58	2.10	2 lanes	Two-Way, Not Divided	5 - 15 MPH
1	Boston Av	1519.20	3.48	2 lanes	Two-Way, Not Divided	5 - 15 MPH
1	Boyer St	5404.24	0.98	2 lanes	Two-Way, Not Divided	40 - 45 MPH
1	Braden Dr	3283.95	1.61	2 lanes	Two-Way, Not Divided	20 - 25 MPH
1	Branch Hill Cr	3415.30	1.55	2 lanes	Two-Way, Not Divided	40 - 45 MPH
1	Brantley Dr	520.39	10.15	2 lanes	Two-Way, Not Divided	30 - 35 MPH
1	Briar Creek Rd	6786.25	0.78	2 lanes	Two-Way, Not Divided	30 - 35 MPH
1	Briarwick Ln	1746.49	3.02	2 lanes	Two-Way, Not Divided	20 - 25 MPH
1	Brick Yard Rd	2380.87	2.22	2 lanes	Two-Way, Not Divided	30 - 35 MPH
1	Brickleberry Ln	989.39	5.34	1 lane	Two-Way, Divided, Unprotected Median	30 - 35 MPH
1	Brite And Earley Rd	1292.91	4.08	1 lane	Two-Way, Not Divided	Unknown
1	Brookshire Bv	44557.78	0.12	4 lanes	Two-Way, Divided, Unprotected Median	40 - 45 MPH

Ped Crashes	WHOLESTNAM	Length	Crashes /Mile	Number Lanes*	Road Configuration*	Speed Limit*
1	Brooksvale St	2292.98	2.30	2 lanes	Two-Way, Not Divided	5 - 15 MPH
1	Browne Rd	10618.82	0.50	2 lanes	Two-Way, Not Divided	40 - 45 MPH
1	Bugle Ct	121.28	43.54	2 lanes	Two-Way, Not Divided	20 - 25 MPH
1	Bungalow Rd	808.49	6.53	2 lanes	Two-Way, Not Divided	20 - 25 MPH
1	Burleigh St	889.36	5.94	1 lane	Two-Way, Not Divided	5 - 15 MPH
1	Cameron Bv	9045.10	0.58	2 lanes	Two-Way, Divided, Unprotected Median	20 - 25 MPH
1	Campus Connection Dr	206.17	25.61	3 lanes	Two-Way, Not Divided	30 - 35 MPH
1	Canterwood Dr	2282.89	2.31	2 lanes	Two-Way, Not Divided	20 - 25 MPH
1	Carowinds Bv	7600.98	0.69	5 lanes	Two-Way, Not Divided	40 - 45 MPH
1	Catalina Av	3512.54	1.50	2 lanes	Two-Way, Not Divided	30 - 35 MPH
1	Catherine Simmons Av	3388.38	1.56	2 lanes	Two-Way, Not Divided	20 - 25 MPH
1	Cedars East Ct	4147.07	1.27	4 lanes	Two-Way, Not Divided	30 - 35 MPH
1	Cedarwild Rd	1795.76	2.94	2 lanes	Two-Way, Not Divided	30 - 35 MPH
1	Celia Av	3495.66	1.51	2 lanes	Two-Way, Not Divided	20 - 25 MPH
1	Charlottetowne Av	4264.93	1.24	6 lanes	Two-Way, Divided, Positive Median Barrier	30 - 35 MPH
1	Chasewood Dr	2870.14	1.84	4 lanes	Two-Way, Divided, Unprotected Median	40 - 45 MPH
1	Chesterfield Av	4895.43	1.08	2 lanes	Two-Way, Not Divided	30 - 35 MPH
1	Chicago Av	952.35	5.54	2 lanes	Two-Way, Not Divided	20 - 25 MPH
1	Chippendale Rd	2101.54	2.51	2 lanes	Two-Way, Not Divided	30 - 35 MPH
1	Clifton Meadow Dr	5090.07	1.04	2 lanes	Two-Way, Not Divided	20 - 25 MPH

Ped Crashes	WHOLESTNAM	Length	Crashes /Mile	Number Lanes*	Road Configuration*	Speed Limit*
1	Clyde Dr	1348.36	3.92	2 lanes	Two-Way, Not Divided	20 - 25 MPH
1	Cochran Farm Ln	1100.15	4.80	2 lanes	Two-Way, Not Divided	5 - 15 MPH
1	Coleman Dr	1430.45	3.69	2 lanes	Two-Way, Not Divided	40 - 45 MPH
1	College-tryon St	558.76	9.45	1 lane	One-Way, Not Divided	30 - 35 MPH
1	Colony Acres Dr	2575.61	2.05	2 lanes	Two-Way, Not Divided	30 - 35 MPH
1	Colony Rd	31076.80	0.17	3 lanes	Two-Way, Not Divided	30 - 35 MPH
1	Columbus Cr	3689.70	1.43	2 lanes	Two-Way, Not Divided	20 - 25 MPH
1	Community House Rd	6720.37	0.79	4 lanes	Two-Way, Not Divided	40 - 45 MPH
1	Connecticut Av	1274.02	4.14	2 lanes	Two-Way, Not Divided	30 - 35 MPH
1	Copper Creek Ct	1432.21	3.69	2 lanes	Two-Way, Not Divided	5 - 15 MPH
1	Copperplate Rd	3158.59	1.67	2 lanes	Two-Way, Not Divided	30 - 35 MPH
1	Coronation Bv	1268.89	4.16	4 lanes	Two-Way, Divided, Unprotected Median	Unknown
1	Corton Dr	194.58	27.14	2 lanes	Two-Way, Not Divided	Unknown
1	Coulee Pl	1641.25	3.22	2 lanes	Two-Way, Not Divided	20 - 25 MPH
1	Countryside Dr	1296.37	4.07	2 lanes	Two-Way, Not Divided	Unknown
1	Covecreek Dr	7835.05	0.67	2 lanes	Two-Way, Not Divided	Unknown
1	Crape Myrtle Ln	1155.81	4.57	2 lanes	Two-Way, Not Divided	30 - 35 MPH
1	David Cox Rd	11878.55	0.44	2 lanes	Two-Way, Not Divided	30 - 35 MPH
1	Densmore Dr	930.60	5.67	2 lanes	Two-Way, Not Divided	Unknown
1	Downs Av	1993.43	2.65	4 lanes	Two-Way, Divided, Unprotected Median	30 - 35 MPH
1	Dresden Dr East	1686.11	3.13	2 lanes	Two-Way, Not Divided	30 - 35 MPH
1	Dunn Av	2015.62	2.62	2 lanes	Two-Way, Divided, Unprotected Median	30 - 35 MPH

Ped Crashes	WHOLESTNAM	Length	Crashes /Mile	Number Lanes*	Road Configuration*	Speed Limit*
1	Dwightware Bv	3885.90	1.36	2 lanes	Two-Way, Not Divided	30 - 35 MPH
1	E 10th St	3866.20	1.37	8 lanes	Two-Way, Not Divided	30 - 35 MPH
1	E 11th St	3557.54	1.48	4 lanes	One-Way, Not Divided	30 - 35 MPH
1	E 17th St	2825.11	1.87	2 lanes	Two-Way, Not Divided	Unknown
1	E 28th St	1583.32	3.33	4 lanes	Two-Way, Not Divided	30 - 35 MPH
1	E 36th St	7189.60	0.73	2 lanes	Two-Way, Divided, Unprotected Median	30 - 35 MPH
1	E 37th St	1504.09	3.51	2 lanes	Two-Way, Not Divided	30 - 35 MPH
1	E 9th St	5554.61	0.95	2 lanes	Two-Way, Not Divided	30 - 35 MPH
1	E Hebron St	4493.11	1.18	3 lanes	Two-Way, Divided, Unprotected Median	30 - 35 MPH
1	E I-485 Outer Hy	80425.42	0.07	4 lanes	Two-Way, Divided, Positive Median Barrier	60 - 75 MPH
1	E Independence/Briar Creek Ra	1987.17	2.66	8 lanes	Two-Way, Divided, Unprotected Median	50 - 55 MPH
1	E John Belk Ra	16473.75	0.32	4 lanes	One-Way, Not Divided	50 - 55 MPH
1	E Liddell St	491.33	10.75	4 lanes	Two-Way, Not Divided	30 - 35 MPH
1	E Mallard Creek Church Rd	6554.22	0.81	4 lanes	Two-Way, Divided, Unprotected Median	40 - 45 MPH
1	E Morehead St	8636.36	0.61	4 lanes	Two-Way, Divided, Unprotected Median	30 - 35 MPH
1	East Bv	9232.55	0.57	4 lanes	Two-Way, Not Divided	30 - 35 MPH
1	Eastfield Rd	20354.74	0.26	2 lanes	Two-Way, Not Divided	40 - 45 MPH
1	Eastland Ct	507.45	10.40	2 lanes	Two-Way, Not Divided	30 - 35 MPH
1	Echo Glen Rd	3647.07	1.45	2 lanes	Two-Way, Not Divided	30 - 35 MPH
1	Electra Ln	1069.40	4.94	2 lanes	Two-Way, Not Divided	30 - 35 MPH

Ped Crashes	WHOLESTNAM	Length	Crashes /Mile	Number Lanes*	Road Configuration*	Speed Limit*
1	Eli St	399.14	13.23	2 lanes	Two-Way, Not Divided	30 - 35 MPH
1	Elm Ln	16135.95	0.33	2 lanes	Two-Way, Not Divided	30 - 35 MPH
1	Ennis Av	1304.88	4.05	2 lanes	Two-Way, Not Divided	20 - 25 MPH
1	Erskine Dr	1527.43	3.46	2 lanes	Two-Way, Not Divided	30 - 35 MPH
1	Evanton Loch Rd	3345.28	1.58	2 lanes	Two-Way, Not Divided	20 - 25 MPH
1	Evergreen Dr	1084.86	4.87	2 lanes	Two-Way, Not Divided	30 - 35 MPH
1	Exit 10 I-85 Ra	3335.07	1.58	8 lanes	Two-Way, Divided, Positive Median Barrier	60 - 75 MPH
1	Exit 30 I-485 Ra	2651.13	1.99	8 lanes	Two-Way, Divided, Positive Median Barrier	60 - 75 MPH
1	Exit 48 S I-485 Rock Hill Ra	3265.36	1.62	6 lanes	Two-Way, Divided, Positive Median Barrier	60 - 75 MPH
1	Faires Farm Rd	5084.74	1.04	2 lanes	Two-Way, Not Divided	30 - 35 MPH
1	Fairhaven Dr	1367.61	3.86	2 lanes	Two-Way, Not Divided	40 - 45 MPH
1	Fallow Ln	1914.42	2.76	2 lanes	Two-Way, Not Divided	20 - 25 MPH
1	Fawnbrook Ln	1324.90	3.99	2 lanes	Two-Way, Not Divided	20 - 25 MPH
1	Fielding Rd	3811.76	1.39	2 lanes	Two-Way, Not Divided	30 - 35 MPH
1	Flamingo Av	1247.82	4.23	2 lanes	Two-Way, Not Divided	30 - 35 MPH
1	Fleetwood Dr	1657.58	3.19	2 lanes	One-Way, Not Divided	20 - 25 MPH
1	Flintrock Rd	1817.68	2.90	2 lanes	Two-Way, Not Divided	40 - 45 MPH
1	Foster Av	1901.24	2.78	4 lanes	Two-Way, Divided, Positive Median Barrier	30 - 35 MPH
1	Four Mile Creek Rd	10704.03	0.49	2 lanes	Two-Way, Not Divided	30 - 35 MPH

Ped Crashes	WHOLESTNAM	Length	Crashes /Mile	Number Lanes*	Road Configuration*	Speed Limit*
1	Gemway Dr	4998.71	1.06	Unknown	One-Way, Not Divided	Unknown
1	Glenham Dr	1640.52	3.22	4 lanes	Two-Way, Not Divided	30 - 35 MPH
1	Glenn St	606.67	8.70	4 lanes	Two-Way, Divided, Unprotected Median	30 - 35 MPH
1	Grace St	3174.63	1.66	2 lanes	Two-Way, Divided, Unprotected Median	30 - 35 MPH
1	Graham Meadow Dr	1997.66	2.64	2 lanes	Two-Way, Not Divided	20 - 25 MPH
1	Green Forest Dr	1162.45	4.54	2 lanes	Two-Way, Divided, Positive Median Barrier	5 - 15 MPH
1	Hanna Ct	2987.20	1.77	2 lanes	Two-Way, Not Divided	30 - 35 MPH
1	Hanover St	1359.66	3.88	2 lanes	Two-Way, Divided, Unprotected Median	30 - 35 MPH
1	Harlee Av	2634.81	2.00	6 lanes	Two-Way, Divided, Positive Median Barrier	40 - 45 MPH
1	Harrisburg Rd	25241.47	0.21	4 lanes	Two-Way, Divided, Unprotected Median	40 - 45 MPH
1	Harrison St	1148.65	4.60	2 lanes	Two-Way, Not Divided	30 - 35 MPH
1	Hartford Av	6839.29	0.77	2 lanes	Two-Way, Divided, Unprotected Median	20 - 25 MPH
1	Hashem Dr	775.09	6.81	2 lanes	Two-Way, Not Divided	Unknown
1	Hateras Av	2097.48	2.52	2 lanes	Two-Way, Not Divided	20 - 25 MPH
1	Hawthorne Ln	9159.15	0.58	2 lanes	Two-Way, Divided, Unprotected Median	30 - 35 MPH
1	Heather Ln	5326.50	0.99	2 lanes	Two-Way, Not Divided	20 - 25 MPH
1	Hemphill St	1875.67	2.81	2 lanes	Two-Way, Not Divided	20 - 25 MPH
1	Herman Av	641.59	8.23	1 lane	One-Way, Not Divided	Unknown
1	Herrin Av	6439.79	0.82	2 lanes	Two-Way, Divided, Unprotected Median	30 - 35 MPH
1	Hewitt Dr	2109.86	2.50	2 lanes	Two-Way, Not Divided	30 - 35 MPH
1	Hiddenbrook Dr	2124.21	2.49	2 lanes	Two-Way, Not Divided	30 - 35 MPH

Ped Crashes	WHOLESTNAM	Length	Crashes /Mile	Number Lanes*	Road Configuration*	Speed Limit*
1	Highland St	2170.06	2.43	2 lanes	Two-Way, Not Divided	20 - 25 MPH
1	Holabird Ln	1050.02	5.03	4 lanes	Two-Way, Divided, Unprotected Median	30 - 35 MPH
1	Houston Branch Rd	5605.52	0.94	2 lanes	Two-Way, Not Divided	Unknown
1	Howie Cr	2320.78	2.28	2 lanes	Two-Way, Not Divided	30 - 35 MPH
1	Hubbard Rd	7373.61	0.72	2 lanes	Two-Way, Divided, Unprotected Median	30 - 35 MPH
1	IBM Dr	12206.37	0.43	3 lanes	Two-Way, Divided, Unprotected Median	30 - 35 MPH
1	Idlewild Rd North	4139.81	1.28	2 lanes	Two-Way, Divided, Unprotected Median	40 - 45 MPH
1	Independence/I-277 Ra	8163.76	0.65	2 lanes	One-Way, Not Divided	40 - 45 MPH
1	Iris Dr	1766.46	2.99	2 lanes	Two-Way, Not Divided	20 - 25 MPH
1	J M Keynes Dr	3223.90	1.64	2 lanes	Two-Way, Not Divided	5 - 15 MPH
1	J W Clay Bv	4442.20	1.19	4 lanes	Two-Way, Not Divided	30 - 35 MPH
1	John Kirk Dr	4526.22	1.17	2 lanes	Two-Way, Divided, Unprotected Median	30 - 35 MPH
1	Jones St	1577.10	3.35	2 lanes	Two-Way, Not Divided	20 - 25 MPH
1	Kenhill Dr	3056.37	1.73	2 lanes	Two-Way, Divided, Unprotected Median	20 - 25 MPH
1	Kennon St	1766.44	2.99	2 lanes	Two-Way, Not Divided	30 - 35 MPH
1	Kiley Ln	164.47	32.10	2 lanes	Two-Way, Not Divided	20 - 25 MPH
1	Kingman Dr	776.69	6.80	2 lanes	Two-Way, Not Divided	30 - 35 MPH
1	Kings Creek Dr	1812.46	2.91	2 lanes	Two-Way, Not Divided	20 - 25 MPH
1	Lambeth Dr	1577.14	3.35	5 lanes	Two-Way, Divided, Unprotected Median	40 - 45 MPH
1	Lasalle St	9762.61	0.54	2 lanes	Two-Way, Not Divided	30 - 35 MPH
1	Latrobe Dr	5052.55	1.05	2 lanes	Two-Way, Not Divided	Unknown
1	Leeds Dr	1068.53	4.94	2 lanes	Two-Way, Not Divided	Unknown

Ped Crashes	WHOLESTNAM	Length	Crashes /Mile	Number Lanes*	Road Configuration*	Speed Limit*
1	Liggett St	348.83	15.14	2 lanes	Two-Way, Not Divided	30 - 35 MPH
1	Ligustrum St	543.79	9.71	2 lanes	Two-Way, Not Divided	20 - 25 MPH
1	Linda Lake Dr	10880.09	0.49	2 lanes	Two-Way, Not Divided	30 - 35 MPH
1	Lockley Dr	2189.84	2.41	2 lanes	Two-Way, Not Divided	20 - 25 MPH
1	Long Pine Dr	1430.14	3.69	1 lane	Two-Way, Not Divided	20 - 25 MPH
1	Magnolia Hill Dr	4128.73	1.28	Unknown	Two-Way, Divided, Positive Median Barrier	5 - 15 MPH
1	Majeed Dr	893.00	5.91	5 lanes	Two-Way, Divided, Unprotected Median	40 - 45 MPH
1	Manhasset Rd	2849.55	1.85	2 lanes	Two-Way, Not Divided	20 - 25 MPH
1	Markland Dr	3800.38	1.39	2 lanes	Two-Way, Not Divided	30 - 35 MPH
1	Marlowe Av	4972.38	1.06	2 lanes	Two-Way, Not Divided	20 - 25 MPH
1	Mcdaniel Ln	1116.15	4.73	2 lanes	Two-Way, Not Divided	30 - 35 MPH
1	Mckinley Dr	1343.35	3.93	4 lanes	Two-Way, Not Divided	30 - 35 MPH
1	Meadowmead Ct	840.08	6.29	2 lanes	Two-Way, Not Divided	20 - 25 MPH
1	Meadowood Ln	4458.89	1.18	5 lanes	Two-Way, Divided, Unprotected Median	40 - 45 MPH
1	Mellwood Dr	2895.45	1.82	2 lanes	Two-Way, Not Divided	30 - 35 MPH
1	Merriman Av	3502.80	1.51	2 lanes	Two-Way, Not Divided	30 - 35 MPH
1	Michael Lynn Rd	2120.29	2.49	2 lanes	Two-Way, Not Divided	40 - 45 MPH
1	Milhaven Ln	6922.72	0.76	2 lanes	Two-Way, Not Divided	40 - 45 MPH
1	Miller St	617.90	8.55	2 lanes	Two-Way, Not Divided	20 - 25 MPH
1	Mint St	2157.52	2.45	4 lanes	Two-Way, Divided, Positive Median	50 - 55 MPH

Ped Crashes	WHOLESTNAM	Length	Crashes /Mile	Number Lanes*	Road Configuration*	Speed Limit*
					Barrier	
1	Miramar Dr	352.47	14.98	2 lanes	Two-Way, Not Divided	20 - 25 MPH
1	Moores Chapel Rd	27300.45	0.19	2 lanes	Two-Way, Not Divided	30 - 35 MPH
1	Moss Mill Ln	1051.76	5.02	2 lanes	Two-Way, Not Divided	20 - 25 MPH
1	Mount Holly Rd	27660.15	0.19	2 lanes	Two-Way, Divided, Unprotected Median	40 - 45 MPH
1	Mt Holly-Huntersville Rd	45984.54	0.11	2 lanes	Two-Way, Not Divided	40 - 45 MPH
1	Murrayhill Rd	10542.11	0.50	2 lanes	Two-Way, Not Divided	20 - 25 MPH
1	N Brevard St	9911.91	0.53	3 lanes	One-Way, Not Divided	20 - 25 MPH
1	N Caswell Rd	2146.70	2.46	3 lanes	Two-Way, Not Divided	30 - 35 MPH
1	N Church St	8201.18	0.64	4 lanes	Two-Way, Not Divided	30 - 35 MPH
1	N I-77 Ra	6898.15	0.77	1 lane	One-Way, Not Divided	30 - 35 MPH
1	N I85xlittle Rock Rd Ra Nb	1950.84	2.71	8 lanes	Two-Way, Divided, Positive Median Barrier	60 - 75 MPH
1	N Us 29 By-pass Hy	11876.95	0.44	5 lanes	Two-Way, Divided, Unprotected Median	40 - 45 MPH
1	Newcastle St	2817.58	1.87	2 lanes	Two-Way, Not Divided	20 - 25 MPH
1	Newell-Hickory Grove Rd	4611.70	1.14	2 lanes	Two-Way, Not Divided	40 - 45 MPH
1	Norris Av	5847.08	0.90	2 lanes	Two-Way, Not Divided	30 - 35 MPH
1	Northlake Mall Dr	7574.51	0.70	2 lanes	Two-Way, Not Divided	30 - 35 MPH
1	Oak Arbor Ln	485.75	10.87	2 lanes	One-Way, Not Divided	5 - 15 MPH
1	Oak Pasture Ln	1379.19	3.83	2 lanes	Two-Way, Not Divided	5 - 15 MPH
1	Oakdale Rd	23846.87	0.22	2 lanes	Two-Way, Not Divided	40 - 45 MPH

Ped Crashes	WHOLESTNAM	Length	Crashes /Mile	Number Lanes*	Road Configuration*	Speed Limit*
1	Old Dowd Rd	26781.63	0.20	2 lanes	Two-Way, Not Divided	30 - 35 MPH
1	Old House Cr	3389.71	1.56	2 lanes	Two-Way, Not Divided	20 - 25 MPH
1	Old Pineville Rd	19450.10	0.27	2 lanes	Two-Way, Not Divided	Unknown
1	Old Statesville Rd	24998.81	0.21	2 lanes	Two-Way, Not Divided	30 - 35 MPH
1	Old Steele Creek Rd	7489.46	0.70	2 lanes	Two-Way, Not Divided	20 - 25 MPH
1	Orange St	1937.40	2.73	2 lanes	Two-Way, Not Divided	20 - 25 MPH
1	Oregon St	1357.96	3.89	2 lanes	Two-Way, Not Divided	Unknown
1	Orr Rd	10591.45	0.50	2 lanes	Two-Way, Not Divided	30 - 35 MPH
1	Paddock Cr	2945.14	1.79	2 lanes	Two-Way, Not Divided	30 - 35 MPH
1	Pallisers Tr	2346.00	2.25	2 lanes	Two-Way, Not Divided	30 - 35 MPH
1	Park Rd Shopping Center Dr	3178.50	1.66	4 lanes	Two-Way, Divided, Unprotected Median	30 - 35 MPH
1	Park South Dr	6666.49	0.79	2 lanes	Two-Way, Not Divided	5 - 15 MPH
1	Parkmont Dr	639.28	8.26	2 lanes	Two-Way, Not Divided	30 - 35 MPH
1	Parson St	4279.59	1.23	2 lanes	Two-Way, Not Divided	20 - 25 MPH
1	Pavilion Bv	9230.82	0.57	3 lanes	Two-Way, Not Divided	30 - 35 MPH
1	Pegram St	4524.65	1.17	2 lanes	Two-Way, Not Divided	20 - 25 MPH
1	Pine Mountain Rd	2244.45	2.35	2 lanes	Two-Way, Not Divided	20 - 25 MPH
1	Pinebark Ct	625.92	8.44	2 lanes	Two-Way, Not Divided	5 - 15 MPH
1	Pineborough Rd	2258.04	2.34	2 lanes	Two-Way, Not Divided	20 - 25 MPH
1	Planters Row Dr	4808.23	1.10	2 lanes	Two-Way, Not Divided	30 - 35 MPH
1	Pleasant Grove Rd	12833.54	0.41	2 lanes	Two-Way, Not Divided	30 - 35 MPH

Ped Crashes	WHOLESTNAM	Length	Crashes /Mile	Number Lanes*	Road Configuration*	Speed Limit*
1	Plott Rd	9645.90	0.55	2 lanes	Two-Way, Divided, Unprotected Median	30 - 35 MPH
1	Poindexter Dr	5544.76	0.95	2 lanes	Two-Way, Not Divided	5 - 15 MPH
1	Progress Ln	1613.66	3.27	Unknown	Two-Way, Not Divided	5 - 15 MPH
1	Prosperity Church Rd	18194.83	0.29	2 lanes	Two-Way, Not Divided	40 - 45 MPH
1	Providence Country Club Dr	6909.96	0.76	2 lanes	Two-Way, Not Divided	Unknown
1	Quail Wood Dr	2213.19	2.39	2 lanes	Two-Way, Not Divided	20 - 25 MPH
1	Rachel St	2090.80	2.53	2 lanes	Two-Way, Not Divided	30 - 35 MPH
1	Rama Rd	10583.93	0.50	4 lanes	Two-Way, Not Divided	30 - 35 MPH
1	Regal Oaks Dr	1910.91	2.76	2 lanes	Two-Way, Divided, Unprotected Median	30 - 35 MPH
1	Renner St	1423.68	3.71	4 lanes	Two-Way, Divided, Unprotected Median	30 - 35 MPH
1	Rensselaer Av	1010.43	5.23	4 lanes	Two-Way, Not Divided	30 - 35 MPH
1	Riverwood Rd	2261.98	2.33	2 lanes	Two-Way, Not Divided	Unknown
1	Rocky River Rd	21442.36	0.25	2 lanes	Two-Way, Not Divided	30 - 35 MPH
1	Rosehaven Dr	2969.10	1.78	3 lanes	Two-Way, Not Divided	30 - 35 MPH
1	Rumple Rd	6280.82	0.84	2 lanes	Two-Way, Not Divided	30 - 35 MPH
1	Runnymede Ln	6933.38	0.76	4 lanes	Two-Way, Not Divided	30 - 35 MPH
1	Rush Wind Dr	1744.02	3.03	2 lanes	Two-Way, Not Divided	20 - 25 MPH
1	S Alexander St	742.29	7.11	4 lanes	Two-Way, Not Divided	30 - 35 MPH
1	S Colonial Av	1547.76	3.41	2 lanes	Two-Way, Not Divided	30 - 35 MPH
1	S Davidson St	2162.37	2.44	3 lanes	Two-Way, Not Divided	20 - 25 MPH
1	S Hoskins Rd	4383.65	1.20	2 lanes	Two-Way, Not Divided	30 - 35 MPH

Ped Crashes	WHOLESTNAM	Length	Crashes /Mile	Number Lanes*	Road Configuration*	Speed Limit*
1	S I-485 Outer Hy	66691.35	0.08	6 lanes	Two-Way, Divided, Positive Median Barrier	60 - 75 MPH
1	S I-77 Exit 11 Ra	8843.77	0.60	8 lanes	Two-Way, Divided, Positive Median Barrier	50 - 55 MPH
1	S I-77 Exit 9-1a Ra	3106.47	1.70	9 or more	Two-Way, Divided, Positive Median Barrier	50 - 55 MPH
1	S Mcdowell St	3705.22	1.43	4 lanes	Two-Way, Divided, Positive Median Barrier	30 - 35 MPH
1	S Mint St	8958.79	0.59	3 lanes	Two-Way, Not Divided	30 - 35 MPH
1	S Poplar St	1729.50	3.05	3 lanes	One-Way, Not Divided	20 - 25 MPH
1	S Sharon Amity Rd	3465.49	1.52	4 lanes	Two-Way, Not Divided	30 - 35 MPH
1	S Tryon/College Connector St	450.72	11.71	2 lanes	One-Way, Not Divided	30 - 35 MPH
1	Salome Church Rd	6422.02	0.82	2 lanes	Two-Way, Not Divided	30 - 35 MPH
1	Sam Drenan Rd	2403.74	2.20	2 lanes	Two-Way, Divided, Unprotected Median	30 - 35 MPH
1	Sam Wilson Rd	13771.29	0.38	2 lanes	Two-Way, Not Divided	40 - 45 MPH
1	Sanders Av	1243.45	4.25	4 lanes	Two-Way, Divided, Unprotected Median	30 - 35 MPH
1	Sandy Ridge Ln	443.11	11.92	2 lanes	Two-Way, Not Divided	30 - 35 MPH
1	Sardis Rd North	12868.41	0.41	4 lanes	Two-Way, Divided, Unprotected Median	Unknown
1	Saxonbury Wy	5189.33	1.02	2 lanes	Two-Way, Not Divided	30 - 35 MPH
1	Scott Av	4649.81	1.14	2 lanes	Two-Way, Not Divided	Unknown
1	Scott Futrell Dr	14982.41	0.35	2 lanes	Two-Way, Not Divided	30 - 35 MPH
1	Seigle Av	6085.64	0.87	2 lanes	Two-Way, Divided, Positive Median Barrier	30 - 35 MPH
1	Sharon Rd West	7995.79	0.66	4 lanes	Two-Way, Not Divided	40 - 45 MPH

Ped Crashes	WHOLESTNAM	Length	Crashes /Mile	Number Lanes*	Road Configuration*	Speed Limit*
1	Skyland Av	2728.86	1.93	2 lanes	Two-Way, Not Divided	20 - 25 MPH
1	Spanish Quarter Cr	1849.49	2.85	2 lanes	Two-Way, Not Divided	5 - 15 MPH
1	Starbrook Dr	3842.93	1.37	4 lanes	Two-Way, Divided, Positive Median Barrier	40 - 45 MPH
1	State St	5175.21	1.02	2 lanes	Two-Way, Not Divided	20 - 25 MPH
1	Steele Creek Rd	45315.69	0.12	2 lanes	Two-Way, Not Divided	40 - 45 MPH
1	Steelechase Dr	1737.46	3.04	2 lanes	Two-Way, Not Divided	20 - 25 MPH
1	Stephens Farm Ln	1311.20	4.03	2 lanes	Two-Way, Not Divided	20 - 25 MPH
1	Sterling Rd	7234.25	0.73	2 lanes	Two-Way, Not Divided	20 - 25 MPH
1	Stone Canyon Ln	222.78	23.70	2 lanes	Two-Way, Not Divided	20 - 25 MPH
1	Stoneykirk Ln	888.12	5.95	2 lanes	Two-Way, Not Divided	30 - 35 MPH
1	Summerville Rd	2579.75	2.05	4 lanes	Two-Way, Divided, Positive Median Barrier	50 - 55 MPH
1	Summey Av	2656.15	1.99	5 lanes	Two-Way, Divided, Positive Median Barrier	40 - 45 MPH
1	Sunnywood Ln	3107.14	1.70	2 lanes	Two-Way, Not Divided	20 - 25 MPH
1	Tallwood Ct	110.40	47.83	2 lanes	Two-Way, Not Divided	20 - 25 MPH
1	Taragate Dr	1576.58	3.35	2 lanes	Two-Way, Divided, Positive Median Barrier	20 - 25 MPH
1	Tarrington Av	2338.77	2.26	2 lanes	Two-Way, Not Divided	Unknown
1	Tate St	896.90	5.89	Unknown	Unknown	20 - 25 MPH
1	Thera Dr	857.88	6.15	2 lanes	Two-Way, Not Divided	30 - 35 MPH
1	Thomas Av	4300.60	1.23	2 lanes	Two-Way, Not Divided	30 - 35 MPH

Ped Crashes	WHOLESTNAM	Length	Crashes /Mile	Number Lanes*	Road Configuration*	Speed Limit*
1	Tilden Rd	3475.67	1.52	2 lanes	Two-Way, Not Divided	30 - 35 MPH
1	Tillman Rd	3763.48	1.40	2 lanes	Two-Way, Not Divided	20 - 25 MPH
1	Tippah Park Ct	1360.81	3.88	4 lanes	Two-Way, Divided, Unprotected Median	30 - 35 MPH
1	Tom Sadler Rd	10098.66	0.52	2 lanes	Two-Way, Not Divided	30 - 35 MPH
1	Toomey Av	3566.00	1.48	2 lanes	Two-Way, Not Divided	20 - 25 MPH
1	Tower Point Dr	2537.27	2.08	4 lanes	Two-Way, Divided, Unprotected Median	Unknown
1	Tranquil Av	2163.34	2.44	1 lane	Two-Way, Not Divided	20 - 25 MPH
1	Trinity Rd	4776.34	1.11	2 lanes	Two-Way, Not Divided	20 - 25 MPH
1	University City Bv	26467.76	0.20	4 lanes	Two-Way, Divided, Unprotected Median	40 - 45 MPH
1	University Rd	1735.09	3.04	2 lanes	Two-Way, Divided, Unprotected Median	20 - 25 MPH
1	Village Ct	750.49	7.04	2 lanes	Two-Way, Not Divided	20 - 25 MPH
1	Vilma St	230.38	22.92	2 lanes	Two-Way, Not Divided	30 - 35 MPH
1	W 10th St	3550.16	1.49	2 lanes	Two-Way, Not Divided	30 - 35 MPH
1	W 12th St	2654.73	1.99	3 lanes	One-Way, Not Divided	30 - 35 MPH
1	W 15th St	347.30	15.20	4 lanes	Two-Way, Not Divided	30 - 35 MPH
1	W 29th St	568.00	9.30	4 lanes	Two-Way, Not Divided	30 - 35 MPH
1	W 30th St	1477.27	3.57	2 lanes	Two-Way, Not Divided	30 - 35 MPH
1	W 4th St	4892.97	1.08	4 lanes	Two-Way, Not Divided	30 - 35 MPH
1	W 9th St	2776.75	1.90	2 lanes	Two-Way, Not Divided	20 - 25 MPH
1	W Brookshire Fr	20802.69	0.25	8 lanes	Two-Way, Divided, Positive Median Barrier	50 - 55 MPH

Ped Crashes	WHOLESTNAM	Length	Crashes /Mile	Number Lanes*	Road Configuration*	Speed Limit*
1	W Brookshire Ra	6820.99	0.77	8 lanes	Two-Way, Divided, Positive Median Barrier	50 - 55 MPH
1	W I-485 Inner Hy	80641.19	0.07	4 lanes	Two-Way, Divided, Positive Median Barrier	40 - 45 MPH
1	W Morehead St	10282.77	0.51	3 lanes	Two-Way, Not Divided	30 - 35 MPH
1	W Tyvola Rd	23802.72	0.22	2 lanes	Two-Way, Not Divided	30 - 35 MPH
1	Wakehurst Rd	3297.13	1.60	1 lane	Two-Way, Not Divided	5 - 15 MPH
1	Walkers Cove Tl	3846.24	1.37	2 lanes	Two-Way, Not Divided	5 - 15 MPH
1	Wallace Av	1641.57	3.22	2 lanes	Two-Way, Not Divided	20 - 25 MPH
1	Wallace Rd	4736.13	1.11	2 lanes	Two-Way, Not Divided	30 - 35 MPH
1	Walnut Av	4404.40	1.20	3 lanes	Two-Way, Not Divided	30 - 35 MPH
1	Walsh Bv	1618.91	3.26	2 lanes	Two-Way, Divided, Unprotected Median	30 - 35 MPH
1	Washburn Av	3037.13	1.74	2 lanes	Two-Way, Not Divided	30 - 35 MPH
1	Waterford Lakes Dr	2826.62	1.87	2 lanes	Two-Way, Divided, Positive Median Barrier	5 - 15 MPH
1	Westgarth Av	349.13	15.12	2 lanes	Two-Way, Not Divided	20 - 25 MPH
1	Wicker Dr	867.73	6.08	2 lanes	Two-Way, Not Divided	5 - 15 MPH
1	Willard St	1252.07	4.22	2 lanes	Two-Way, Not Divided	20 - 25 MPH
1	Willow Oak Rd	3152.65	1.67	2 lanes	Two-Way, Not Divided	20 - 25 MPH
1	Wilora Lake Rd	6843.95	0.77	6 lanes	Two-Way, Divided, Positive Median Barrier	40 - 45 MPH
1	Winedale Ln	2399.05	2.20	2 lanes	Two-Way, Not Divided	Unknown
1	Winston Dr	1184.05	4.46	2 lanes	Two-Way, Not Divided	20 - 25 MPH

Ped Crashes	WHOLESTNAM	Length	Crashes /Mile	Number Lanes*	Road Configuration*	Speed Limit*
1	Winston St	768.12	6.87	2 lanes	Two-Way, Not Divided	20 - 25 MPH
1	Woodway Hills Dr	1352.68	3.90	5 lanes	Two-Way, Divided, Unprotected Median	40 - 45 MPH
1	Yorkmont Rd	23953.91	0.22	4 lanes	Two-Way, Divided, Positive Median Barrier	30 - 35 MPH

* from crash records and may not be accurate for whole length of street

Table 23: Pedestrian Crash Rate by Population by Census Tract

Number of Pedestrian Crashes	Census Tract	Population in 2000	Square Miles	Crash Rate per Population
137	1.00	1127	0.730151948	0.121561668
52	40.00	4574	3.904360654	0.011368605
40	17.02	5151	1.423962689	0.007765482
39	55.07	10240	9.875504839	0.003808594
36	52.00	3056	1.407158073	0.011780105
34	53.03	6970	2.16921843	0.004878049
34	16.02	8346	1.864235023	0.004073808
33	19.03	9425	2.542713636	0.003501326
30	46.00	3162	0.87366805	0.009487666
30	25.00	1523	0.587530998	0.019697965
28	23.00	3191	0.744488313	0.008774679
27	48.00	4009	1.260216379	0.006734847
27	19.08	6966	1.637358549	0.003875969
27	38.04	8122	2.209257185	0.003324304
26	61.02	8034	9.168496997	0.003236246
26	39.01	3369	6.537717809	0.007717424
26	19.09	5831	2.04381222	0.004458926
25	15.03	9191	3.06415397	0.002720052
25	5.00	2351	0.648332136	0.010633773
25	19.12	5263	1.271254446	0.004750143
25	18.00	4380	1.782795326	0.005707763
21	53.01	2773	2.220047403	0.007573026
21	13.00	4319	1.009512499	0.004862237
21	8.00	3099	0.515671883	0.006776379
20	15.04	4806	1.362353742	0.004161465
20	19.13	7315	2.359298458	0.002734108
20	31.03	4564	1.57130539	0.004382121
19	53.04	6393	0.758502154	0.002972001
19	43.01	9388	5.2823319	0.00202386
19	6.00	1755	0.419861721	0.010826211
19	37.00	2148	0.982995273	0.008845438
18	38.02	3456	2.606610282	0.005208333
18	59.04	10986	11.88491265	0.001638449
17	56.03	6373	4.084067914	0.002667504
17	14.00	2656	0.819609738	0.006400602
17	17.01	4111	0.582162644	0.004135247
17	32.02	5701	1.343003583	0.002981933

Number of Pedestrian Crashes	Census Tract	Population in 2000	Square Miles	Crash Rate per Population
17	31.02	4014	1.495911326	0.004235177
16	56.04	5007	2.228177658	0.003195526
16	60.01	6771	10.74942804	0.002363019
16	51.00	2628	2.126405395	0.00608828
16	42.00	3625	1.05943125	0.004413793
16	41.00	3812	1.435956373	0.004197272
16	12.00	5552	1.622249438	0.002881844
16	36.00	3874	1.123816577	0.004130098
16	39.02	3667	2.277085595	0.00436324
16	19.10	4614	0.996815461	0.003467707
16	59.05	6798	10.37512652	0.002353633
15	15.06	6423	2.107760012	0.002335357
15	11.00	2614	0.744813984	0.005738332
15	31.06	2745	0.86970479	0.005464481
15	58.07	8206	3.058222113	0.001827931
14	54.02	6588	4.463985006	0.002125076
14	38.03	7121	6.476183471	0.001966016
13	59.01	4490	19.24430461	0.002895323
13	2.00	0	0.206369445	N/A
13	31.07	6662	0.931701728	0.001951366
13	58.16	3871	2.109198429	0.003358305
12	54.01	4350	4.515405424	0.002758621
12	22.00	3772	1.668425311	0.003181336
12	55.06	11554	13.61444721	0.001038601
11	15.05	2906	2.028080191	0.003785272
11	43.02	4893	1.238186024	0.00224811
11	45.00	3639	1.415169611	0.003022808
10	56.05	3591	1.248846029	0.00278474
10	44.00	2410	3.081591909	0.004149378
10	16.04	6993	1.575273625	0.001430001
10	35.00	2189	0.678798604	0.004568296
10	57.08	7302	3.648473509	0.001369488
10	58.12	4653	4.138082704	0.002149151
9	61.01	6668	15.49739536	0.00134973
9	4.00	672	0.672053648	0.013392857
9	24.00	2438	0.553168837	0.00369155
9	27.00	6866	1.941933698	0.001310807
9	19.11	5041	1.220321727	0.00178536

Number of Pedestrian Crashes	Census Tract	Population in 2000	Square Miles	Crash Rate per Population
9	58.06	7662	9.563373505	0.001174628
9	58.15	3251	2.098548636	0.002768379
8	60.04	5054	6.485551256	0.001582905
8	34.00	3754	1.146599949	0.00213106
8	19.07	6300	2.913127781	0.001269841
8	29.01	6251	2.919535547	0.001279795
8	30.11	5422	1.96467173	0.00147547
8	58.11	4153	1.535657599	0.001926318
8	58.22	7561	4.671851381	0.001058061
8	58.19	8409	3.83348266	0.000951362
7	55.04	6924	5.477551715	0.001010976
7	56.06	5720	7.556392907	0.001223776
7	3.00	422	0.310777093	0.016587678
7	32.01	2947	0.724495045	0.002375297
7	58.08	7646	2.440777604	0.000915511
7	58.18	5639	6.100622903	0.001241355
6	56.07	6653	9.724600934	0.000901849
6	9.00	2224	0.430572391	0.002697842
6	16.03	4082	0.986798778	0.001469868
6	26.00	922	0.271989202	0.006507592
6	20.02	5727	2.24708742	0.001047669
6	29.03	3919	1.650435678	0.001531003
6	59.02	5017	22.64341019	0.001195934
6	30.13	4223	2.403674965	0.001420791
6	58.20	5461	4.500394009	0.0010987
5	7.00	667	0.493501219	0.007496252
5	10.00	2255	0.612294762	0.002217295
5	28.00	3403	1.097870499	0.001469292
5	30.08	5688	1.963753424	0.000879044
4	55.03	5991	6.364147786	0.000667668
4	55.05	9327	3.175261375	0.000428862
4	60.03	4184	6.204951426	0.000956023
4	50.00	2424	0.384269998	0.001650165
4	33.00	3053	0.769602522	0.001310187
4	58.23	2894	4.556792794	0.00138217
4	58.21	4201	3.50340287	0.000952154
2	49.00	894	0.340190021	0.002237136
2	57.06	5019	6.32828776	0.000398486

Number of Pedestrian Crashes	Census Tract	Population in 2000	Square Miles	Crash Rate per Population
2	29.04	5766	2.446388649	0.000346861
2	31.05	3805	1.296461361	0.000525624
2	30.07	6776	3.478407495	0.000295159
2	30.14	4973	2.03817161	0.000402172
1	63.02	3593	13.22056512	0.000278319
1	47.00	2469	0.434301836	0.000405022
1	21.00	2441	0.61325702	0.000409668
1	57.10	3904	1.108084054	0.000256148
1	20.03	6030	2.392682868	0.000165837
1	30.06	4106	1.168140502	0.000243546
1	30.16	3859	1.172433134	0.000259134
1	30.12	3913	1.736404245	0.000255558
1	58.13	6623	3.044313236	0.000150989
1	58.14	5561	4.192131003	0.000179824
1	58.17	3680	1.760538478	0.000271739

More information about pedestrian crashes by wedge is provided here. The first map (Figure 28: Pedestrian Crash Numbers and Rates by Wedge) illustrates both the raw numbers of crashes as well as the rate by square mile of crashes for each wedge.

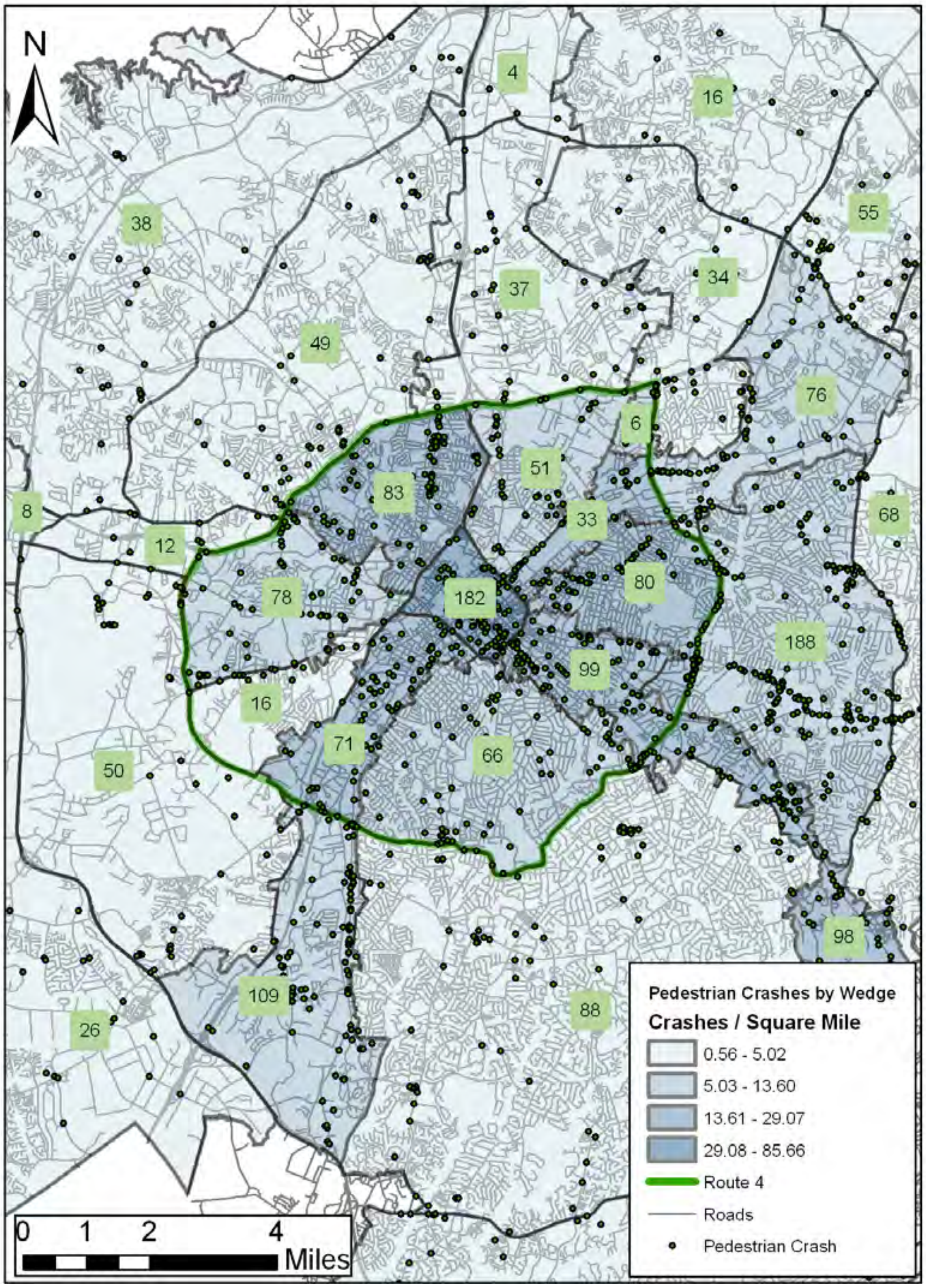

Figure 28: Pedestrian Crash Numbers and Rates by Wedge

Table 24: Pedestrian Crashes by Wedge

Number of Crashes	Wedge
188	East Wedge Middle
182	Uptown
109	South Corridor Outer
99	Southeast Corridor Inner
98	Southeast Corridor Outer
88	South Wedge Middle
83	Northwest Wedge Inner
80	East Wedge Inner
78	West Corridor Inner
76	Northeast Corridor Middle
71	South Corridor Inner
68	East Wedge Outer
67	South Wedge Outer
66	South Wedge Inner
55	Northeast Corridor Outer
51	North Corridor Inner
50	Southwest Wedge Middle
49	Northwest Wedge Middle
38	Northwest Wedge Outer
37	North Corridor Middle
34	Northeast Wedge Middle
33	Northeast Corridor Inner
26	Southwest Wedge Outer
16	Northeast Wedge Outer
16	Southwest Wedge Inner
12	West Corridor Middle
8	West Corridor Outer
6	Northeast Wedge Inner
4	North Corridor Outer

As some of the data regarding the exact area of the Wedge is missing, the rate of crashes to area is not included in Table 24: Pedestrian Crashes by Wedge. Figure 28: Pedestrian Crash Numbers and Rates by Wedge

The following map (Figure 29: Charlotte Population by Square Mile by Census Tract) provides an overview of the population density in Charlotte by square mile. It is clear that, while the southern area of Charlotte is relatively densely populated, the real crash issues are in the areas surrounding downtown, indicated in blue.

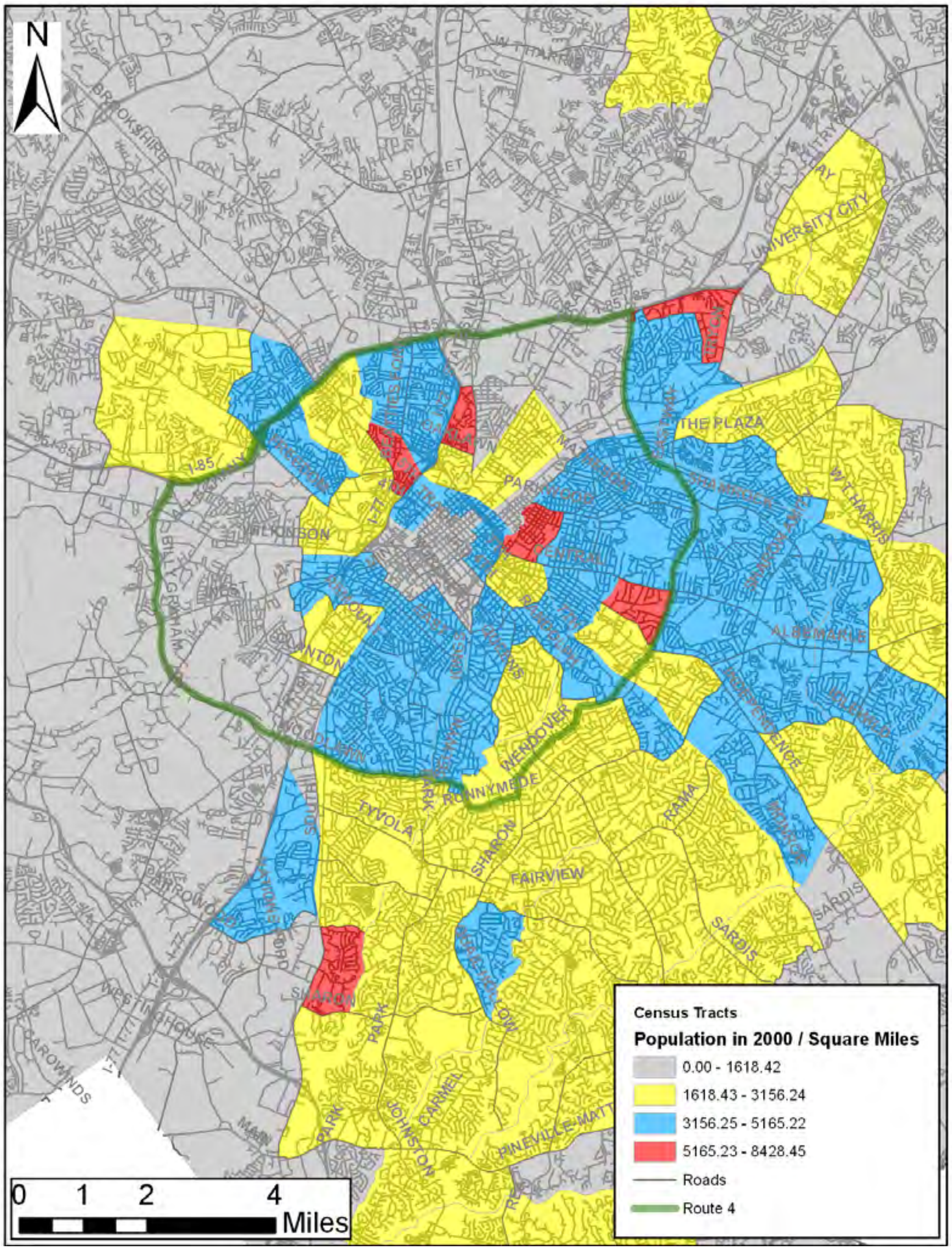

Figure 29: Charlotte Population by Square Mile by Census Tract

Appendix B: Raleigh Crash Data Analysis Report

Max Bushell
November 2011
The University of North Carolina at Chapel Hill

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Introduction

The main objective of the current project is to identify, prioritize and implement enforcement and educational strategies to help reduce pedestrian crashes in the State of North Carolina. Raleigh is one of four model cities in the overall Focus State project which aims to develop processes, actions, and sustainable strategies for pedestrian safety improvement to help reduce pedestrian crashes and injuries in North Carolina. Successful strategies will then be promoted to communities across the State. While the primary focus is on implementing and evaluating appropriate educational and enforcement countermeasures, comprehensive programs that incorporate education, enforcement, and engineering have the best chance of succeeding in reducing pedestrian trauma. Even encouraging more walking may reduce the individual risk of a collision, according to recent studies and practices in Europe (Fischer et al., 2010). The information developed in these processes can therefore certainly be used, and has been used, to identify areas where engineering improvements may be needed. Additionally, the information may facilitate the discussion of policies and practices, training, data quality, and other initiatives that might be improved to further help pedestrian safety and mobility in Raleigh as well as other communities in the State.

Raleigh, overall, has seen an upward trend in pedestrian crashes between 1997 and 2009, as indicated in Figure 1, which includes crashes that occurred in Public Vehicular Areas (PVAs). While this trend is likely related in part to the substantial population increase in the city, this project, the ongoing Pedestrian Planning process, and the NCDOT Department of Bicycle and Pedestrian Division focus on reducing pedestrian crashes can be instrumental in reversing this upward trend. In particular, 2007 had a large increase in crash numbers.

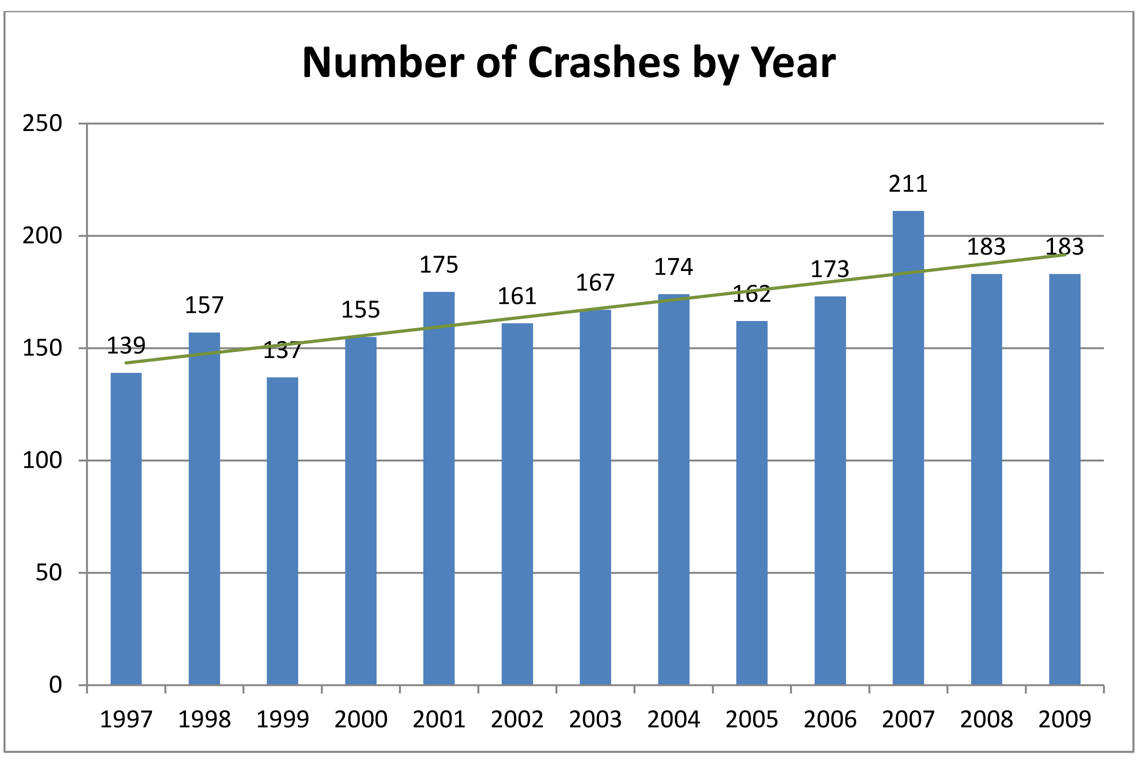


Figure 1: Pedestrian Crash Trends in Raleigh, NC, 1997-2009.

Purpose

The purpose of this document is to provide an overview of pedestrian crash problems and trends as identified through a preliminary analysis of available data from 2004 – 2010 (though 2010 data is in some instances not available) and to help set priorities for addressing pedestrian safety problem in Raleigh, NC.

Data Sources and Methods

The data used for analyses were obtained from the City of Raleigh Office of Transportation Planning. The Chair of the Raleigh Bicycle and Pedestrian Advisory Commission geocoded pedestrian crashes for the City based on crash location data provided by NCDOT. Crashes that were reported to have occurred in Public Vehicular Areas (PVAs) such as parking lots and other off-roadway areas not maintained by the State or City were excluded from the data by the City prior to geo-coding the pedestrian crash locations, as the city cannot undertake infrastructure improvements on property not owned by the City of Raleigh or the State of North Carolina.

HSRC had also provided the City of Raleigh data on typed pedestrian crashes for the years 2004-2008, and has since completed crash analyses of 2009 crashes which were merged with the spatial data. Based on these data for the years 2004-2009, which included review of every reported pedestrian (and bicycle crash), 1086 reported pedestrian crashes occurred in the City of Raleigh on both City and State-owned streets and in PVAs , while only 767 occurred on City and State-owned streets alone (excluding the PVA crashes). Figure 2 shows the distribution of crashes by location type when all reported pedestrian crashes are included, and when crashes reported to occur on PVA's are excluded. Most of the excluded PVA crashes occurred in **non-roadway** areas such as parking lots and driveways, but they may sometimes occur on private roads.

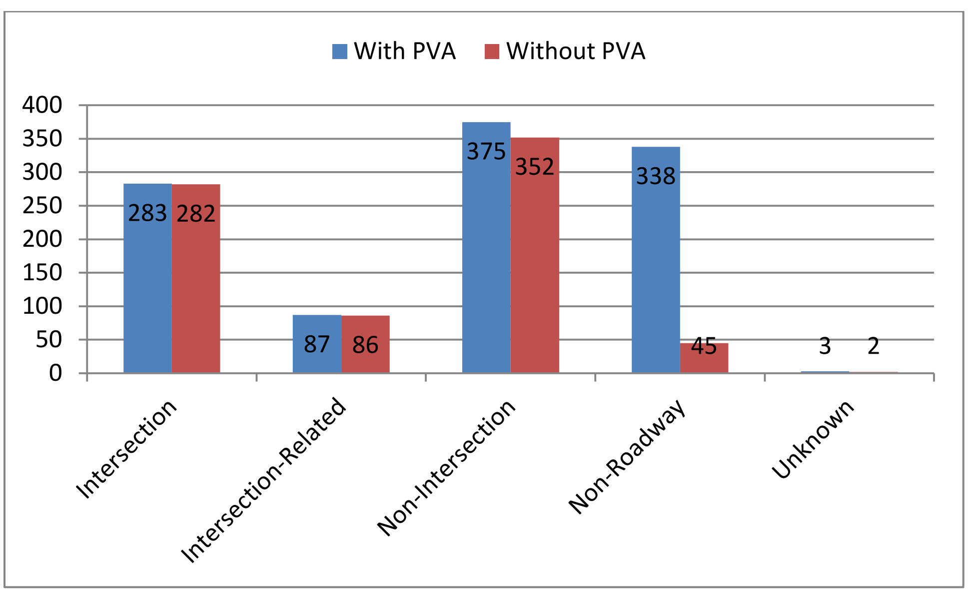


Figure 2: Pedestrian Crash Numbers with and without PVA Crash Data Included, 2004-2009.

The analyses contained in this report utilized the data provided by the City, which excluded PVA crashes, and which made up nearly 30% of reported pedestrian crashes. It is also likely that the crashes reported from PVAs are only a fraction of the total crashes occurring in such areas. While the city cannot directly make improvements in PVAs, cities can influence the design and safety of PVAs through parking lot design guidelines, ordinances, communications with property owners, lighting, enhanced security, and other measures, as well as through educational efforts targeting both drivers and pedestrians. Strategies to mitigate crashes in PVAs could be considered based on the large number of such reported crashes and even larger number of likely crashes, as well as part of over-all efforts to create a safe pedestrian environment from door-to-door. Figure 3 provides a clear representation of how many more crashes occurred in PVAs yearly and highlights the importance of identifying measures to address crashes occurring in PVAs as well as on roadways in a comprehensive way.

As mentioned, HSRC provided the crash typed data for 2004-2009 crashes. Crash typing refers to the process by which the sequence of events and participating actions leading to a pedestrian/motor vehicle crash are identified and is conducted using the Pedestrian and Bicycle Crash Analysis Tool (PBCAT) (Harkey, et al. 2006). As the 2010 pedestrian crashes for the City of Raleigh have not yet been reviewed and crash typed, only preliminary crash data from 2010 from NCDOT has been included in these analyses, and is subject to change as the data are refined. In summary, spatial data will in most cases include pedestrian crashes from 2004 to 2010, but in some cases, which are specifically noted in the text, the spatial data will <u>not</u> include 2010 crash data, as it is not yet available in complete form. To recap:

- Spatial Data includes data from 2004 -2010 (n=924, excludes crashes reported to have occurred on PVAs).
- Characteristics Data (Alcohol-Involvement, Day of the Week, Crash Location, etc.): Includes data from 2004-2009, excluding crashes reported from PVAs and may include data from 2010 if it is available (n=767).

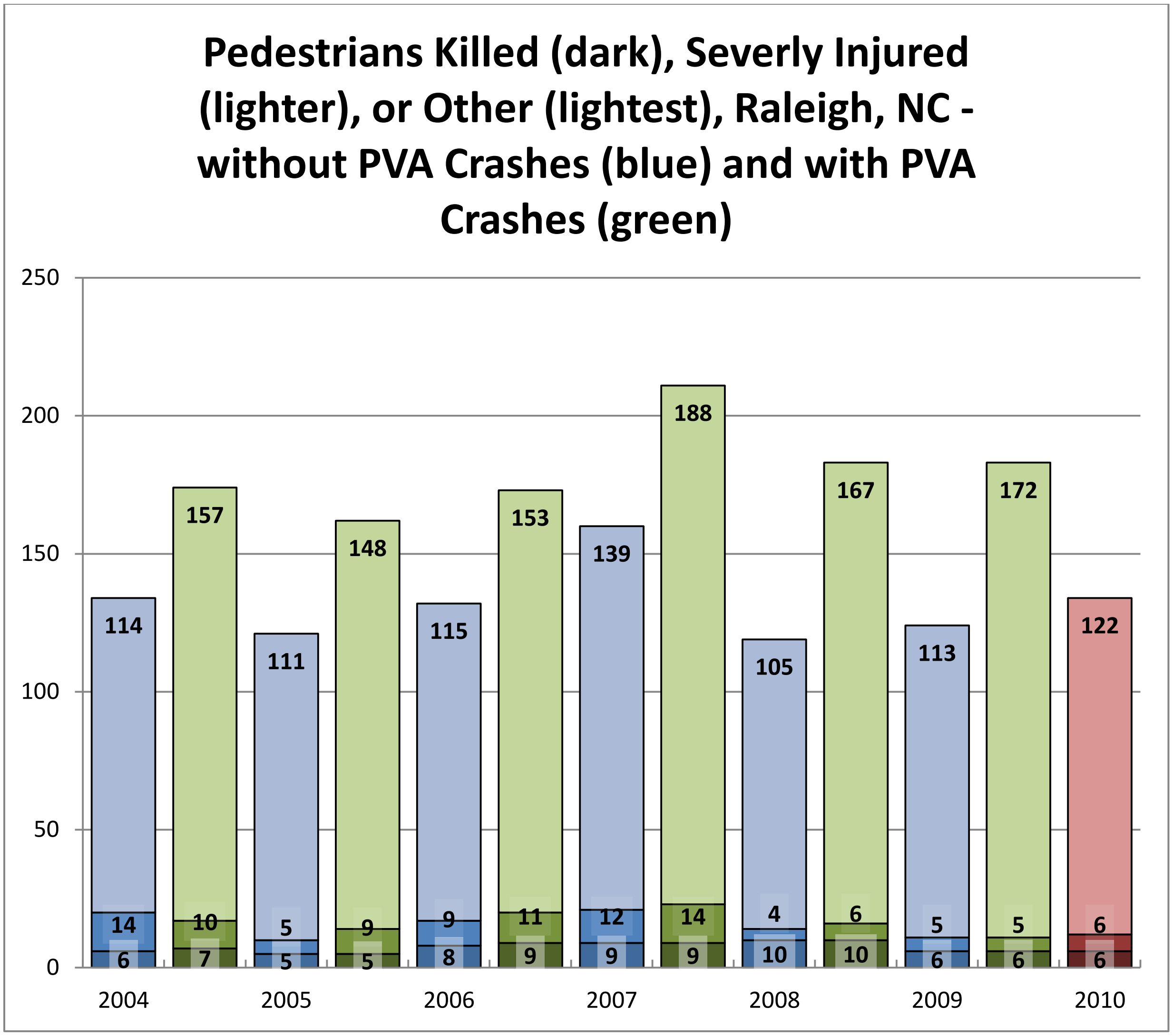


Figure 3: Pedestrians Killed, Severely Injured, and Other with and without PVA Crashes Included, 2004-2010.

Following the geocoding procedure, HSRC checked a subset of the crashes using ArcGIS and Google Earth to ensure accuracy. With pedestrian crash data from 2004 to 2010, HSRC created kernel and dot density maps using ArcGIS. If the preliminary 2010 pedestrian crash data was incomplete, it was omitted from the analysis.

Although occasionally more than one pedestrian is involved in the same crash, the database on which these analyses are based counts each crash one time to avoid over-representing crashes at locations or in other factors. Thus, in tables and data summarizing pedestrian-related factors, only the first pedestrian struck in the crash – the one used to type the crash – is accounted for.

The HSRC performed a number of spatial analyses of pedestrian crashes. In simple dot maps, multiple crashes might occur at the same location or close enough that the actual density of crashes cannot be easily observed or quantified. Various types of density analyses including by population and by area were also performed. By exploring the spatial distribution and characteristics of pedestrian crashes, specific zones where large numbers of crashes have occurred or specific types of factors are concentrated, suggest areas where countermeasures could have a substantial positive impact. Kernel density analysis is useful in examining broad areas where crashes may be more concentrated as opposed to other areas of the City, as it is not limited by artificial geographic boundaries; only by the edges of the map and or where crashes occurred. Kernel density also has some limitations as it searches in planar space for nearby crashes as opposed to along the street network, where roadway crashes, at least, should be concentrated. Although crash concentrations along a roadway network can be identified using a network based analysis, we have found in other studies that kernel density analysis, and other types of general spatial analyses readily available in the ArcGIS software, provide similar results to some more intensive procedures and are useful for identifying general areas or neighborhoods of crash concentration. (Note that some of the earlier maps shown also utilized kernel density analysis.)

Pedestrian Crash Facts

Using exposure measures, such as counts of pedestrians, may help to target countermeasures toward locations where the risk of individual collisions or severe crashes are highest. It should be noted, however, that any pedestrian collision may be severe, particularly if older pedestrians or young children, or higher speeds are involved. Any safety efforts should take all crashes as well as areas with high crash rates into consideration. Unfortunately, exposure measures often do not exist at all, making an analysis of pedestrian activity and areas of high pedestrian concentration difficult. Boarding and alighting data from Capital Area Transit (see Figure 31) is used in this analysis as a surrogate measure.

Educational, engineering, and enforcement measures are crucial to developing an overall safety culture, engendering respect for and compliance with traffic laws, and reducing the severity and incidence of not only pedestrian crashes, but all crashes. Understanding where, when, how, why, and who is involved in pedestrian collisions can help target appropriate countermeasures to the areas and populations where they are most needed. The following figures and tables highlight some of the characteristics of pedestrian collisions in Raleigh over a recent seven year period. Figure 4 displays clusters of crashes in Raleigh, using data from 2004-2010, while Figure 5 presents a closer more detailed view of crashes in downtown Raleigh.

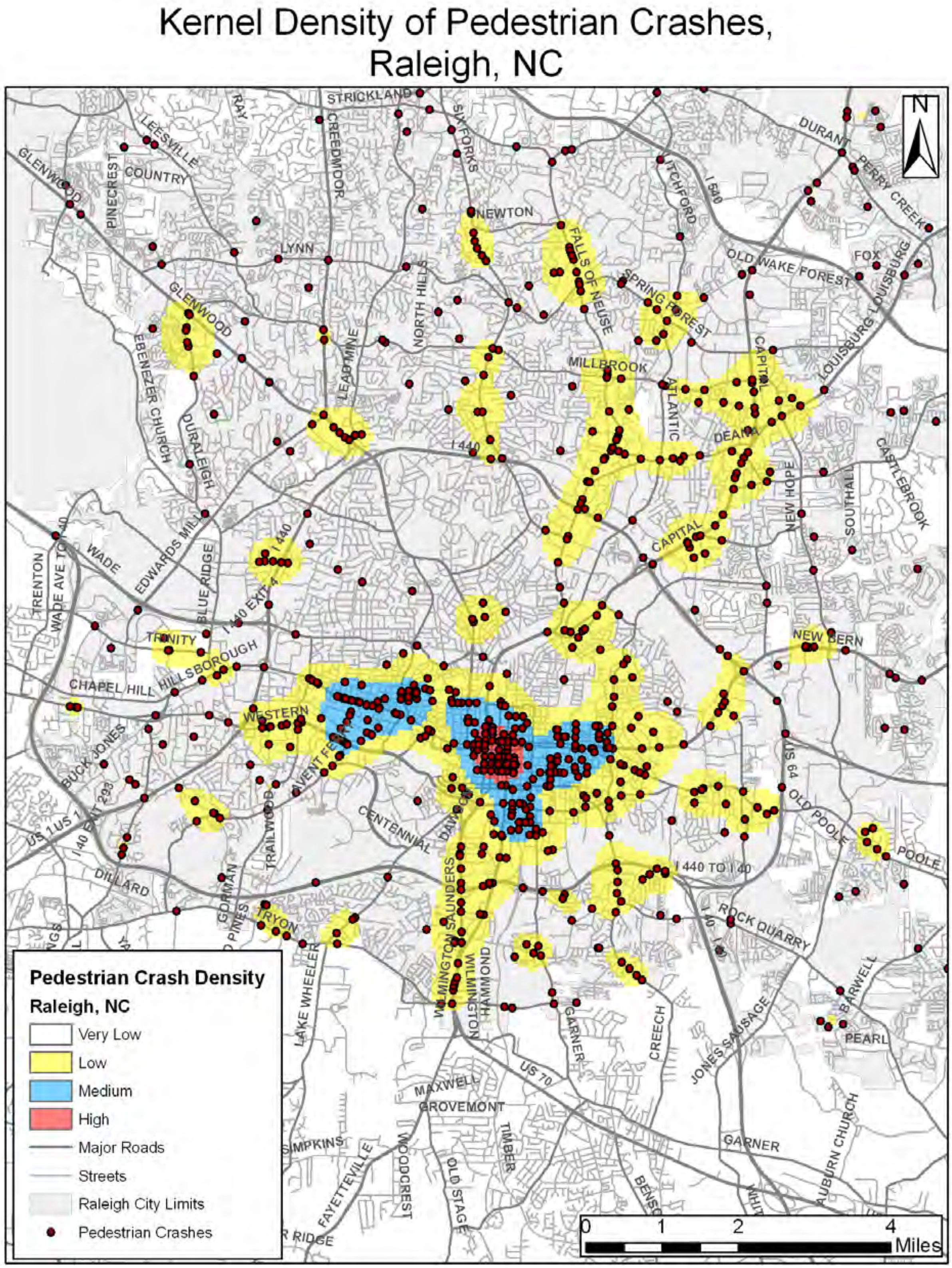


Figure 4: Pedestrian Crash Density, 2004-2010.

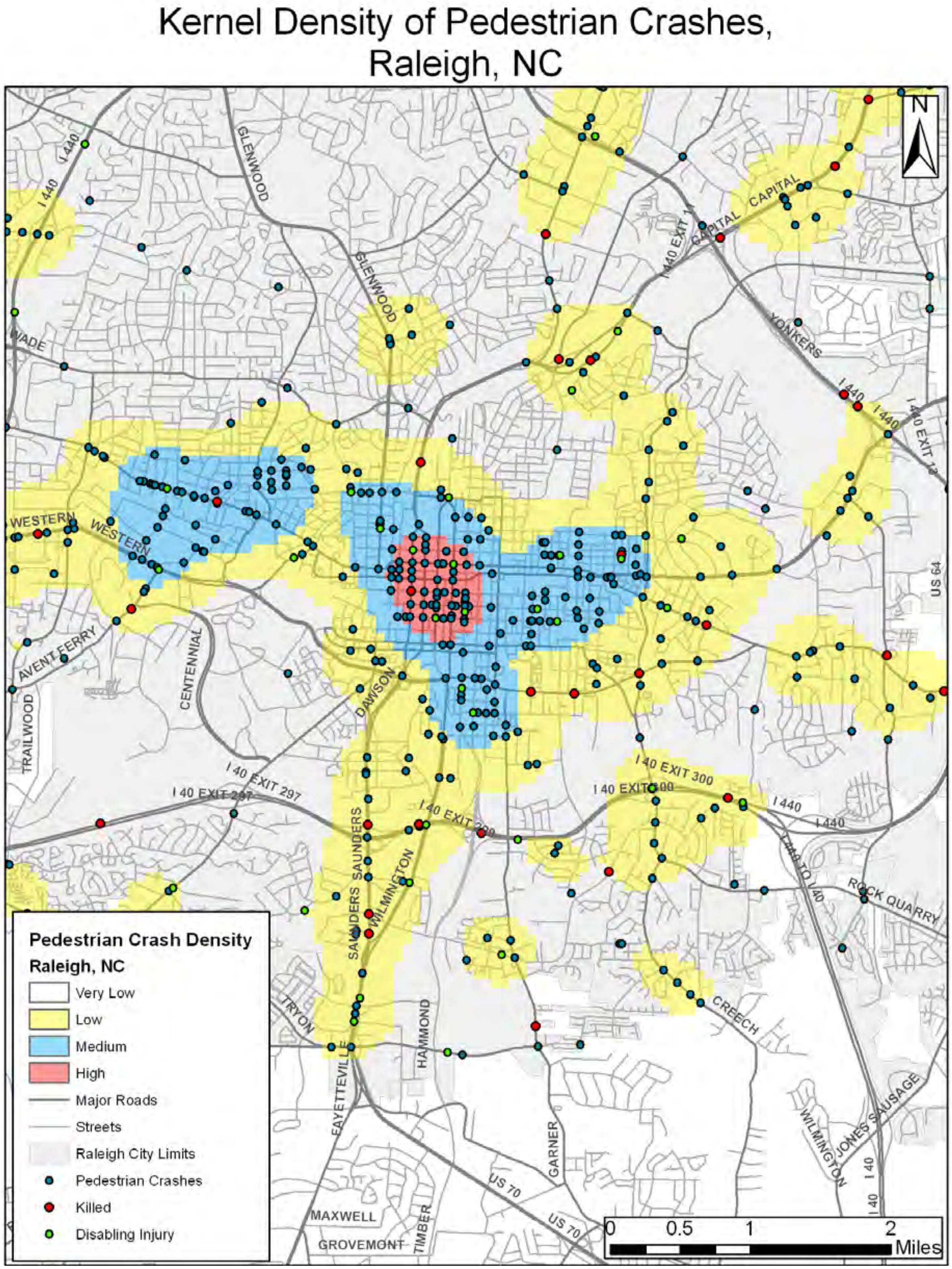


Figure 5: Pedestrian Crash Density near Downtown, 2004-2010.

Crash Severity

While the overall distribution of pedestrian crashes in Raleigh is helpful, examining crashes resulting in pedestrian deaths or serious injuries can further refine one's understanding of the pedestrian safety issue in Raleigh. In terms of crash severity, the NCDOT Standardized Crash Cost Estimates for North Carolina memorandum was used to weight the crashes (NCDOT 2008). The following table (Table 1) provides the estimates.

Table 1: NCDOT Standardized Crash Cost Estimates (2008).

Crash Type	Cost per Crash (2008 Dollars)
Fatal Crash	4,400,000
A Injury Crash	250,000
B Injury Crash	74,000
C Injury Crash	36,000
Property Damage only Crash	5,000

These costs were linked to the shapefile for pedestrian crashes in ArcGIS 9.3 and the kernel density tool was used to map the distribution of pedestrian crashes using the costs as weighting factors. Figure 6 displays this information. In particular, those areas highlighted when crashes are weighted by severity include the Falls of Neuse Road, Poole Road, Western Boulevard, Wilmington Street, and S. Saunders Street corridors, as well as Interstate 40 and others. Such information may be useful in attempting to prioritize among the many areas of general crash concentration. Figure 7, based on spatial analysis of the locations of fatal and A-type injuries, presents findings similar to, but not as comprehensive as, the map incorporating all severities of crashes. Those areas where more severe crashes occurred are clearly highlighted and include Falls of Neuse Road, Capital Boulevard, Wilmington Street, and Interstate 40.

Pedestrian Crash Density by Severity, Raleigh, NC

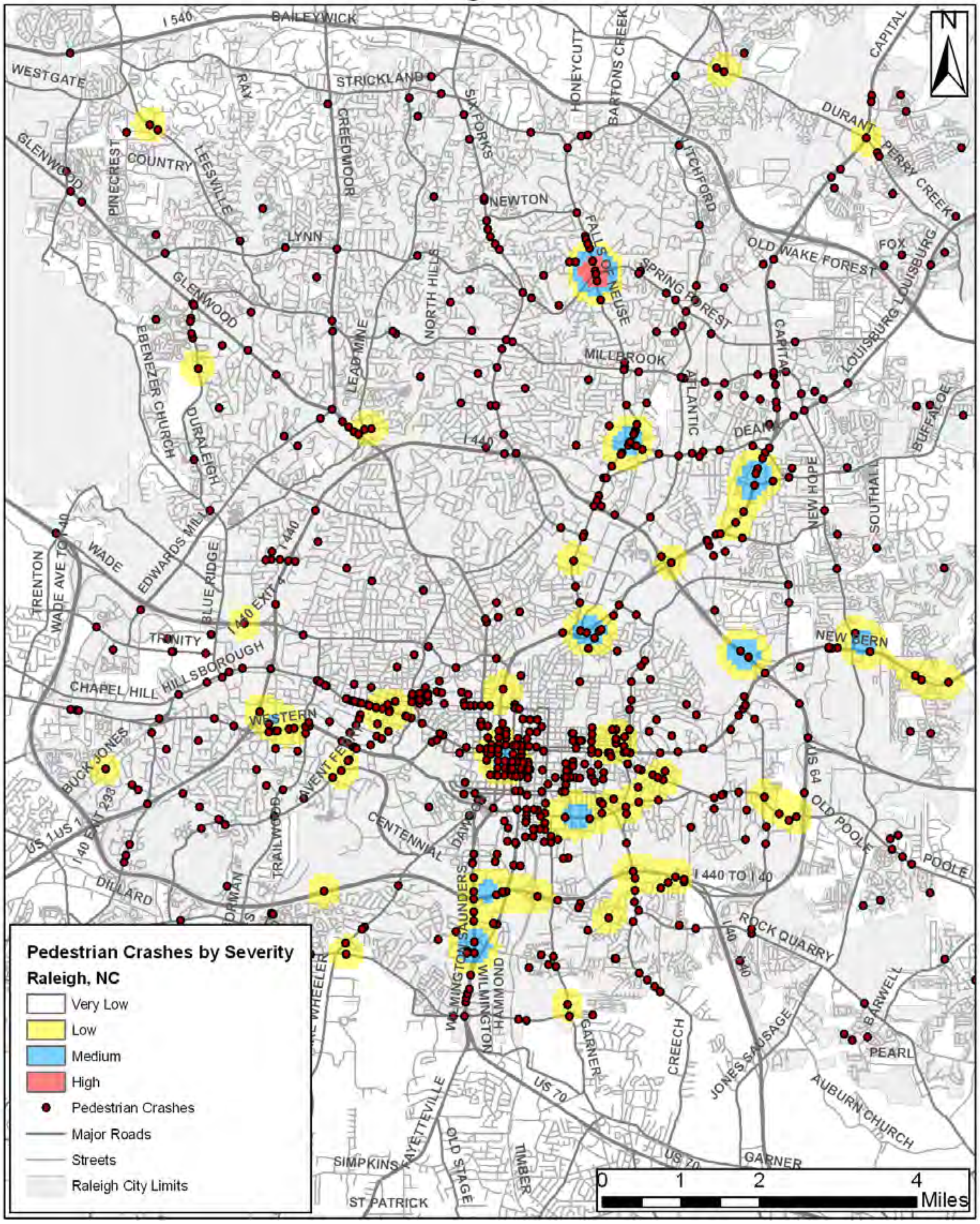


Figure 6: Pedestrian Crashed by Severity, Raleigh, NC, 2004-2010.

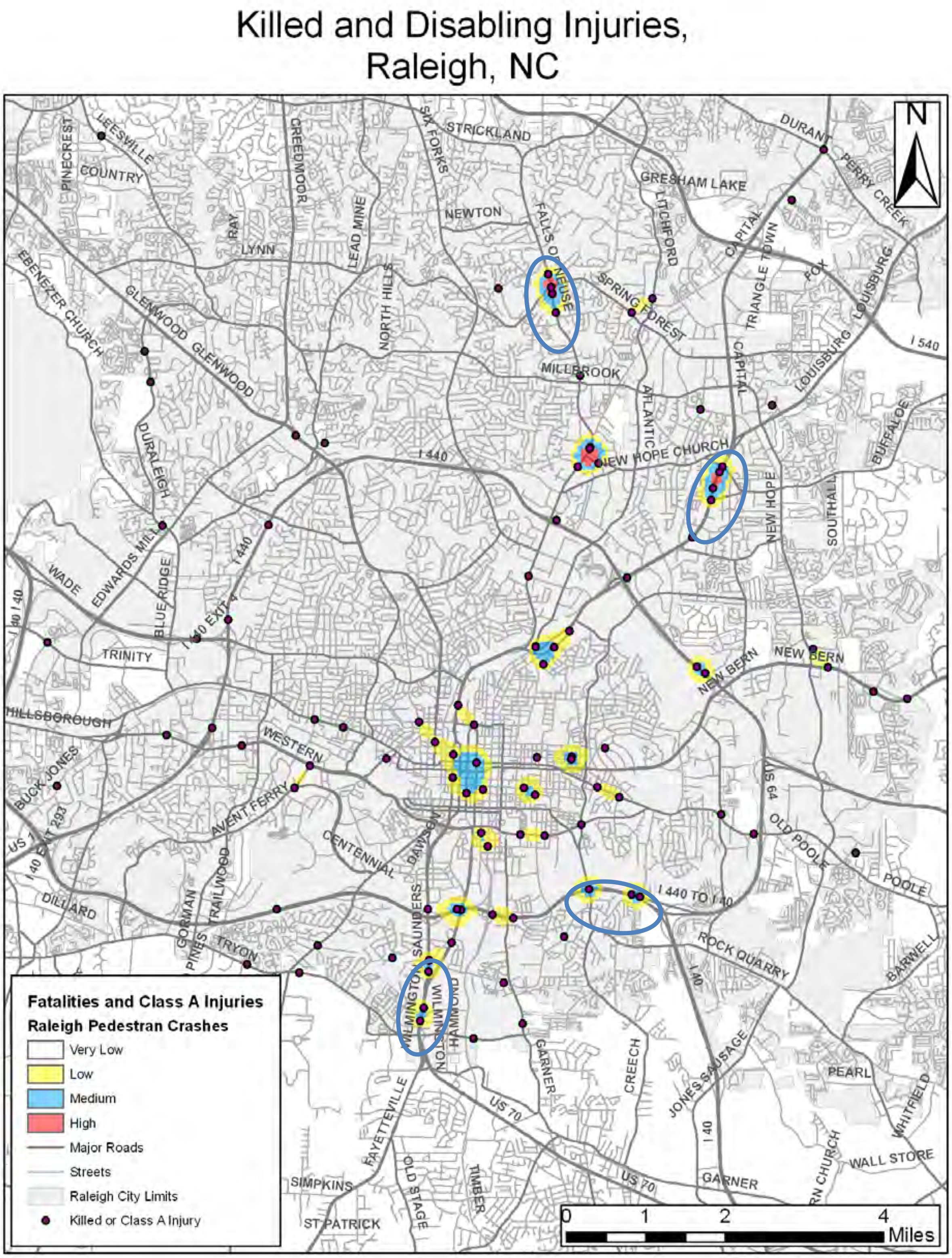


Figure 7: Killed and Disabling Injuries, Raleigh, NC, 2004-2010.

Traffic Control

Fifty-nine percent of collisions were reported to have occurred at locations with no traffic controls present, while 28 percent were reported to have occurred at locations with Stop and Go traffic signals and 10 percent at locations with Stop signs. Due to the lack of availability of these data from 2010, only data from 2004-2009 were taken into account in determining the traffic control present at the crash location. Small numbers and percentages occurred at locations with various other types of traffic control, with 5 (one percent) of collisions reported at locations with human traffic control in operation.

Temporal Factors

Crashes tend to fluctuate by month from year to year, but typically the autumn months (September, October, and November) have somewhat higher numbers of crashes. During this seven-year period, the autumn months accounted for slightly more than 31 percent of crashes with proportionally fewer in other seasons (Figure 8). The months of October, November, and December are also the highest crash months Statewide from 2004 to 2008, accounting for 28.5% of all crashes per year (NCDOT 2010). Year-to-year variability in crash proportions by month may reflect weather, special events, or other conditions that affect exposure to collisions as well as just chance variation. Crash data for North Carolina is only available through 2008, though Figure 8 includes crash data from Raleigh through 2010.

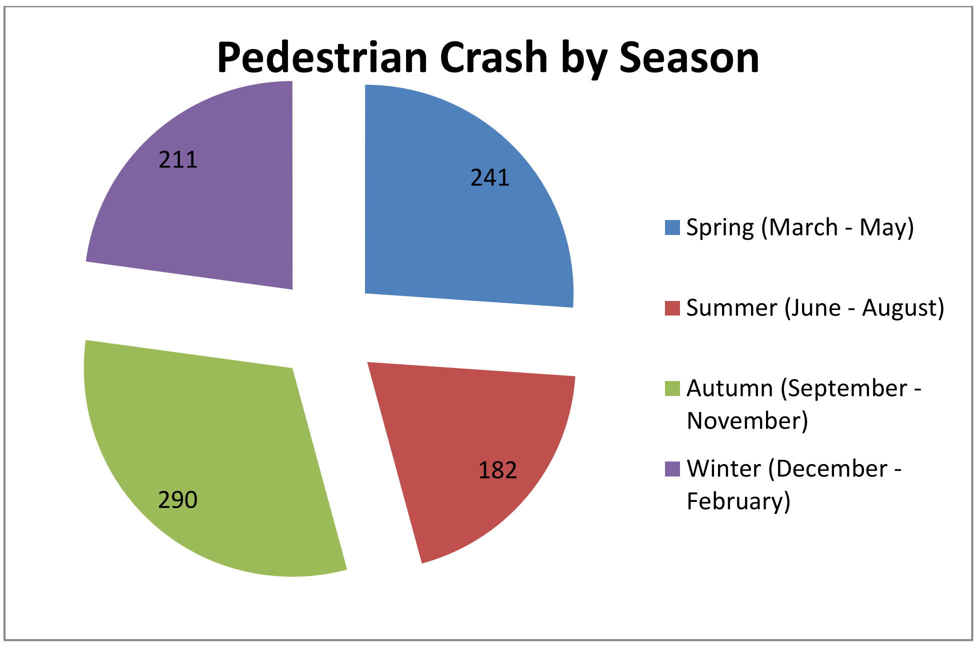


Figure 8. Pedestrian Crashes by Season of the Year, 2004-2010.

There are year-to-year fluctuations in crashes by day of the week, but on average, pedestrian crashes have been very evenly distributed across days of the week with all days except Sunday accounting for about 15 percent; Fridays have accounted for slightly more than other days at 17 percent, while Tuesdays have accounted for 16 percent. Sunday, on average the lowest crash day across the state, has similarly accounted for about 8 percent in Raleigh.

In terms of the light conditions at the time of the crash, most crashes occurred during daylight hours at 59 percent, most likely as a result of higher walking volumes during daylight hours, while 26 percent of crashes occurred on lighted roadways during dark hours. Approximately 9 percent of crashes occurred on unlighted roadways.

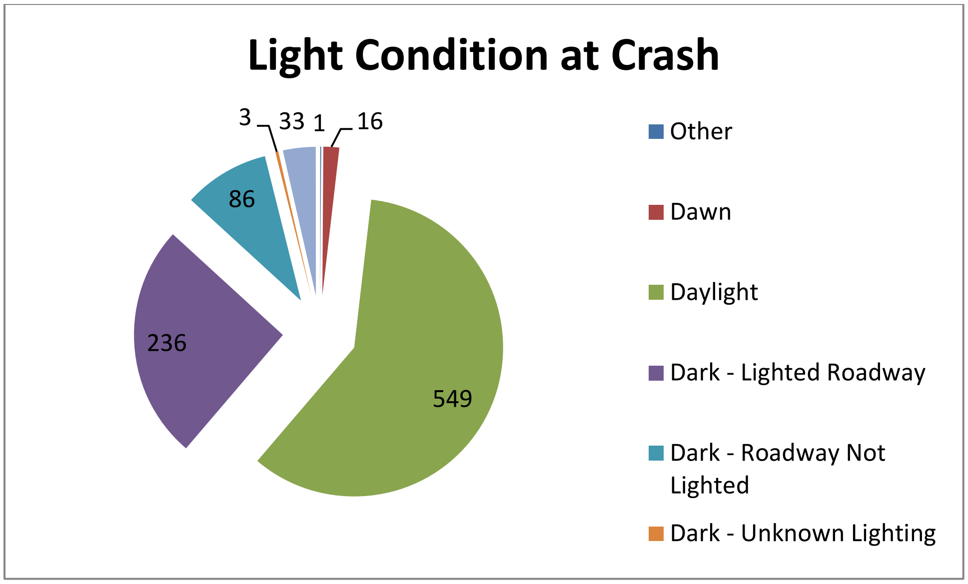


Figure 9. Raleigh Pedestrian Crashes by Light Condition, 2004-2010.

The following map (Figure 10) provides some insight into where crashes are occurring. In particular, the downtown area and certain corridors, including the Saunders, Capital, and Old Wake Forest arterials, exhibit crash problems during both daylight and dark hours. A map of crashes occurring during daylight hours has not been included here, as it mirrors the overall crash density for the City of Raleigh. For crashes occurring during hours of darkness, concentrations of crashes are clearly visible and seem to be clustered along certain corridors.

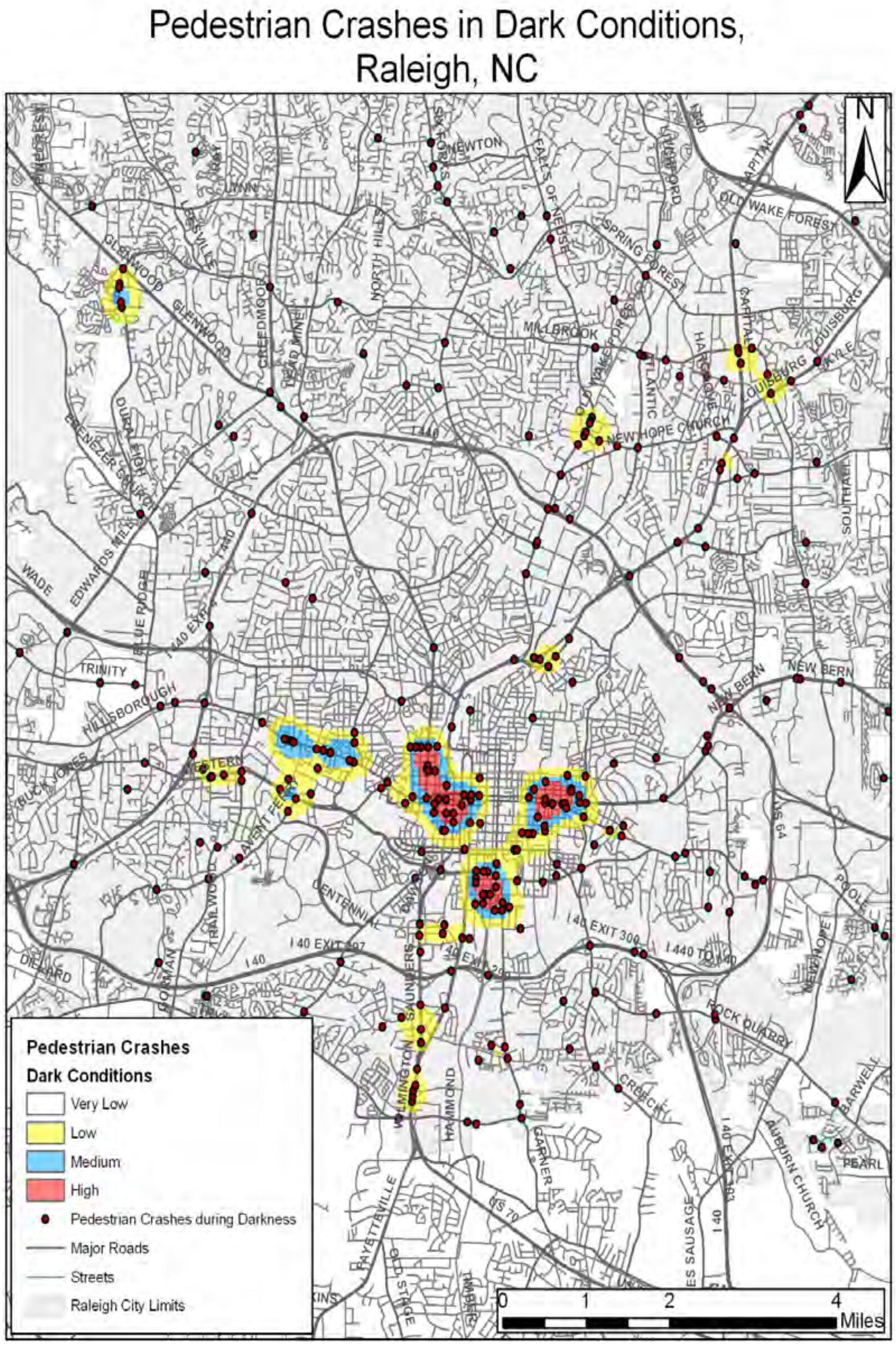


Figure 10. Pedestrian Crashes under Dark or Low- Light Conditions, 2004-2010.

The peak in pedestrian collisions occurs during the afternoon hours to evening hours, especially from 3 to 6 PM (24 percent), while pedestrian crashes remain high between 1 and 9 PM (Figure 11). The six hours from 3 to 9 PM together account for 41 percent of daily crashes on average. The mid-day period from noon to 3 PM accounts for another 15 percent. Late night hours from midnight to 6 AM account for 9 percent of pedestrian collisions, but 18 percent of fatalities, in keeping with higher night-time fatality rates.

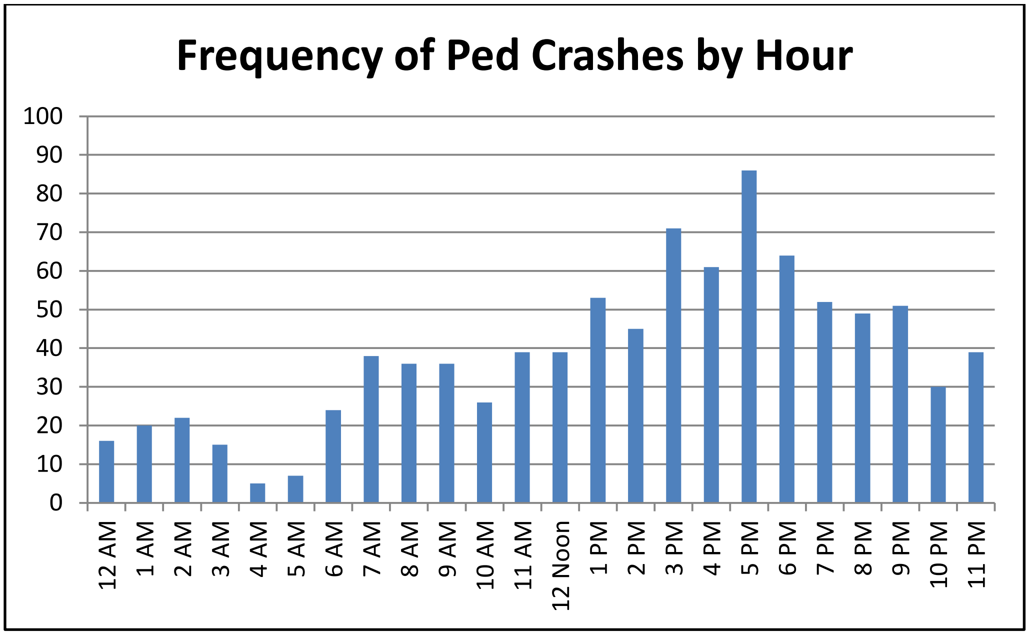


Figure 11. Pedestrian Crashes by Hour of Day, 2004-2010.

Pedestrian Characteristics

As mentioned in the introduction, crashes occurring in PVAs constitute a substantial number of total crashes in the City of Raleigh. Specifically, a total of 46 pedestrians were killed and 56 seriously injured in Raleigh (within the City limits) from 2004-2009 **including PVA crash data.**

Age

Crash proportions for different age groups fluctuate over the years. (Note that age groups span different numbers of years.) Young adults and teenagers, including 11 to 29 year olds account for 42% of pedestrians involved in any crash over the period. Adults aged 40 to 59 years, comprised 26% of crash-involved pedestrians over this entire time period. Older pedestrians have a somewhat lower representation in collisions with only 7%, while children 10 years and younger also only account for 7% of total crashes. As data from 2010 is available, this analysis includes data from 2004-2010, but does not include PVA crashes. Figure 12 displays this information.

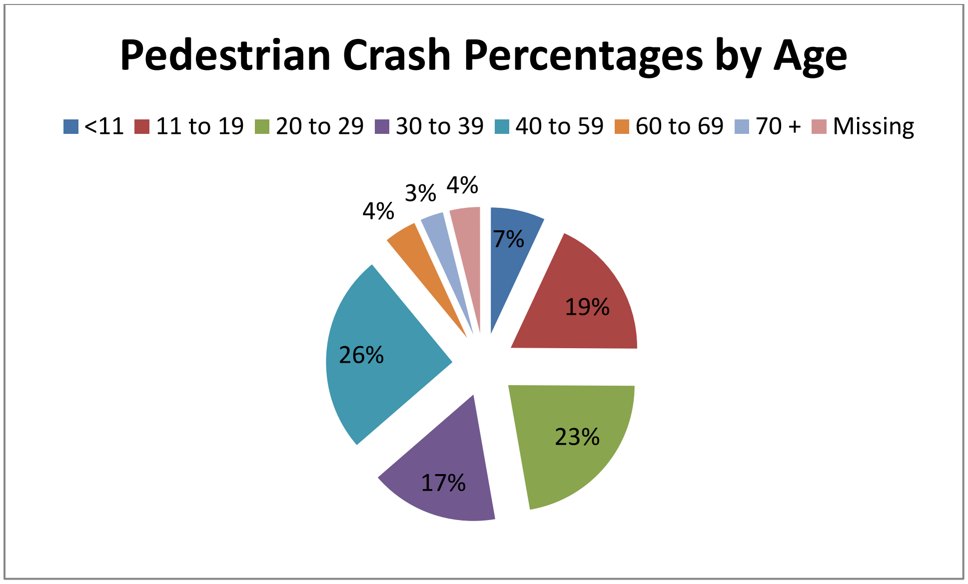


Figure 12: Pedestrian Crash Percentages by Age, 2004-2010.

In general, older pedestrians and very young children may be more vulnerable to severe injuries or fatalities in a crash. As illustrated in Figure 13, adults 70 and older have the combined highest proportions of fatalities and serious injuries for those involved in a pedestrian crash. The youngest children also have a higher rate of disabling and fatal injuries than older children who were struck.

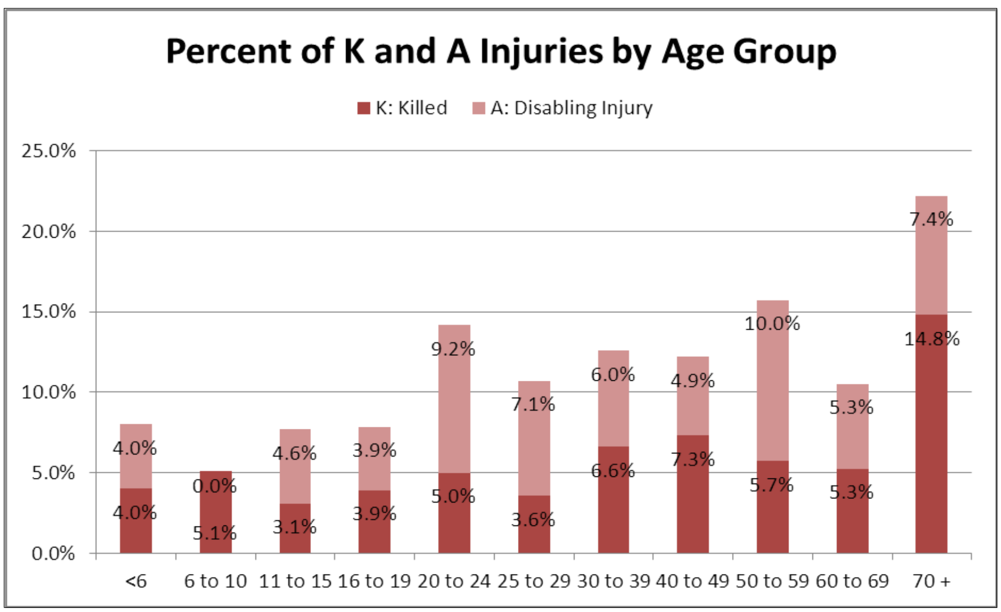


Figure 13. Severe Injury Proportions by Age Group, 2004-2010.

Overall however, adults between the ages of 30 and 59 have suffered the highest rates of fatalities among those involved in a pedestrian crash in Raleigh, when adults 70 and over are not taken into account. As will be indicated later, nighttime and alcohol-involved crashes may have an influence on adult crashes.

In terms of the location of pedestrian crashes by age, the following maps present the kernel density analysis of crashes by children under the age of 16 and adults of the age of 65. For pedestrian crashes involving children under the age of 16, the density of crashes is skewed toward the southeast of downtown as well as in the northeast of the city, while pedestrian crashes for adults over the age of 65 are clustered in one instance to the west of downtown.

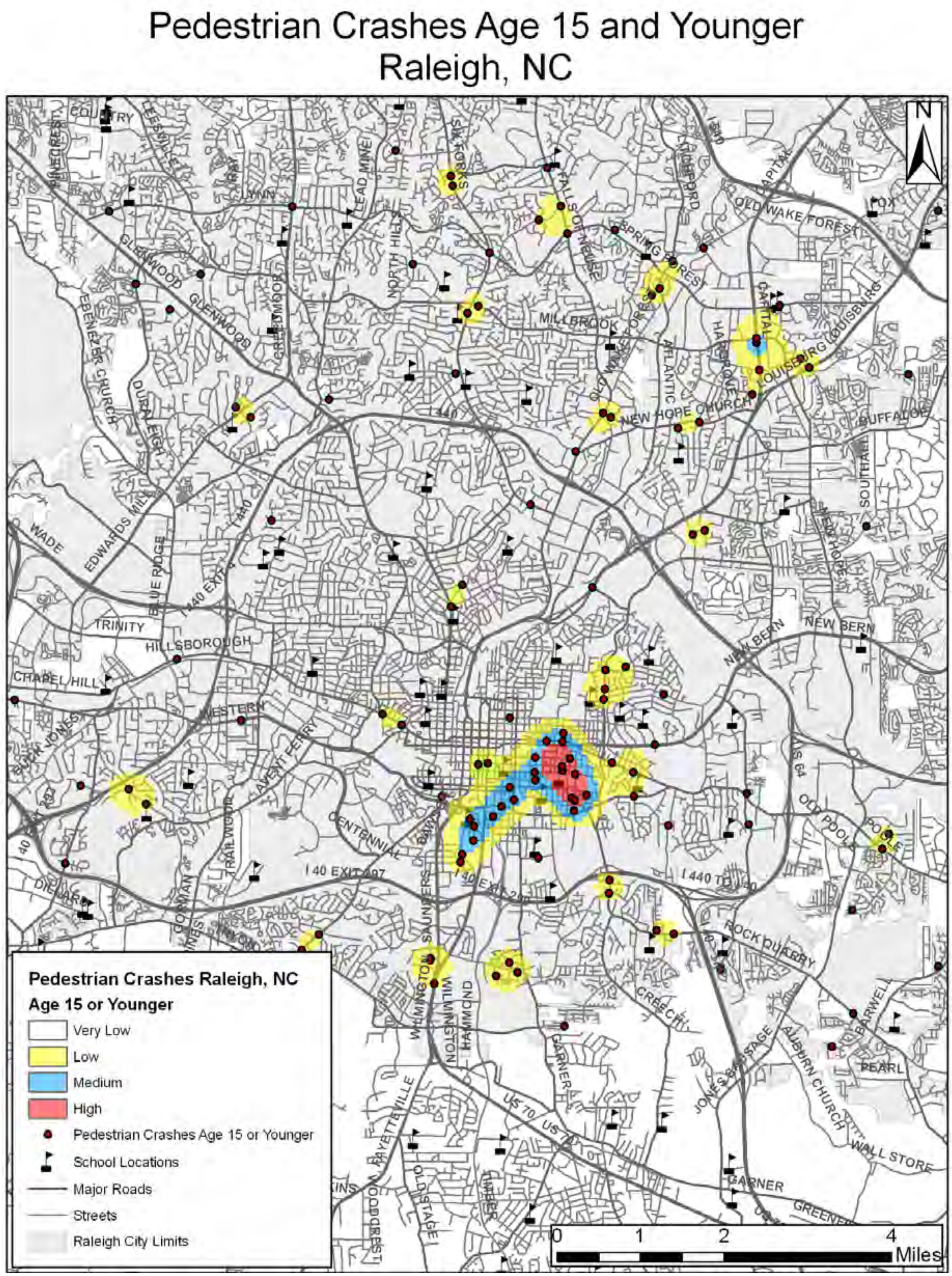


Figure 14: Child Pedestrian Crashes and School Locations, 2004-2010.

Pedestrian Crashes for Individuals Age 65 and Older, Raleigh, NC

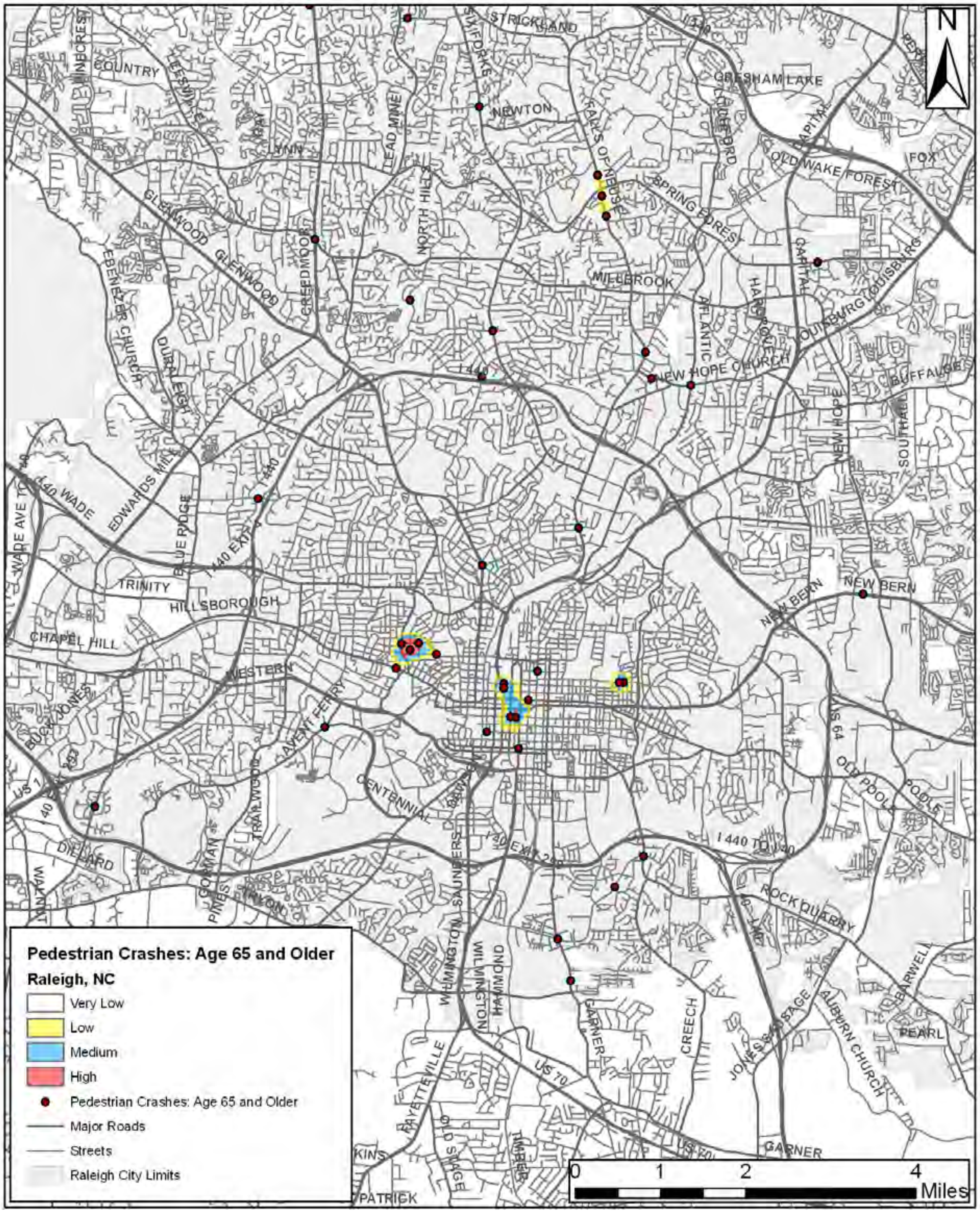


Figure 15: Pedestrian Crashes involving Older Adults, 2004-2010.

Demographics

Blacks/African Americans account for almost half (46 percent) of pedestrians involved in Raleigh collisions for 2004-2010. By comparison, Blacks accounted for approximately 29 percent of Raleigh's population (2010 Census). Hispanics accounted for 11 percent of pedestrians in collisions according to police-crash report data, while Hispanics (all races) accounted for about 11 percent of Raleigh's population in the year 2010. For Whites, roughly 39% of pedestrian crashes involved white people, while they constitute more than 57% of population in Raleigh. Figure 16 displays this information.

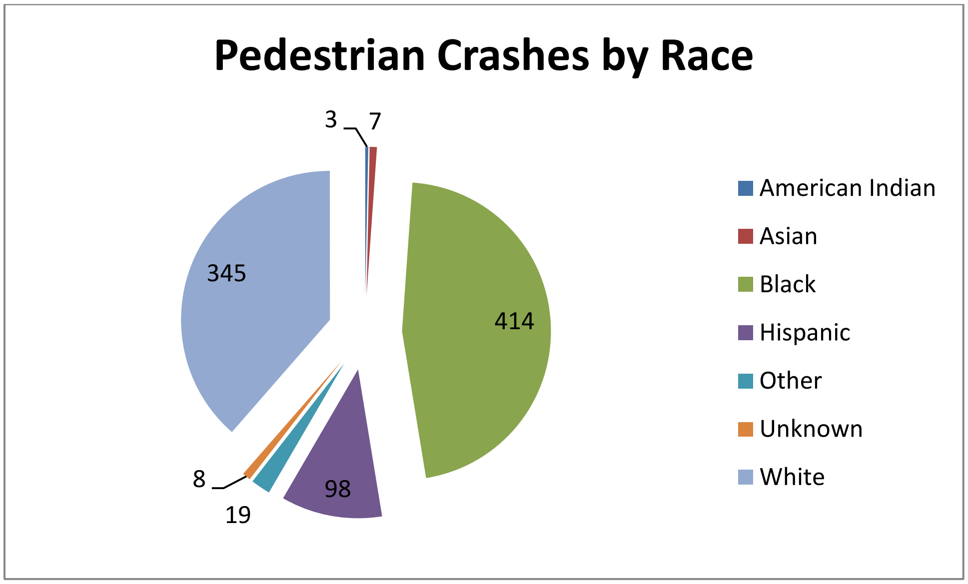


Figure 16: Pedestrian Crashes by Race, 2004-2010.

The reporting and capturing of these groups is different on police crash reports than for the Census, though population numbers from the 2010 Census should be relatively up-to-date. The following maps provide an idea of where crashes are located in Raleigh by race.

While pedestrian crashes involving both Whites and African Americans are widely dispersed across the City of Raleigh, a slight skew to the east of downtown exists for African Americans (see Figure 17). For pedestrian crashes involving whites, however, the skew exists to the west of downtown (see Figure 18). Pedestrian crashes involving Hispanics are less widely dispersed in Raleigh and clear clusters can be identified in the map. Hotspots in downtown and along Old Wake Forest and New Hope Church roads are particularly noteworthy, while Western Boulevard and Wilmington Road are also high crash areas for Hispanic pedestrians (see Figure 19).

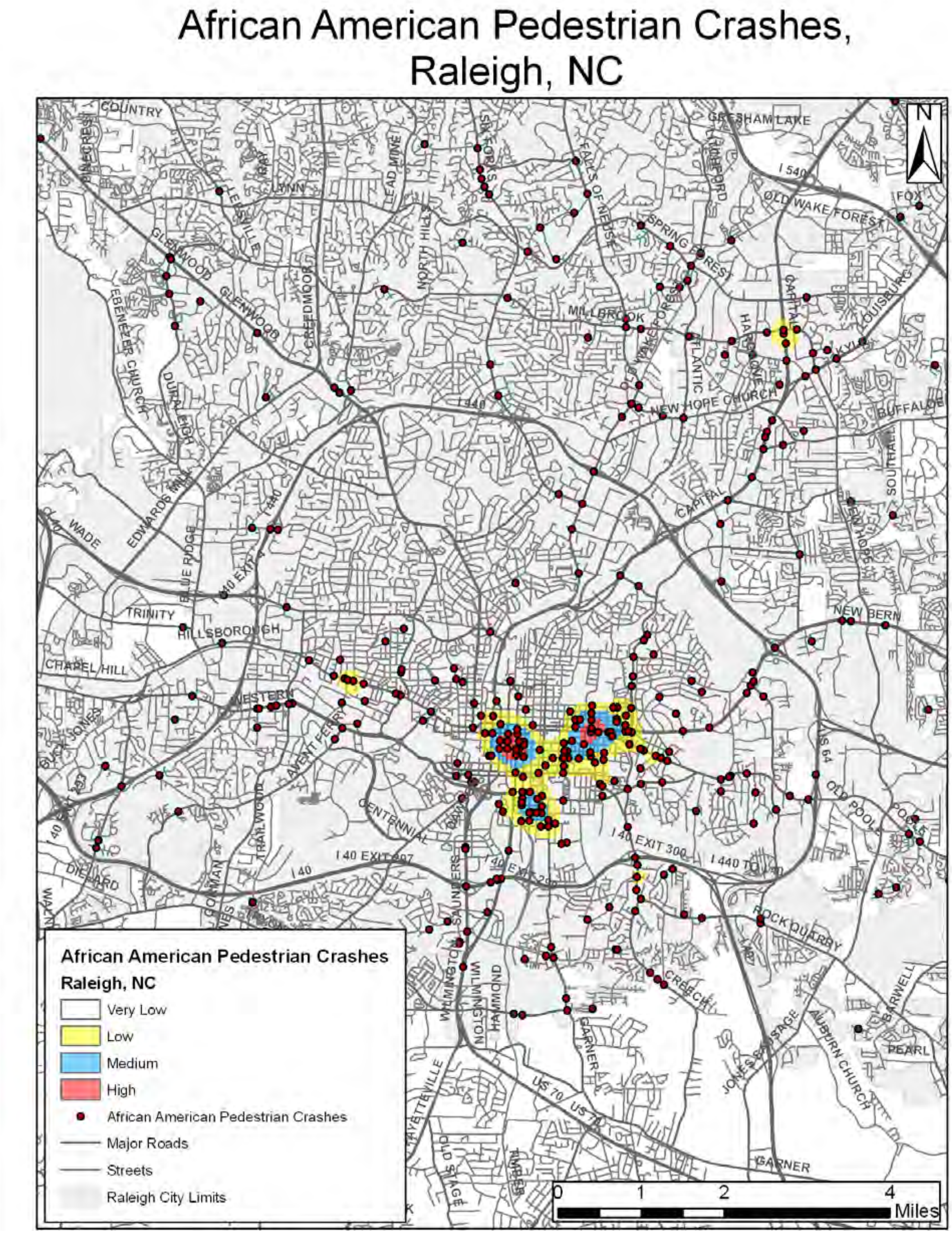


Figure 17: African American Pedestrian Crashes, 2004-2010.

White Pedestrian Crashes,
Raleigh, NC

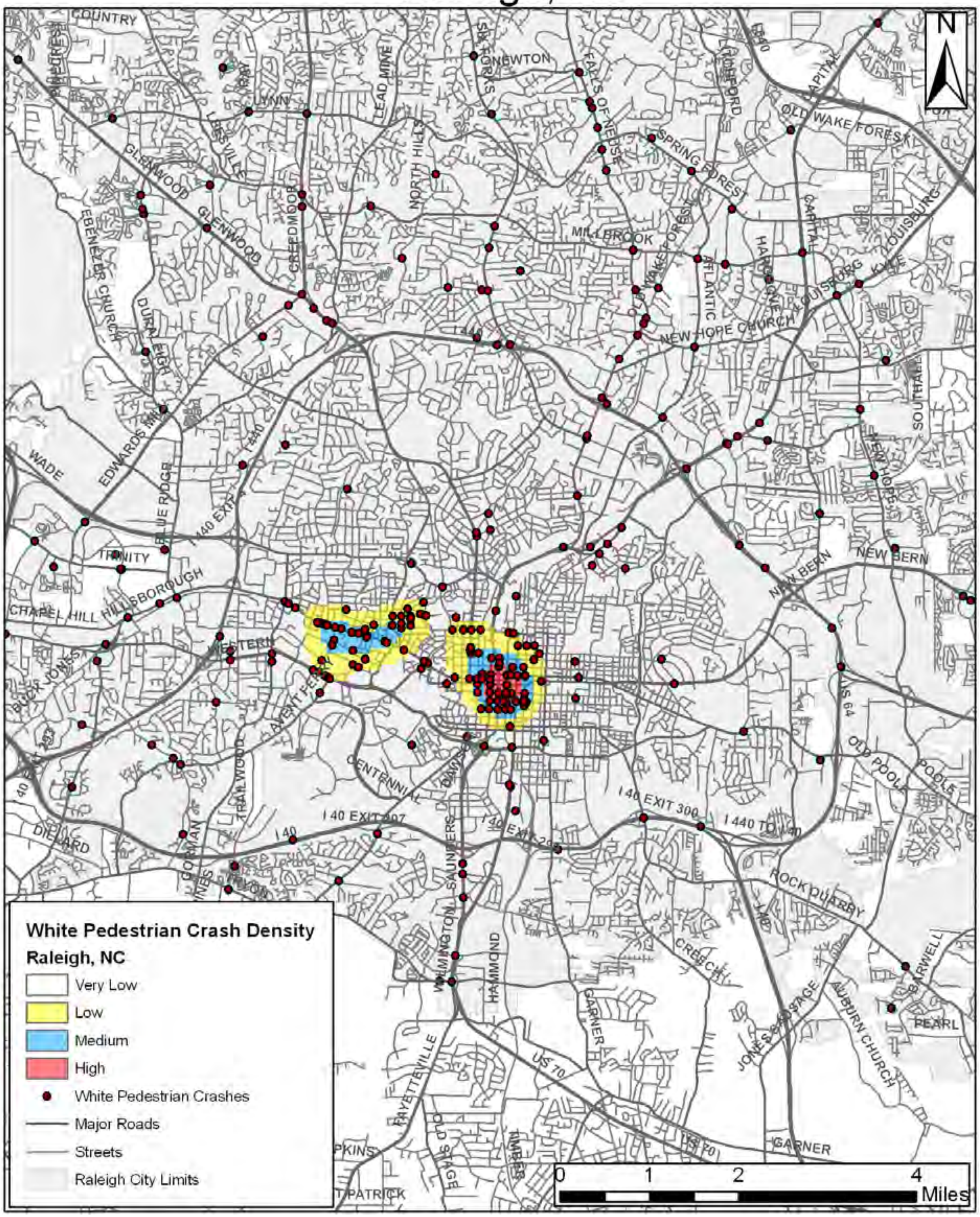


Figure 18: White Pedestrian Crashes, 2004-2010.

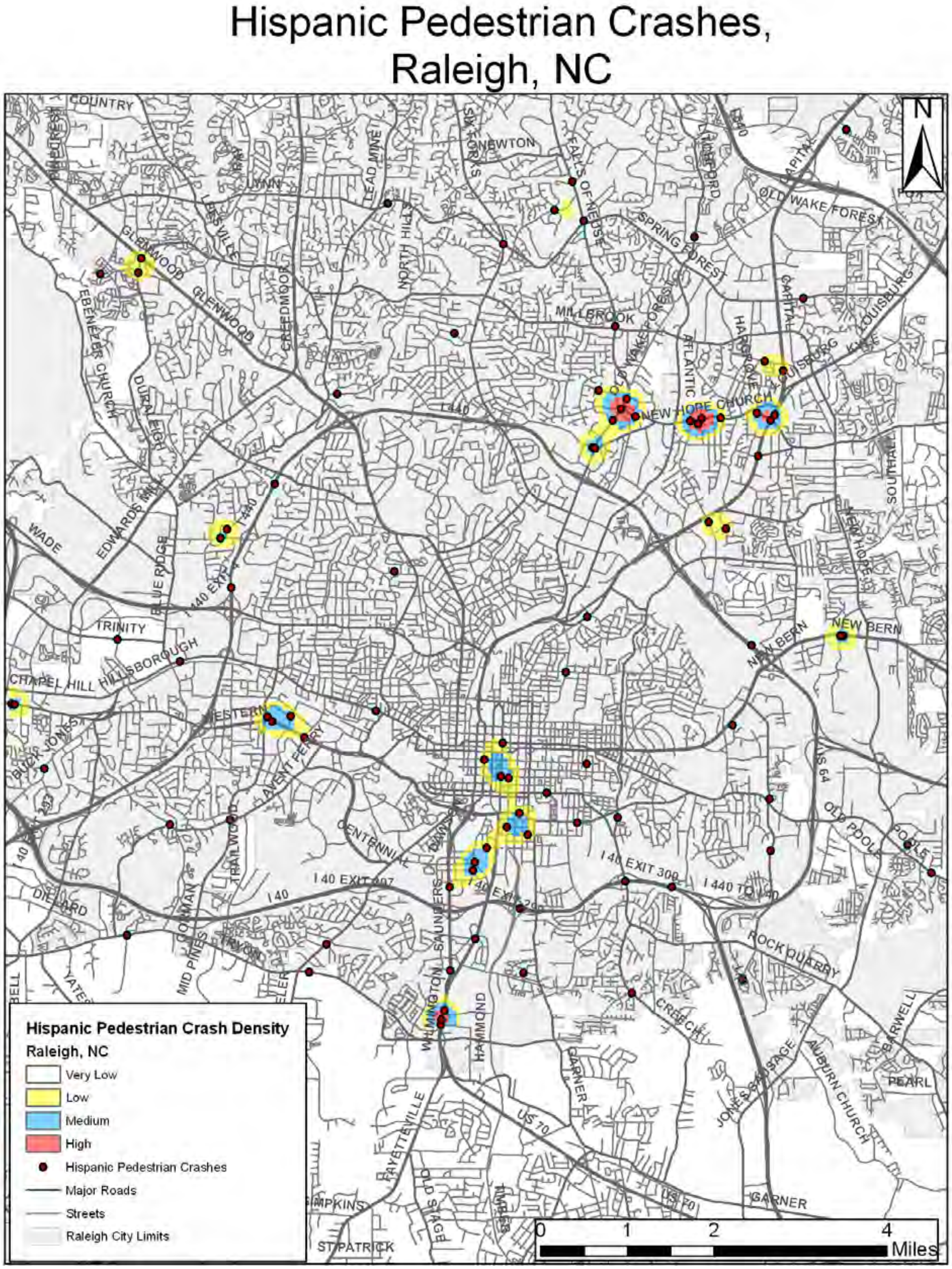


Figure 19: Hispanic Pedestrian Crashes, 2004-2010.

Sex

Males account for about 59 percent of pedestrians in crashes in Raleigh, but a slightly lower percentage than for the State as a whole (which is 61 percent, data not shown).

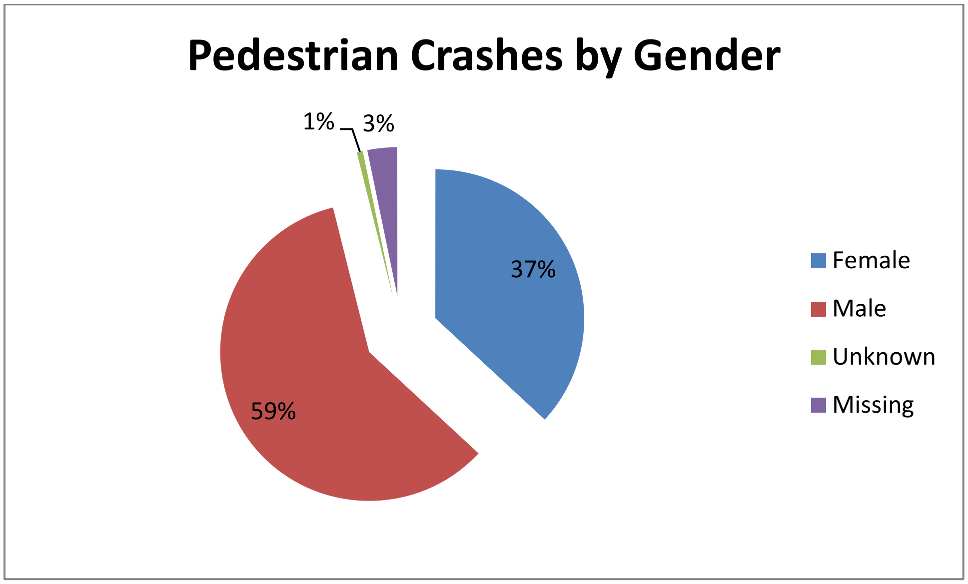


Figure 20: Pedestrian Crashes by Gender, 2004-2010.

Females account for 37 percent of pedestrians in crashes, while roughly 4 percent of crashes did not have information with regard to gender. No clear pattern in pedestrian crashes emerges, though male pedestrian crashes are clustered in greater numbers to the east of downtown Raleigh.

Alcohol Involvement

Alcohol indicators suggest that alcohol use by the pedestrian was noted in slightly less than 13 percent of crashes on average, and alcohol use by either the pedestrian or driver or both may be a factor in more than 15 percent of pedestrian crashes in Raleigh, though this analysis only takes data from 2004 to 2009 into account, due to the lack of available data from 2010. It is important to note that detection or suspicion of alcohol use prior to the collision does not necessarily indicate impairment.

The reported crash data do not suggest that Raleigh has a worse problem than the rest of the State, which reports alcohol use by one or both parties in about 14 percent of crashes on average over this period. It is not known whether police officers usually indicate alcohol use if it is suspected for pedestrians or how much variation there is by jurisdiction in reporting of alcohol use by either party. Twenty-three fatalities (53 percent of the total) apparently involved either driver or pedestrian use of alcohol, so alcohol use is clearly over-represented in fatal collisions. For pedestrians only, 21 fatalities involved alcohol, equaling 49 percent of pedestrian fatalities. Again, data from 2004-2009 were used to determine these figures.

The following map (Figure 21) details the locations of alcohol-involved pedestrian crashes and clearly indicates that certain corridors, including Wilmington, Hillsborough, Old Wake Forest Road, as well as Capital, have issues with alcohol-related crashes.

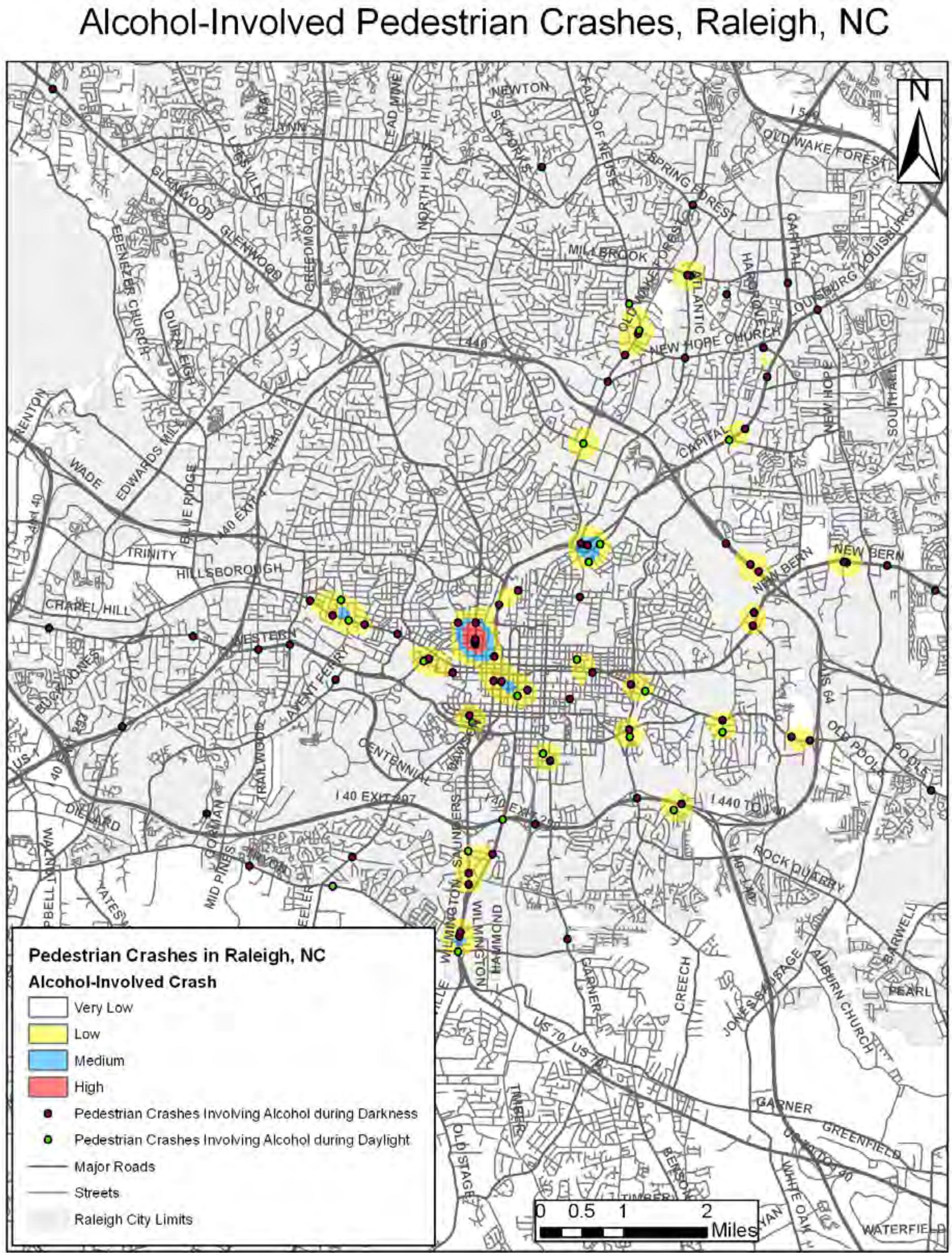


Figure 21: Alcohol-Involved Pedestrian Crashes, 2004-2009.

Weekday versus Weekend

The spatial patterns for crashes occurring on weekdays roughly mirrors the overall crash density for the City of Raleigh. As the spatial patterns do not yield any new information on the distribution of crashes in Raleigh, the weekday crash map has not been included in this section.

Downtown is highlighted as an area of concentrated pedestrian crashes during the week, while the area along Hillsborough Street near the campus of North Carolina State University is also characterized by a high density of pedestrian crashes. Other weekday pedestrian crashes are spread throughout the city, but seem to occur along major collectors and arterials as opposed to local roads. Weekday crashes constitute 76 percent of all crashes in Raleigh. Figure 22 presents the proportions of crashes by weekday and weekend. Data from 2004-2009 relating to the day of the crash was used for these maps, due to the lack of available 2010 data.

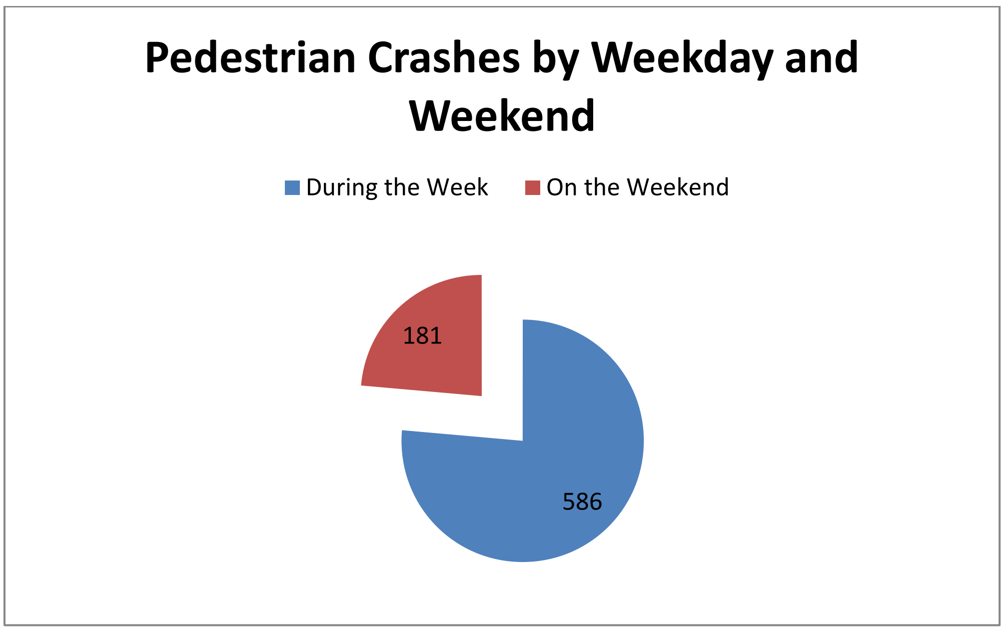


Figure 22: Pedestrian Crashes by Weekday and Weekend, Raleigh, NC, 2004-2009.

For weekend crashes, which constitute 24 percent of all crashes, corridors and hotspots can easily be identified. There are substantially fewer crashes occurring directly downtown, with high crash densities directly to the northwest, west, southeast, and east of Raleigh's downtown. The following map (Figure 23) provides insight into the spatial pattern of weekend crashes. These locations are also hotspots for alcohol-related crashes (Figure 21) and could be areas for pedestrian education with regard to safe walking at night.

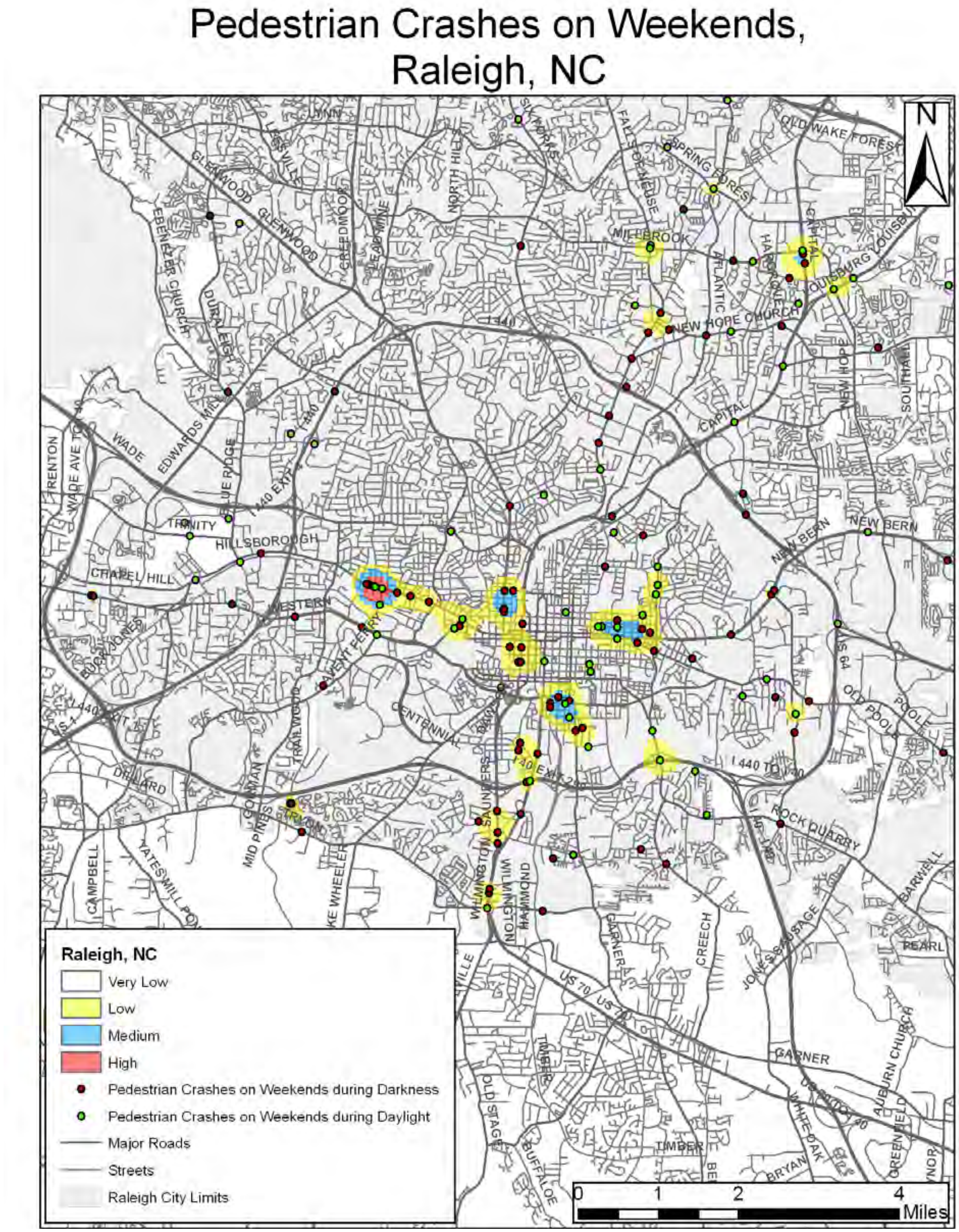


Figure 23: Weekend Crashes, 2004-2009.

Crash Types and Location

Crash Types

All types of crashes are observed in Raleigh with many types accounting for relatively small numbers. Crashes from 2010 have not been typed, so this analysis only includes crashes from 2004-2009. For ease of interpretation, all crash types have been grouped into relevant categories, which are listed in the table below.

In descending order, the most common types of crashes observed in Raleigh **without including crashes occurring in PVAs** were:

Table 2: Crash Type Categories, Raleigh, NC, 2004-2009.

Code	Crash Type Categories	Number	Percent
6	Vehicle Going Straight	355	45%
6.1	Intersection / Marked Crosswalk	51	6%
6.2	Midblock / No Marked Crosswalk	194	25%
6.3	Dart/Dash	110	14%
1	Unusual/Unique Circumstances	141	18%
7	Turning Vehicle / Intersection	117	15%
3	Walking Along Roadway	45	6%
0	No Crash Type	36	5%
9	Unknown	34	4%
5	Multiple Threat / Trapped	24	3%
8	Parking Lot*	16	2%
2	Transit or School-Bus Related	13	2%
4	Driveway or Alley†	9	1%
Total		790	100%

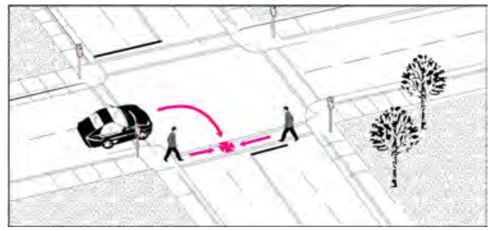
The 10 crash categories above account for all crash-typed pedestrian collisions in Raleigh from 2004 to 2009. As the 2010 crashes have not yet been crash types, no crashes have been included from 2010. These and other related crash types should be the primary focus of countermeasures to reduce crashes. Please reference Appendix B for more detail on which crash types are included in the crash type categories.

The most frequent crash type involved **vehicles going straight**. This crash type includes crashes occurring at both intersections with striped crosswalks and mid-block crossings without striped crosswalks and accounts for 45% of all crashes. Based on this data, pedestrian and vehicle conflicts in

* As crashes occurring in PVAs are not reflected in this analysis, this underestimates the total crashes that occurred in parking lots/on privately owned vehicular areas substantially.
† Ibid.

roadways are a large issue in Raleigh and could be addressed through either engineering treatments or enforcement activities. High speed, wide roads would seem to be particularly dangerous for this crash type (see Figure 24: Vehicles Going Straight Crash Density, 2004-2009.). Educational measures could also help reduce instances of this crash type. Overall, this crash type accounted for **28 fatalities.**

Unusual or unique circumstances account for a substantial number of crashes in Raleigh, including crashes related to driverless vehicles, working in the roadway, lying in the roadway, pedestrians on vehicles, and pedestrian crashes related to mailboxes among others. Many of these crash types occurred in very small numbers and can often not be addressed through traditional enforcement and education initiatives.



However, **turning vehicle crashes at intersections** accounted for the third highest total of crashes in Raleigh, and can be addressed effectively through engineering, education, and enforcement efforts. This crash type accounted for **0 fatalities** and 15% of total crashes. The fact that no fatalities occurred is likely due to the low speeds of turning vehicles at intersections. Figure 25: Turning Vehicle/Intersection Crash Density, 2004-2009. represents this crash type. The preponderance of crashes in this crash type occurs at locations with high pedestrian volumes and high average daily traffic volumes around North Carolina State University and Downtown.

Walking along roadway crashes are the fourth most prevalent crash type in Raleigh, accounting for 45 crashes and 6% of all crashes in the city. Education efforts, rather than enforcement, are likely to have the most effect on this type of crash. This crash type accounts for **two fatalities**. Figure 26: Walking Along Roadway Crash Density, 2004-2009. provides a graphic representation of these crashes overlaid with the Raleigh sidewalk build-out layer. While many of the crashes occurred on roads without sidewalks, particularly on major roads and highways, some crashes of this type also occurred in downtown Raleigh.

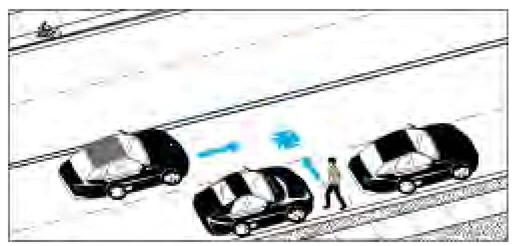


Figure 27: Multiple Threat and Trapped Crash Density, 2004-2009. displays the fifth most prevalent crash type, **Multiple Threat or Trapped**. This crash type occurred with the greatest frequency along major roads and is dispersed across the city. **No fatalities** occurred as a result of this type of crash and relatively few serious injuries were reported in relation to this crash type. By educating both motorists and pedestrians about yielding to pedestrians and crossing in the crosswalk, respectively, this type of crash can be avoided to a large degree.

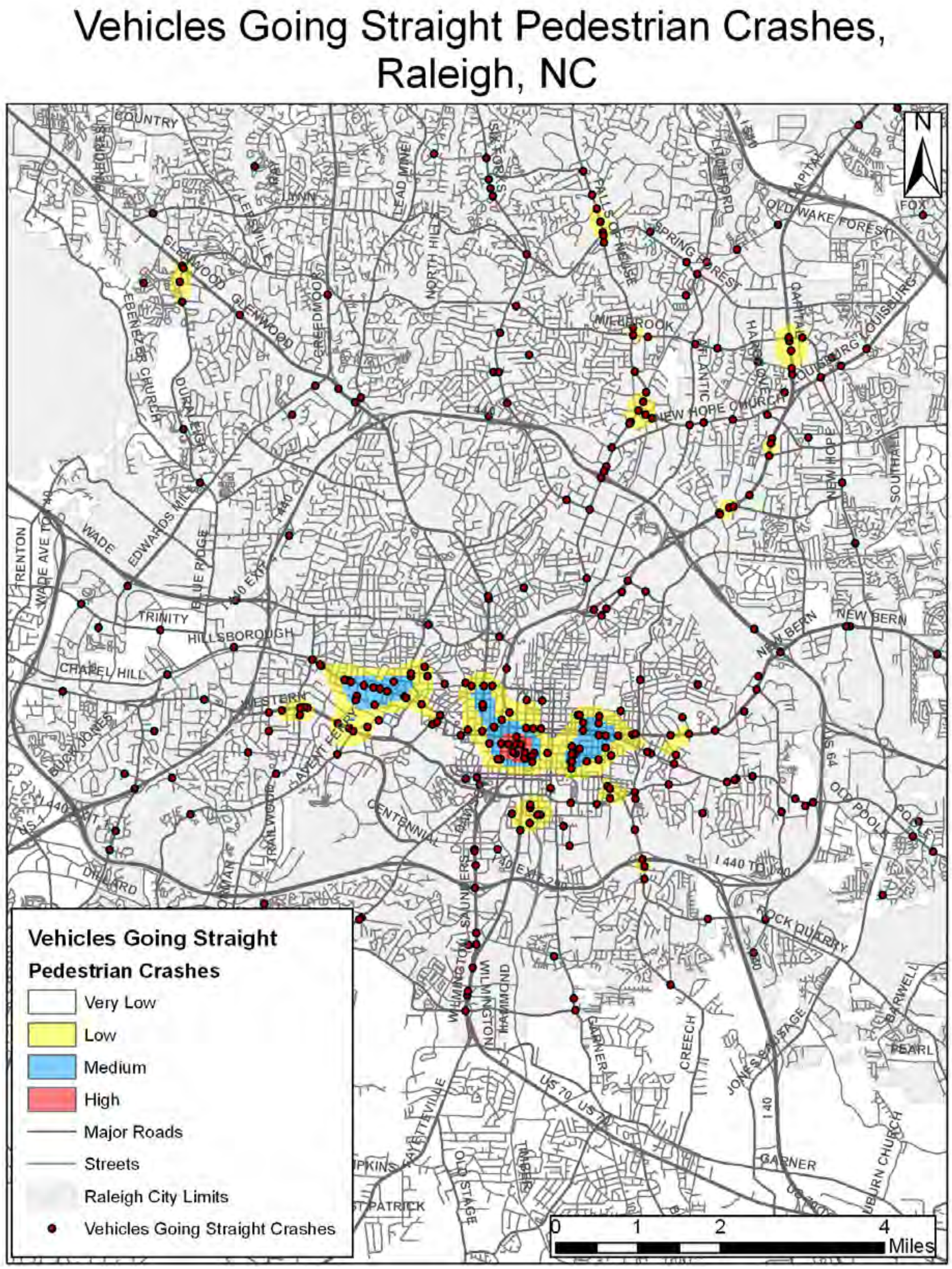


Figure 24: Vehicles Going Straight Crash Density, 2004-2009.

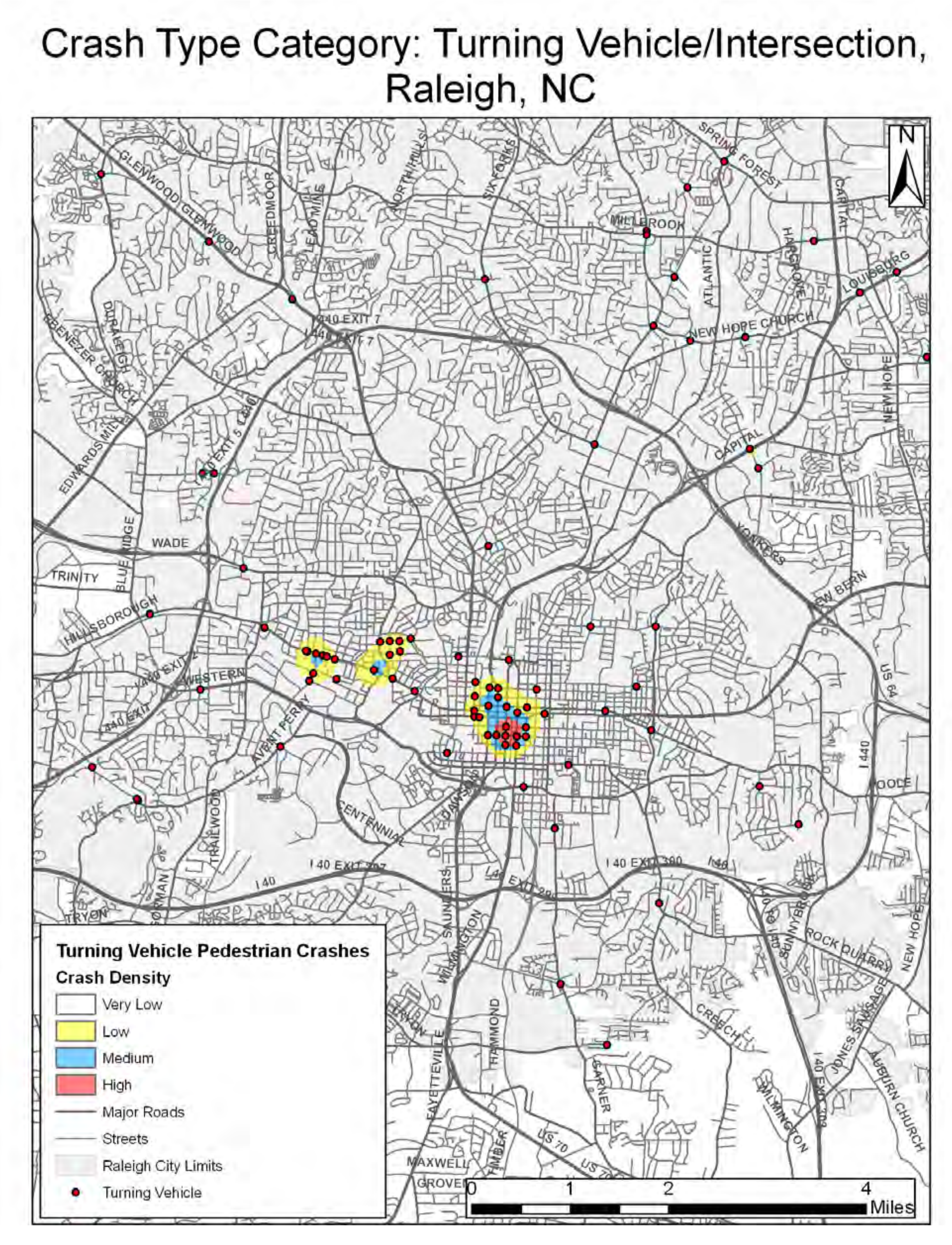


Figure 25: Turning Vehicle/Intersection Crash Density, 2004-2009.

Walking Along Roadway Crashes and Sidewalks, Raleigh, NC

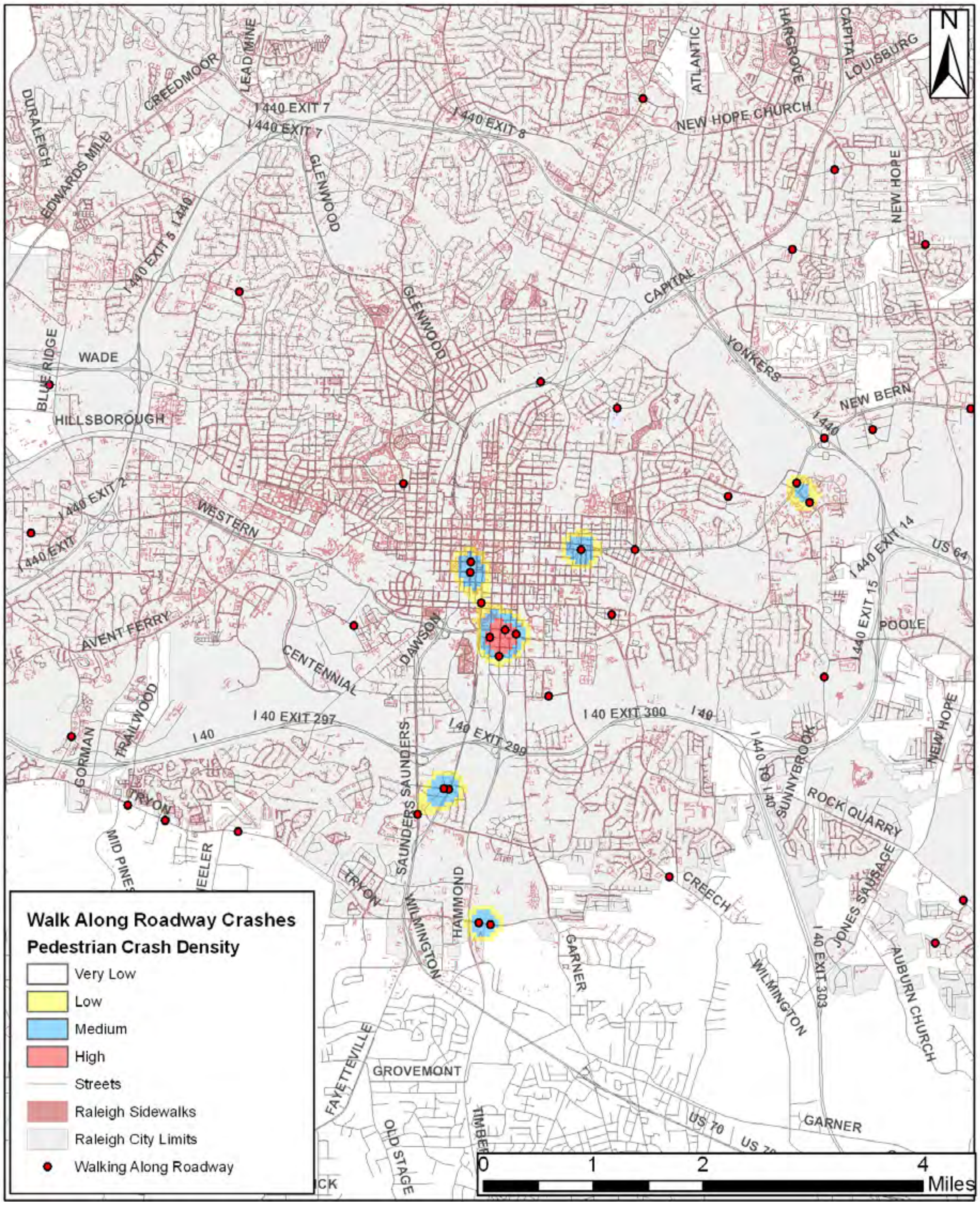


Figure 26: Walking Along Roadway Crash Density, 2004-2009.

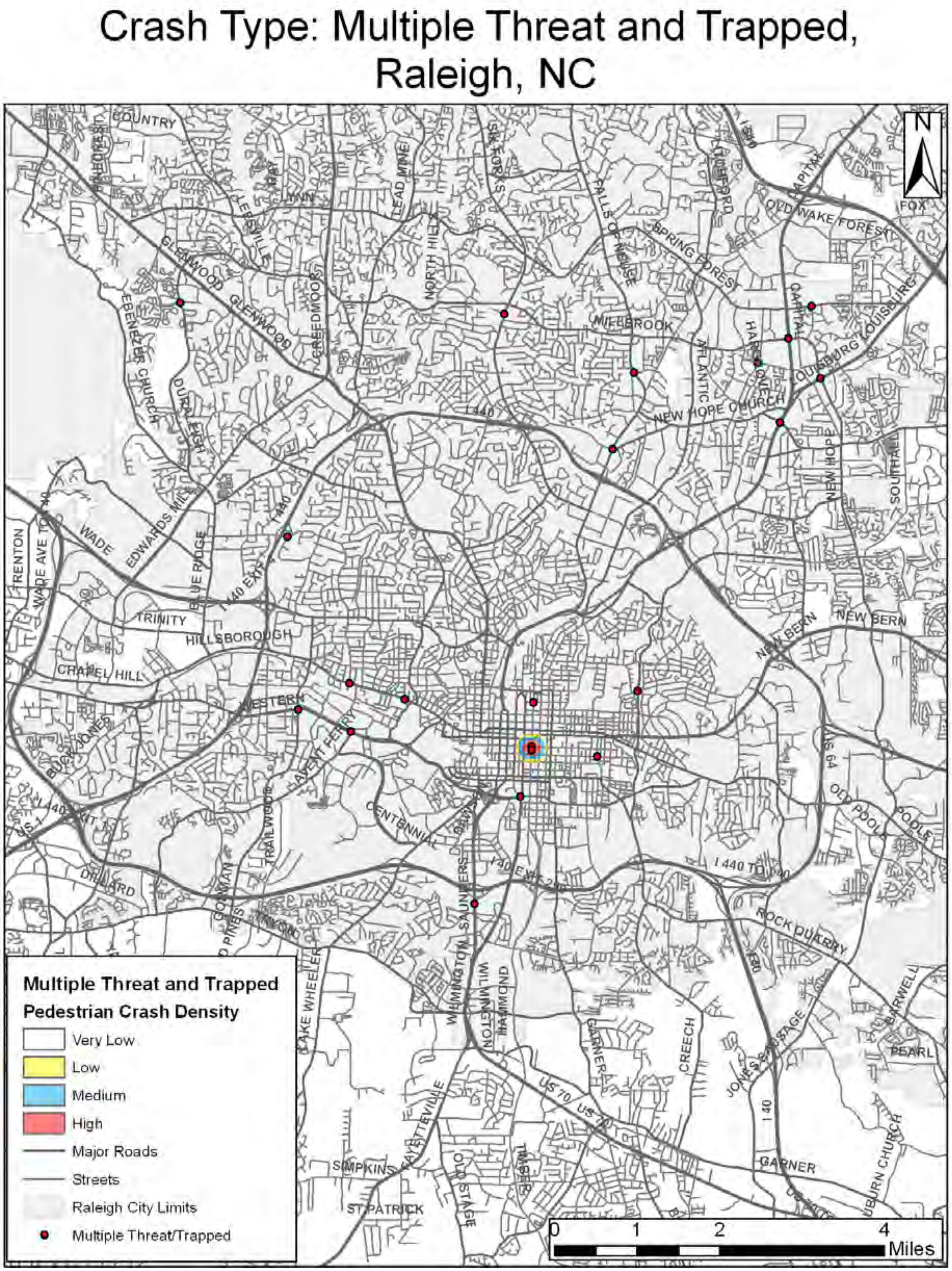


Figure 27: Multiple Threat and Trapped Crash Density, 2004-2009.

Intersection versus Midblock

In terms of the location of pedestrian crashes for the years 2004-2009 (the only data available), 37 percent of crashes occurred at an intersection, though a further 11 percent of crashes were defined as intersection-related. As such, roughly 48 percent of crashes occurred at or near intersections. For crashes occurring away from intersections, roughly 46 percent were defined as such, while slightly less than 6 percent of crashes occurred away from the roadway (PVAs not included). Slightly more than 1 percent of pedestrian fatal crashes occurred at or near intersections, while roughly 2 percent of disabling injuries occurred at or near intersections. Non-intersection locations accounted for 4.2 percent and 3.9 percent of pedestrian fatalities and disabling injuries, respectively.

The following map (Figure 28) illustrates those intersections that have one crash or more occurring within a 100 foot buffer of the intersection. As this map uses a buffer around each intersection, instead of the "Crash Location" field of the attribute table, the map includes information for crashes from 2010. Seven intersections were identified with five or more pedestrian collisions within 100 feet from 2004-2010. Ten more intersections were identified with four collisions (see Table 3). These intersections could warrant further investigation of geometrics, operational parameters, pedestrian amenities, and behavioral issues. If these intersections overlap with those focus/hotspot areas identified in the Pedestrian Plan process for Raleigh, this analysis will provide further information to support infrastructure investments for pedestrians around these intersections. We can also further explore the characteristics of the crashes that occurred at each location for more information. For example, Figure 26 indicates that a number of these intersections are marked by crashes involving motorists turning across the path of pedestrians.

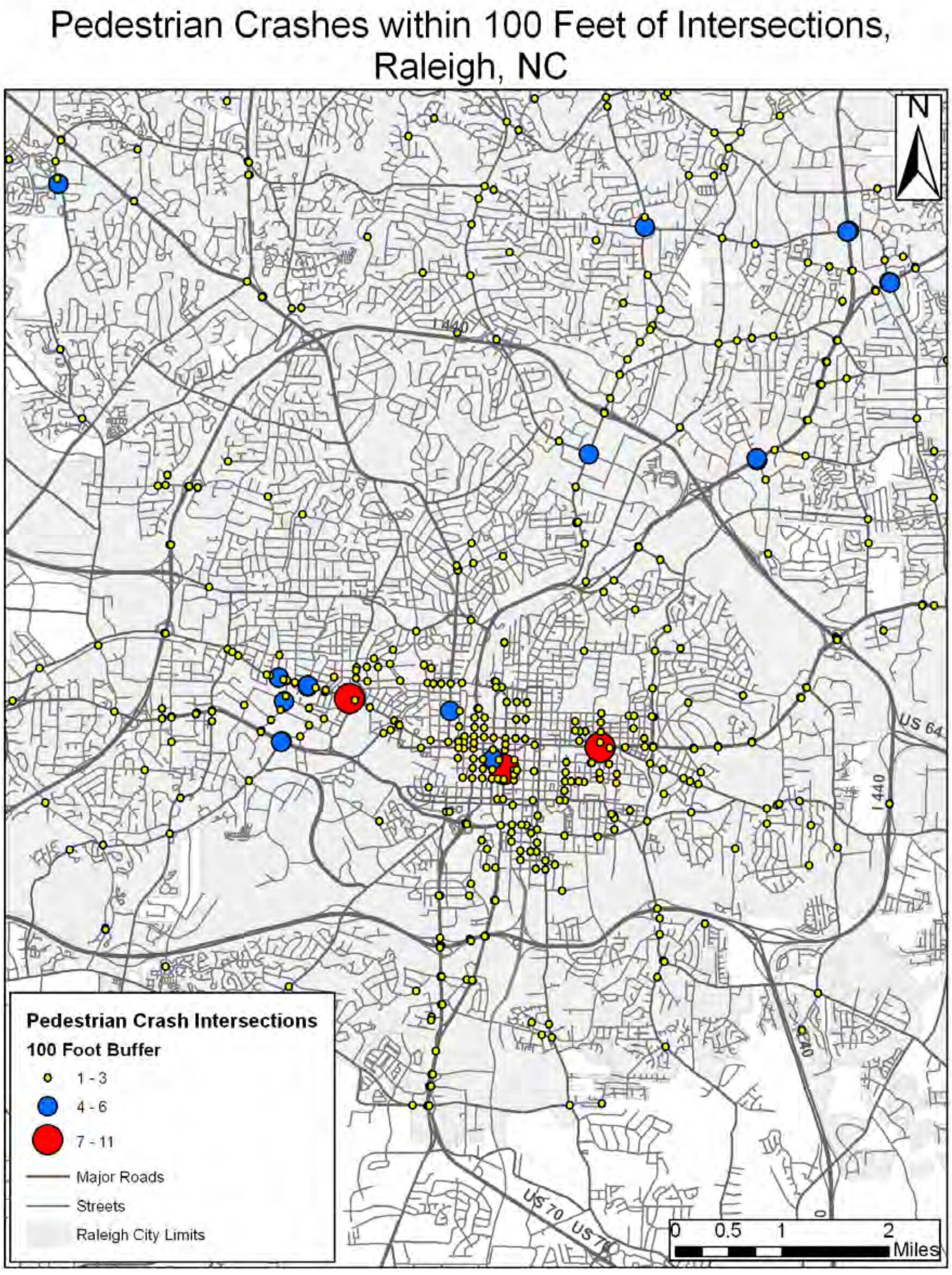


Figure 28: Intersections with Pedestrian Collisions within 100 feet of Center, 2004-2010.

Table 3. Intersections with 4 or More Related Pedestrian Collisions within 100 feet of Center.

Intersection Name	Crashes
Hillsborough and Enterprise	11
Martin and Wilmington	7
New Bern and Tarboro	7
Dixie and Hillsborough	6
Friendly and Hillsborough	6
Hargett and Salisbury	6
Brentwood and Capital	5
Avent Ferry and Western	4
Capital and Millbrook	4
Dan Allen and Thurman	4
Delta Lake and Duraleigh	4
Falls Of Neuse and Millbrook	4
Gardner and Hillsborough	4
Glenwood and North	4
Louisburg and New Hope	4
Morrill and Western	4
Six Forks and Wake Forest	4

An analysis of midblock crashes is presented in the following map (Figure 29). It is clear from the spatial distribution of crashes that certain corridors have a midblock crash problem, most notably Hillsborough Street, Falls of Neuse/Old Wake Forest Road, New Bern Avenue, and Capital Boulevard. These corridors could merit conducting roadway audits and site-specific analyses to determine whether infrastructure, access, roadway operations, or behavioral issues such as failure to yield, speeding, or crossing at night without lights are associated with these areas of higher than average midblock crashes.

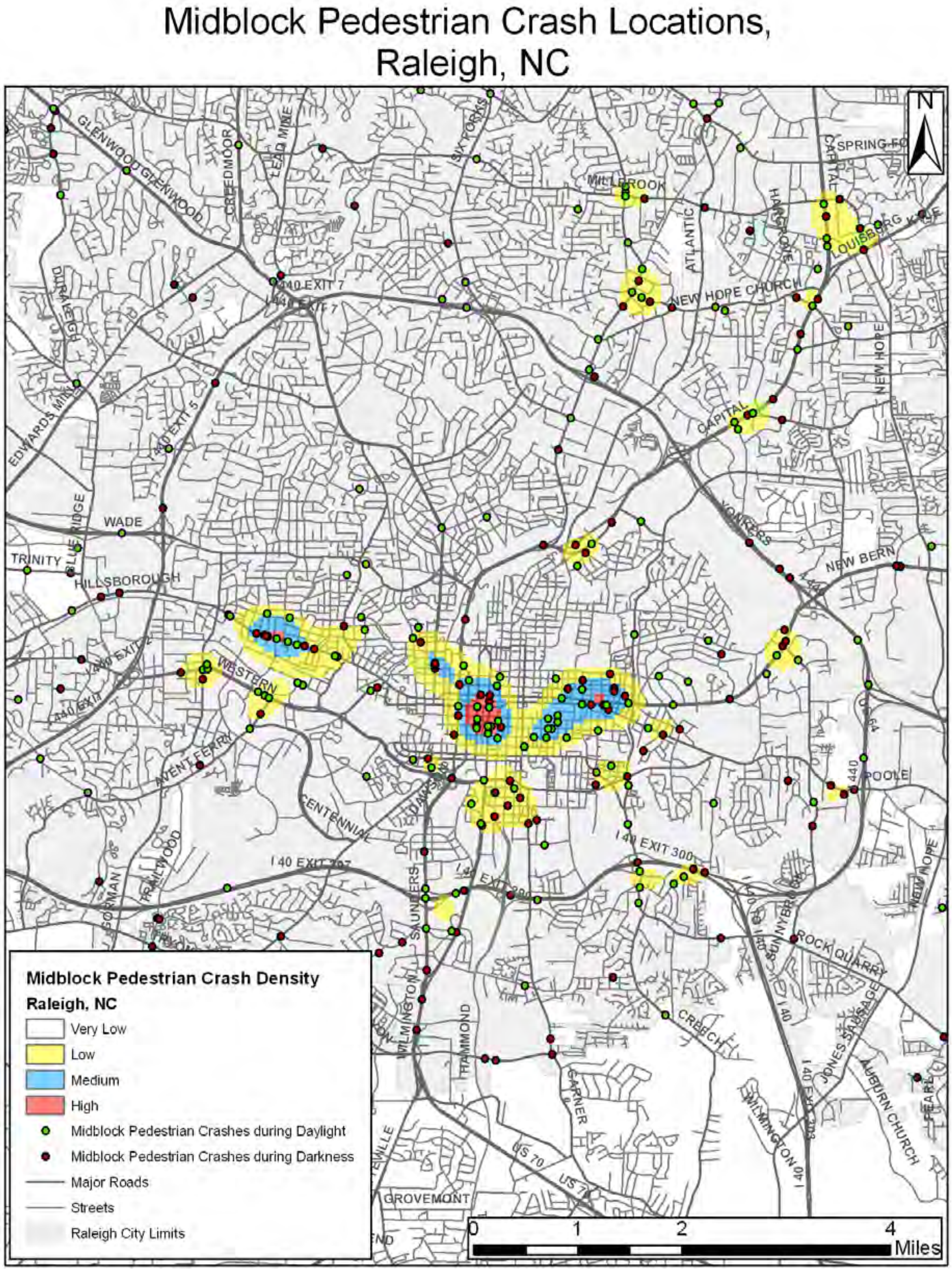


Figure 29. High Density Zones for Midblock Pedestrian Crashes, Raleigh, 2004-09.

Crashes Near Transit

Analyses also identified bus stops where multiple crashes had occurred within 200 feet. These crashes were not necessarily associated with accessing the transit stop or transit stop operations, but could reflect conditions around the transit stop. Figure 30 shows the top locations in terms of crash frequency. Again, these locations may be sites for further investigation, or could be part of a corridor-wide analysis of conditions focusing on safety and access to transit stops among other conditions. Table 4 lists those stops with three or more crashes occurring within 200 feet of the stop.

Boarding and alighting data from Capital Area Transit (CAT) also yielded some interesting information. Most transit riders are also pedestrians at some point of the commute and as pedestrian volume data is unavailable for Raleigh, the boarding and alighting data serves as an imperfect measure of areas where pedestrian activity is high. By overlaying the boarding and alighting data on the kernel density analysis of pedestrian crashes in Raleigh, a pattern emerges, indicating that pedestrian crashes are often located in close proximity to transit stops. Figure 31 displays the pedestrian crash density overlaid with boarding and alighting data. Appendix A provides more detail with regard to the relationship between boarding and alighting data and the Wolfline Campus Bus Service.

Pedestrian Crashes within 200 Feet of a Transit Stop, Raleigh, NC

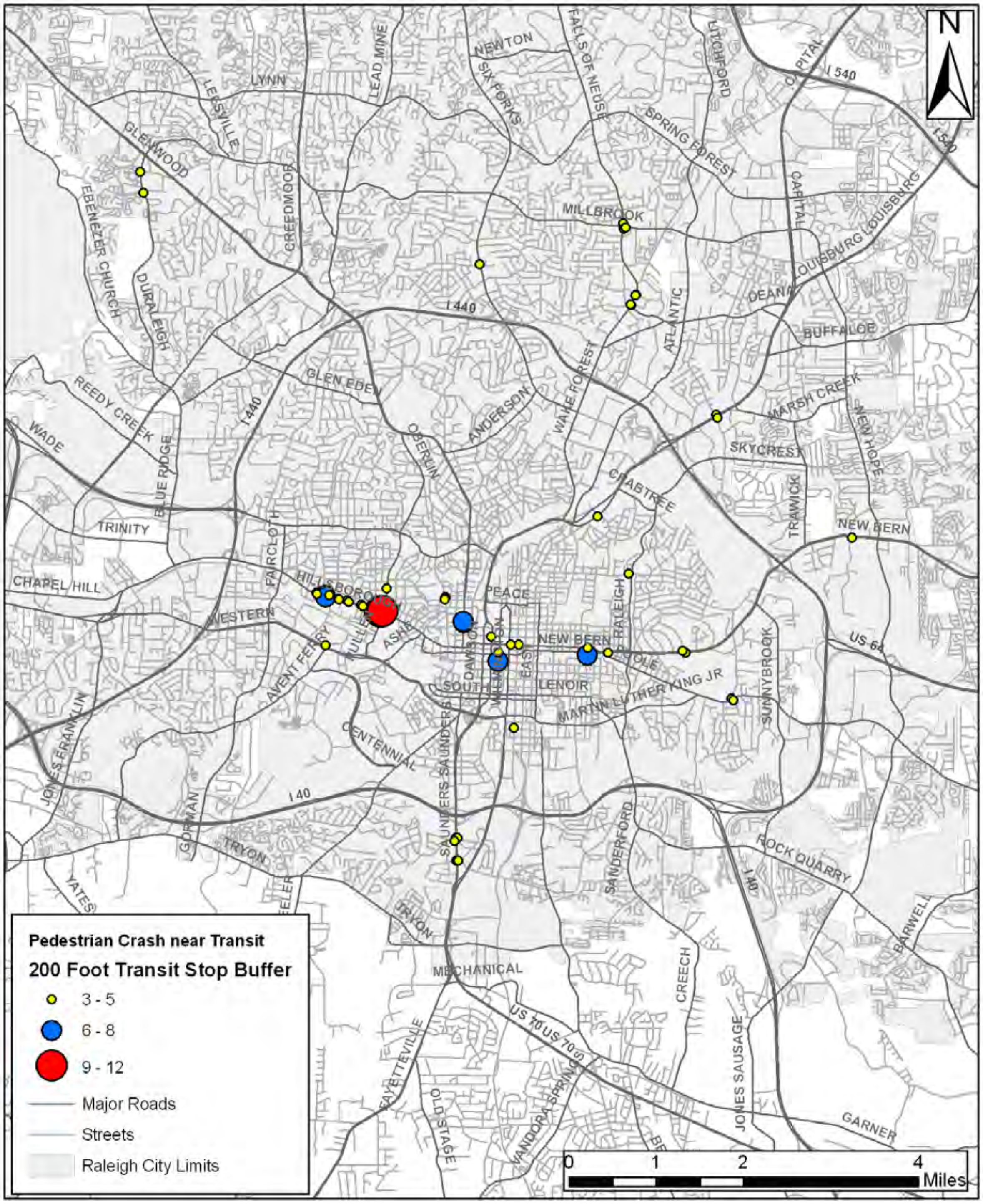


Figure 30. Transit Stops with Pedestrian Collisions within 200 Feet of Stop, 2004-2010.

Table 4. Bus stops with 3+ Pedestrian Crashes within 200 feet of Stop (complete listing available).

Stop Name	Crashes
Hillsborough St & Enterprise	12
Hillsborough St & Dixie	7
New Bern & Tarboro	7
Glenwood Ave & North	6
Salisbury & Hargett	6
Brentwood & Capital	5
Falls Of Neuse & Millbrook	5
Western & Avent Ferry	5
Hillsborough St & Gardner	4
Duraleigh & Delta Lake	4
Hillsborough St & Dan Allen	4
Falls Of Neuse & Millbrook	4
Oberlin & Stafford	4
Capital & Fenton	3
Morgan & Salisbury	3
Wake Forest & Hardimont	3
Wake Forest & Ollie	3
Glascock & Raleigh	3
Hillsborough St & Horne	3
Hillsborough St & Brooks Ave	3
Duraleigh & Pleasant Valley	3
Saunders & Carolina Pines	3
Saunders & Ileagnes	3
Peace & Saint Marys St	3
Northbrook & Six Forks	3
Hillsborough St & Daisey	3
New Bern & Poole	3
New Bern & Clarendon Crescent	3
Edenton & Tarboro	3
Edenton & Blount	3
Wilmington & Edenton	3
Blount & Lee	3
Poole & Ashford	3
Saunders & Carolina Pines	3
Mcdowell & Jones	3
New Bern & Corporation	3

Boardings and Alightings with Pedestrian Crash Density, Raleigh, NC

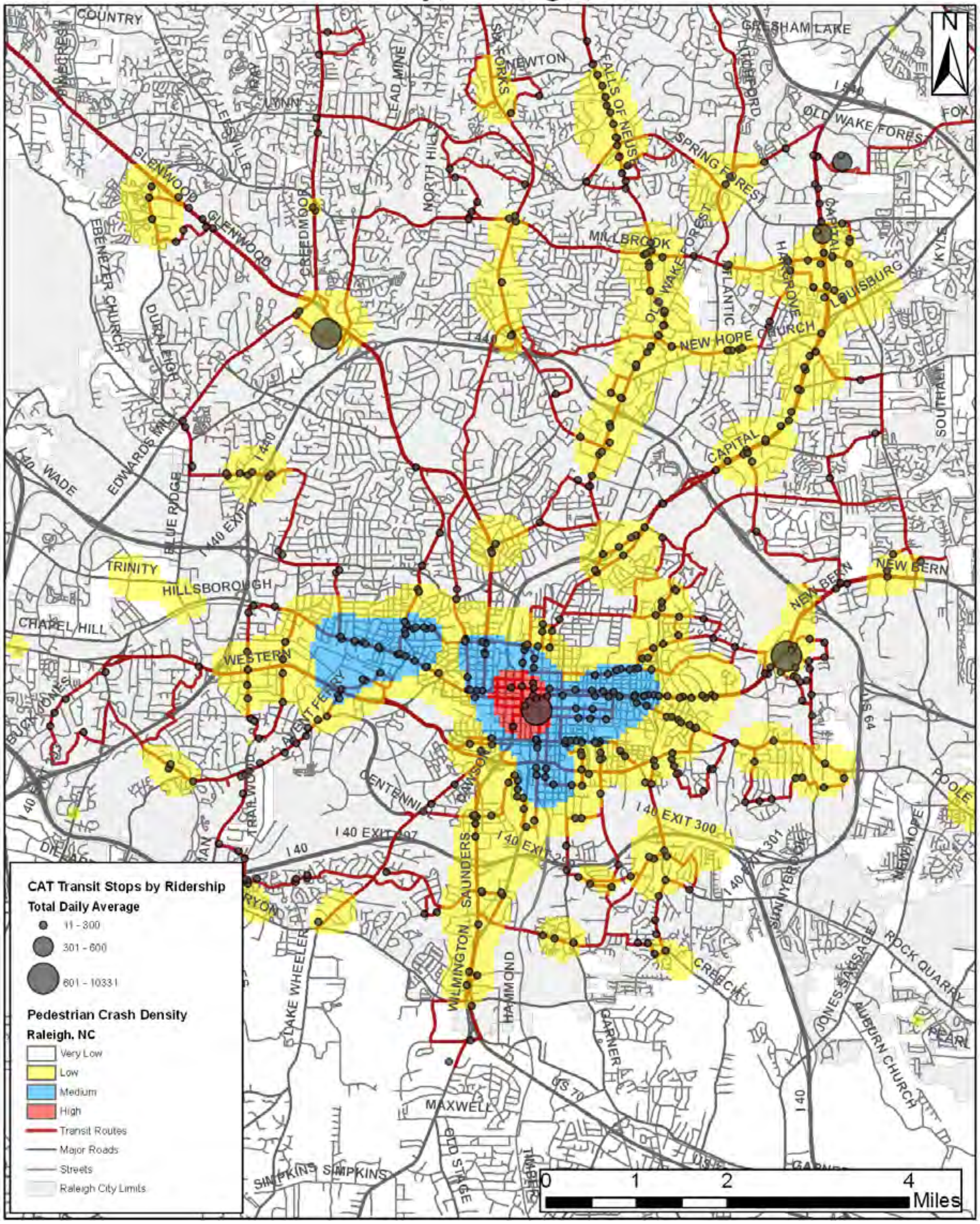


Figure 31: CAT Boardings and Alightings with Pedestrian Crash Density, 2004-2010.

High Crash Corridors

Another method used to identify locations with high midblock crash issues is to identify entire corridors or roadway sections that have a high frequency or a high crash rate per mile.

Since sections with higher crashes may reflect similar problems along an entire corridor, even if higher numbers of crashes haven't yet occurred along the entire corridor, it may be more prudent and proactive to focus attention corridor-wide. Corridors or entire roads that had the highest rates of pedestrian crashes are shown in Table 5. Roads with high counts of pedestrian crashes, 2004-2010. These corridors could reflect a wide variety of issues warranting further investigation, including long block lengths, lack of crosswalks, wide crossing distances, or large pedestrian volumes. These high crash corridors could also be the focus of countermeasure efforts in order to have a significant impact on pedestrian safety in the City.

Table 5. Roads with high counts of pedestrian crashes, 2004-2010.

Crash Corridor	Length of Street in Miles	Number of Crashes	Rate/Mile
Tarboro	0.65	8	12.33
Salisbury	1.34	12	8.94
Hillsborough St	6.28	45	7.17
Blount	2.84	19	6.68
Davie	1.65	11	6.65
Edenton	1.59	10	6.29
Martin	1.81	11	6.08
McDowell	1.66	9	5.43
Wake Forest	3.85	16	4.16
Saunders	4.38	16	3.65
Duraleigh	2.98	10	3.35
Poole	4.26	11	2.58
Rock Quarry	5.41	13	2.40
Falls Of Neuse	8.95	21	2.35
Wilmington	7.55	17	2.25
Tryon	4.54	10	2.20
New Bern	11.87	25	2.11
Raleigh	3.84	8	2.09
Atlantic	4.74	9	1.90
Capital	18.51	34	1.84
Six Forks	7.67	14	1.83
Western	8.96	15	1.67
Millbrook	7.88	9	1.14
Glenwood Ave	25.95	21	0.81
I-440	30.77	19	0.62
I-40	27.22	11	0.40

Crashes Near Schools

Using buffer zones around schools, we also identified schools where crashes involving school-aged children (under 15 years) occurred within ¼ mile of school boundaries (Figure 32). Presumably these crashes could involve school-related travel, although we did not select by time of day, day of week or other factors. Even so, only one school was identified that had more than two child pedestrian crashes within ¼ mile (Table 6). At present, we do not know what these results suggest about safety of neighborhood routes to most schools versus numbers of children walking to school.

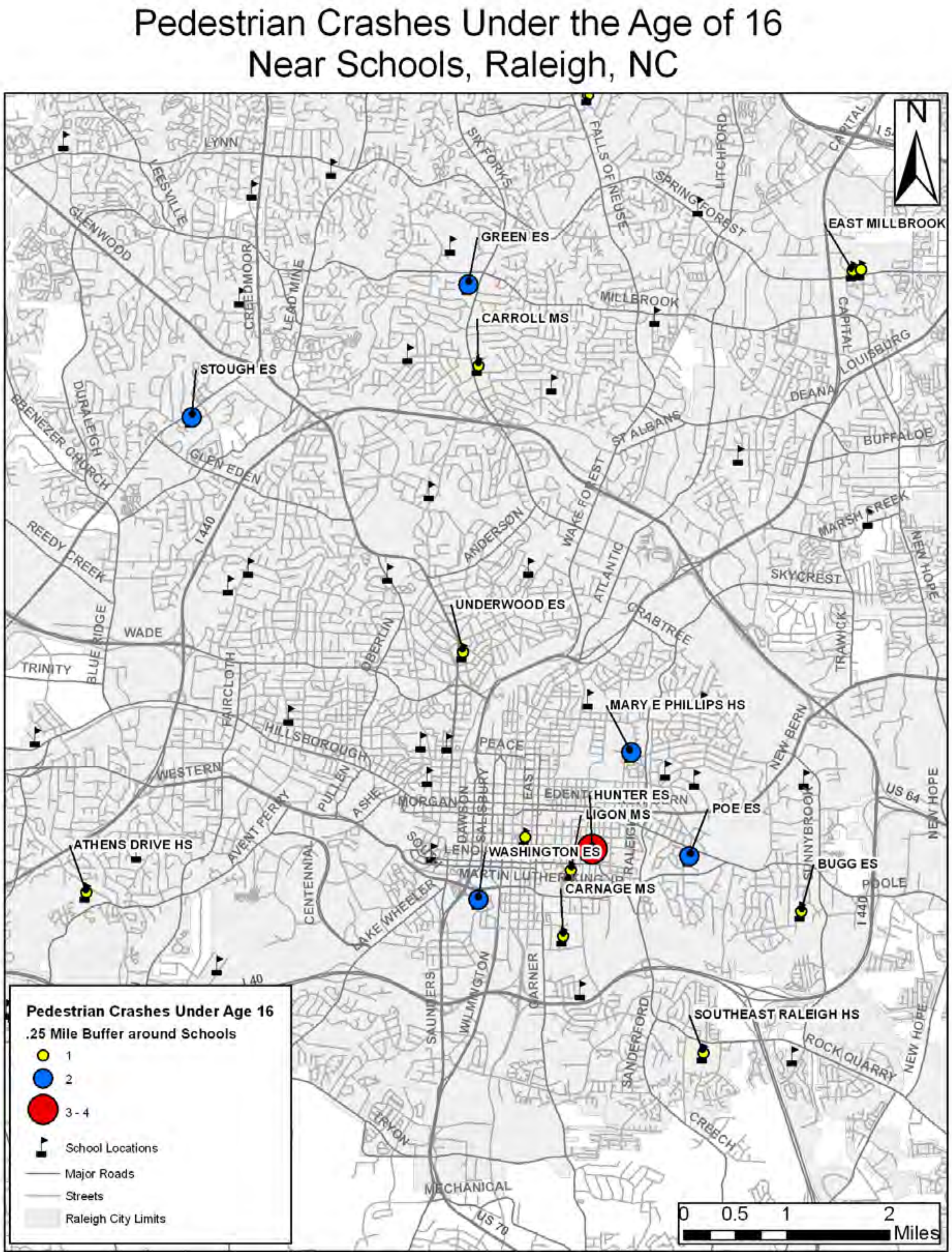


Figure 32. Pedestrian Crashes Under the Age of 16 Near Schools, 2004-2010.

Table 6. Schools with School-Aged Child (5 to 15 years) Pedestrian Crashes within ¼ Mile of School Boundary. 2004-2010.

School Name	Number of Crashes
Hunter ES	4
Mary E Phillips HS	2
Washington ES	2
Stough ES	2
Green ES	2
Poe ES	2
Athens Drive HS	1
Ligon MS	1
Carnage MS	1
Carroll MS	1
East Millbrook MS	1
Bugg ES	1
Southeast Raleigh HS	1
North Ridge ES	1
Moore Sq Museum MS	1
Underwood ES	1
Spring Forest Road Modular Site	1
North Forest Pines Drive ES	1
Forest Pines Drive ES	1

Speed
Travel speed profoundly affects the severity of injuries to pedestrians, but quality data on pre-crash travel speeds are unavailable. However, the relationship between speed and serious or fatal injury is clear in Raleigh, with crashes on roadways with higher speed limits more often resulting in fatal and disabling type injuries (Figure 33).

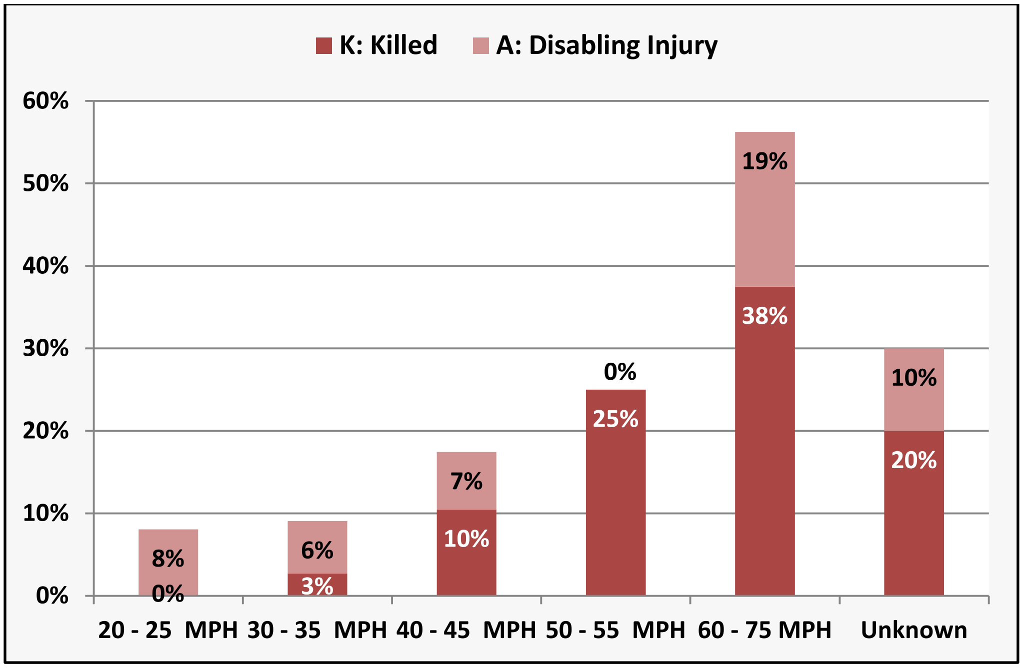


Figure 33: Percent of Killed or Seriously Injured (A-Type) by Speed Limit, 2004-2010.

The City of Raleigh could conduct speed studies on identified corridors to better understand the speeding issue in the city.

Other

Further analysis will be conducted with respect to the Wolfline using boarding and alighting data as well as kernel density analysis of crashes. Parking-related crashes may also be examined and analyzed in the future.

Summary of Data Analysis Findings and Issues

- Crashes have fluctuated over the past seven years and no definitive trend can be determined, though 2007 saw the highest number of pedestrian crashes in one year at 160. However, a clear upward trend can be discerned in terms of crash numbers from 1997-2009, data that include PVA crashes.

- Crashes occurring in Public Vehicular Areas (PVAs) are not included in this analysis, but do constitute a large portion of crashes that occurred in Raleigh from 2004-2009 (see Figure 3).

- The times between 3:00 and 7:00 had the highest crash totals by hour of the day. A majority (59 percent) of crashes occurred during daylight hours. However, 41 percent occurred during dark or low light hours with 26 percent of occurring at night on lighted roadways. Crashes are also higher during the fall months as daylight hours are waning.

- Certain corridors, including Falls of Neuse Road, Capital Boulevard, South Saunders Street, and Wilmington Street, have clear concentrations of fatal and A-type crashes, as indicated in Figure 7.

- Children under the age of 16 accounted for 129 of those struck in reported collisions (14 percent of the total) over the 2004 to 2010 time period. Children five and under accounted for slightly less than three percent. By comparison to another large urban area, pedestrians up to age 15 comprised 13 percent of those struck in the City of Charlotte. Adults 65 and older accounted for 4.5 percent of the total pedestrian crashes in Raleigh, and 4.2 percent in Charlotte.

- The crash problems as characterized by reported collision data suggest that adults of all ages are most involved in collisions, but particularly young adults (16 to 29) who accounted for 36 percent of all pedestrian collisions, with adults 30 to 59 comprising 39 percent and adults ages 60 and up accounting for less than four percent.

- Fatalities occurred with greater frequency for those pedestrians aged 70 or older, though the age group between 30 and 59 also accounted for 13.9% of fatalities. Children under the age of 16 accounted for 12.2 percent of the total fatalities.

- Persons of black or African American heritage accounted for slightly less than half (46 percent) of the Raleigh area pedestrian collisions, though they only account for 29 percent of Raleigh's overall population. Persons identifying as Hispanic accounted for about 11 percent, with whites accounting for roughly 39 percent and Asian and other groups accounting for two percent.

- Males of all ages accounted for about 59 percent of pedestrians involved.

- Weekday crashes account for 76 percent of all crashes.

- A variety of roadway and off-roadway crash types were observed with a majority of fatalities occurring in collisions where the pedestrian was crossing a roadway and was struck by a through vehicle (16 fatalities) or dashed or darted into the roadway (seven fatalities). Other fatalities occurred under more obscured conditions where the pedestrian was in the roadway but other factors are unknown, or under unusual circumstances (such as prior crashes). Alcohol use was also over-represented among fatal crashes with 19 fatalities recorded.

- Crashes overall are fairly evenly divided by location type (midblock or intersection), though crashes that occurred in PVAs were not included in this analysis. Fatalities, however, are more concentrated at non-intersection locations (75 percent of those killed, although only 47 percent of collisions occurred at such locations). Fatalities are also over-represented on higher speed limit roadways of 50+ mph (63 percent of fatalities).

- High crash intersections among other high crash areas, could be candidate sites for roadway safety audits and may warrant special enforcement activities as well as engineering and other measures. Motorists making turns without yielding to pedestrians at intersections are a frequent crash type that may affect where pedestrians choose to cross. Leading Pedestrian Intervals (LPI) could be a good way to mitigate the motorist turning crash problem.

- Areas with concentrations of midblock crashes were also identified where additional roadway and behavioral assessments could occur. Motorists often fail to yield to pedestrians when turning in and out at driveways and pedestrians often fail to yield or choose a safe gap when crossing at midblock locations. Specific roadways with high numbers of pedestrian midblock collisions were identified. These corridors could be the focus of additional safety audits, analysis, and identification of appropriate engineering, enforcement and educational countermeasures.

- Transit stops with pedestrian crashes occurring nearby were also identified. Both mid-block and transit areas could represent segments with inadequate infrastructure and access, operational issues, as well as potential behavioral issues such as speeding, failure to yield, or lack of conspicuity at night. Further site assessments are warranted and these may in turn help to identify appropriate countermeasures such as enforcement or targeted educational measures, along with potential engineering remedies.

- High crash corridors were also identified in this analysis and include Hillsborough Street, Capital Boulevard, New Bern Avenue, Glenwood Avenue, and Falls of Neuse Road. Tarboro Road, Salisbury Street, Hillsborough Street, and Blount Street have the highest pedestrian crash rate per mile of roadway.

- Schools were also identified with crashes for school-age children (15 and under). Hunter Elementary School, Mary Phillips Elementary School, Washington Elementary School, Stough Elementary School, Green Elementary School, and Poe Elementary School all had two or more crashes within ¼ mile of the school itself.

A variety of spatial analyses show that crashes appear to be concentrated downtown, and in some areas west and east sides of Raleigh. Outside of the downtown core, crashes are especially clustered along arterial roads and transit corridors. Within I-440 crashes seem to occur with greater frequency away from major roads, which reflects the assumption that more people are walking in and close to the downtown area.

Discussion

The development and examination of crash data is an important first step in developing a plan to address pedestrian safety problems in the City of Raleigh and prioritizing pedestrian safety measures (Zegeer, Sandt, Scully, et al., 2008). Overall crash issues were described in tables and figures analyzing the pedestrian safety issues City-wide and including demographics, pedestrian and driver behaviors, and location and environmental factors associated with crashes. Some of these factors may be useful for targeting countermeasures City-wide including enforcement, education, lighting, and other issues. In particular, the analysis of race, age, time of day, and gender can influence the development of educational messages and aid in targeting those populations that are most at risk. In addition, some of the issues that have been revealed in this analysis may be useful when reviewing and developing plans, development guidance, and other policies as well as inter-departmental and inter-agency cooperative efforts. In particular, this analysis can supplement the ongoing Pedestrian Plan development process in Raleigh.

Further examination of crash types may also help to identify areas of concern for particular types of problems that might be addressed by comprehensive countermeasures. For example, Pedestrian Failed to Yield or Vehicle Turning collisions could be examined to determine where and why pedestrians are struck while crossing the roadway. Are there gaps or a lack of facilities or space to walk, or are other issues present? For night-time collisions, are there gaps in lighting resulting in dark zones, poor maintenance of lighting, or roadways or segments where no lighting exists but may be needed. An educational campaign incorporating messages regarding conspicuity of pedestrians could be especially effective in mitigating nighttime crashes.

High crash areas at various scales and areas with different types of crash issues were also identified through a variety of spatial analyses. Intersections and corridors with high counts of pedestrian crashes as well as transit stops with pedestrian safety issues were identified. Such locations may also be targeted for further assessment of more location-specific (intersection, corridor, transit stop) crash problems. Once specific locations are identified, more detailed examination of crash factors may be incorporated into on-site assessments of roadway geometry and operations, and observations of pedestrian-motorist interactions such as in roadway safety audits. See Nabors et al. (2007) for more information on conducting roadway safety audits and prompt lists for focusing on pedestrian issues. In addition, more detailed examinations could incorporate neighborhood population, built environment characteristics, and infrastructure buildout in conjunction with traffic crash and demographic factors. Such analyses should aid efforts to develop and target enforcement and educational countermeasures as well as policy and engineering treatments to the specific problems and target audiences in each area.

Tools such as PEDSAFE (Harkey and Zegeer, 2004), Countermeasures That Work (NHTSA, 2010; 6th edition due shortly), the NCHRP Guide for Reducing Collisions Involving Pedestrians (Zegeer, Stutts, Huang, et al., 2004), NCHRP Report 622, Effectiveness of Behavioral Highway Safety Countermeasures (Presseur, Williams, Nichols, Tison, and Chaudhary, 2008), and other references provide help in identification of potentially suitable countermeasures. ***All countermeasures and locations should be thoroughly assessed by qualified traffic safety officials before implementation.*** By adding some of the identified locations to the Pedestrian Plan site identification process in Raleigh, existing resources and ongoing initiatives can be leveraged to create a comprehensive program to enhance pedestrian safety in the city.

Analyses have not yet incorporated pedestrian or motor vehicle volumes or other exposure measures, apart from the boardings and alightings analysis of Capital Area Transit. Although the analyses reported on herein do not account for relative risk or crash rates per individual, identifying areas with significant numbers of pedestrian collisions is still a valid way to prioritize where both engineering and behavioral improvements might be focused to help bring down numbers of crashes, especially when supplemented by additional information gleaned from site visits and roadway audits to assess specific problems. Finally, in developing a safety action plan, it should be considered that crash data suffer from inaccuracies and incomplete reporting (Zegeer, et al. 2008). Although it seems as if every effort has been made to code the crashes in the analysis database correctly with respect to type and location, these fields and the other reported crash factors undoubtedly contain some errors. In addition, pedestrian falls and mishaps due to maintenance issues or other factors are not reported in State crash data. It is also the case that crashes may increase at one location and decrease at others, even if nothing is done. This is a well-documented statistical phenomenon known as regression toward the mean. Thus, in an effort to be more proactive, one might identify areas with similar issues to those with current crash problems and treat them in a similar fashion. City-wide improvements such as measures to slow vehicle speeds, improve visibility, and lighting crossing amenities and others may also be undertaken (Zegeer et al 2006, pp 13-17).

Other Data Issues

The HSRC team has checked a subset of the pedestrian crash ArcGIS shapefile that were provided by the City of Raleigh and found no geocoding errors, though errors may still be present in the data. An intersection file was created for Raleigh for this project, which is available from HSRC upon request.

Next Steps

These data analyses will be combined with additional contextual information and observations from City staff and stakeholders to identify high crash target areas and will hopefully inform the Pedestrian Plan process. These target areas will be further examined through field visits and additional analysis. With stakeholder input, analysis data, and site visit observations in place, a targeted pedestrian safety action plan will be developed. Additionally, this analysis will affect the focus and coordination of a unified pedestrian safety educational campaign for the Triangle region. This action plan will be reviewed by a wide variety of Raleigh stakeholders and revised with their input and will serve as the basis for the project intervention and evaluation efforts for the subsequent 3 years in conjunction with the ongoing Pedestrian Plan efforts of the Toole Design Group. This document should be regularly updated as new issues and opportunities arise.

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ESRI. ArcMap™ 9.3. ArcInfo. Copyright 1999-2006 ESRI Inc., All rights reserved.

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Supporting Material: Wolfline Campus Bus Service

North Carolina State University (NC State) provides its own transit system, the Wolfline Campus Bus Service, which serves areas close to the University campus. Using boarding and alighting data from the system, the following map displays stops by average daily total boardings and alightings overlaid with pedestrian crash density (Figure 34). While pedestrian crash density does not correspond exactly to those areas with high boardings and alightings, there is a pattern with more pedestrian crashes located in those areas with higher boarding and alighting totals. Hillsborough Road has a particularly high number of boardings and alightings as well as pedestrian crashes, though the fact that NC State is a significant pedestrian generator partially explains the high number and concentration of pedestrian crashes.

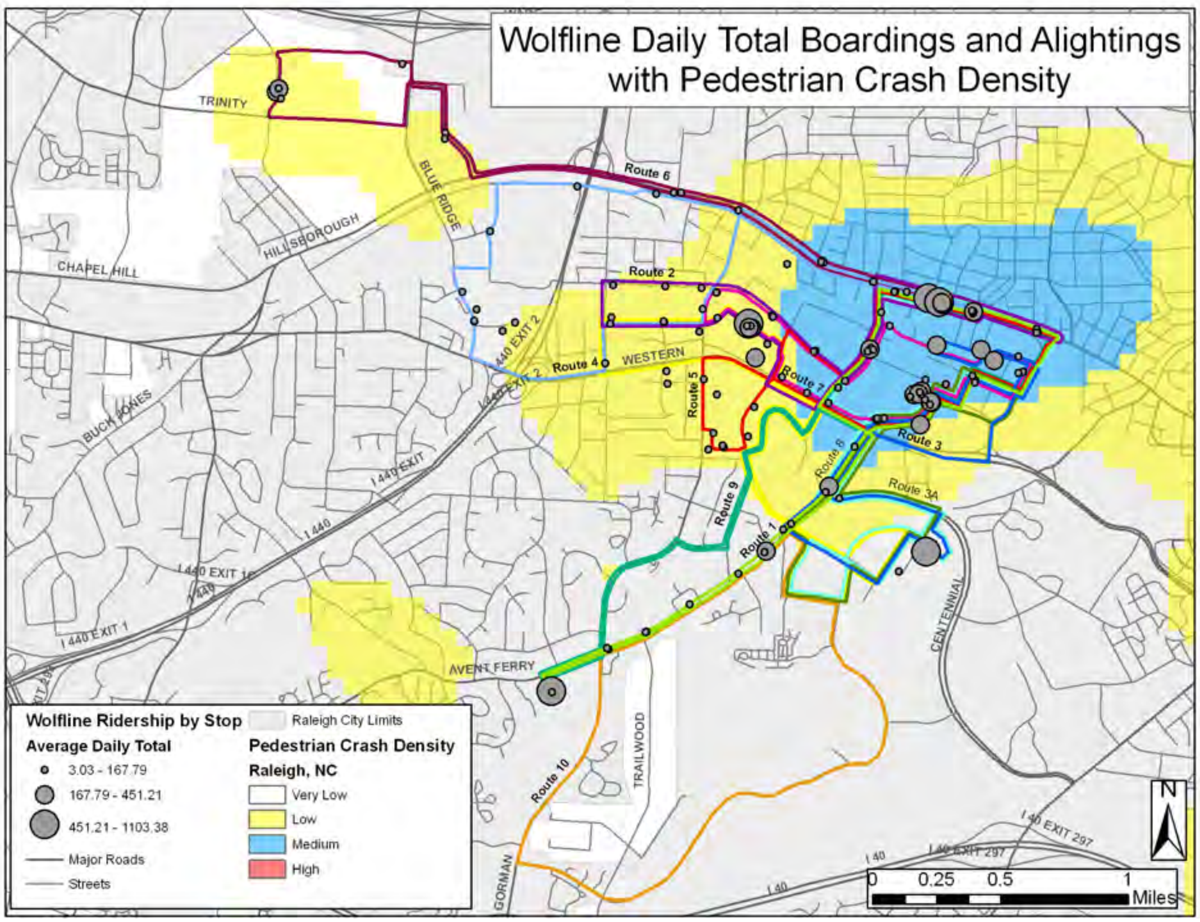


Figure 34: Wolfline Daily Boardings and Alightings with Pedestrian Crash Density, 2004-2010.

The following map (Figure 35) shows those stops by the number of pedestrian crashes within ¼ mile of the stop, with larger dots indicating larger numbers of crashes within ¼ mile. The campus of North Carolina State University is a significant generator of pedestrian traffic, which accounts for some of the clustering of pedestrian crashes within ¼ mile of the bus stops on Hillsborough Road.

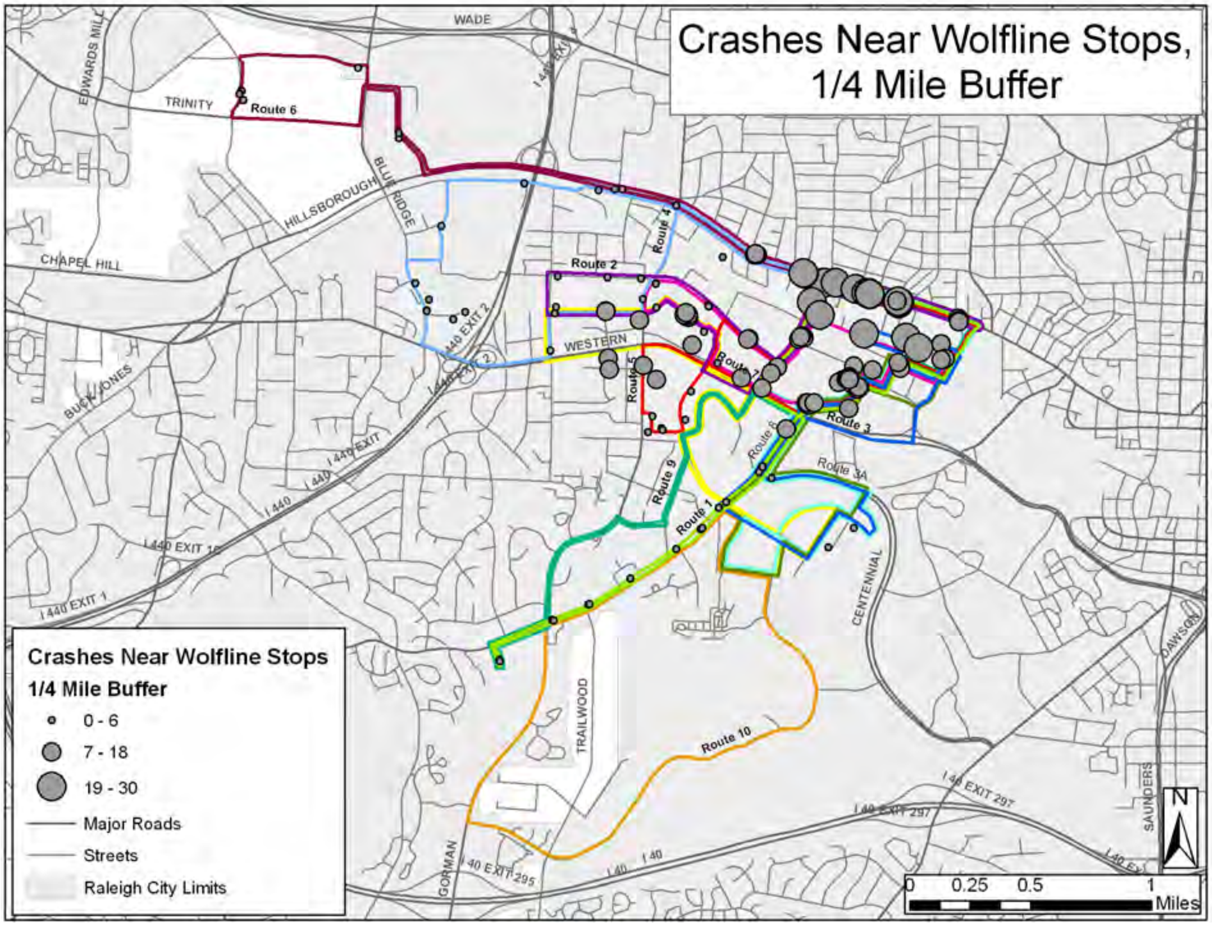


Figure 35: Crashes Within ¼ Mile of Wolfline Stops, 2004-2010.

The following table (Table 7) provides information about those stops with the most pedestrian crashes within ¼ mile of the stop. Many of those stops with the highest numbers of pedestrian crashes are either on or very near the campus of North Carolina State University.

Table 7: Wolfline Campus Bus Service Stops with High Pedestrian Crash Numbers within ¼ Mile, 2004-2010.

Stop Name	Count
Founders Drive At Nelson Hall	30
Dan Allen Drive At Dan Allen	28
Hillsborough St At Bagwell	28
Hillsborough St At Brooks	27
Founders Drive At Lampe Drive	27
Yarborough Drive At Dan Allen	27
Current Drive At Stinson Drive	26
Founders Drive At Lampe Drive	25
Founders Drive At Scott Hall	24
Yarborough Drive At Stinson	23
Current Drive At Stinson Drive	22

Stop Name	Count
Hillsborough At Enterprise	21
Founders Drive At Dh Hill Li	20
Hillsborough St At NCSU B	18
Dan Allen Drive At Food Science	17
Hillsborough St At Ncsu B	17
Stinson Drive At Kamphoefner	16
Pullen Rd At Gold Resident	15
Hillsborough St At Horne	15
Morrill Drive At Faucette Drive	15
Pullen Rd At Gold Resident	15
Morrill Drive At Carmichael	15
Stinson Drive At Polk Bldg	14
Hillsborough St At Rosemary	14
Hillsborough St At Shephen	14
Morrill Drive At Carmichael	14

Supporting Material: Pedestrian Crash Type Categories

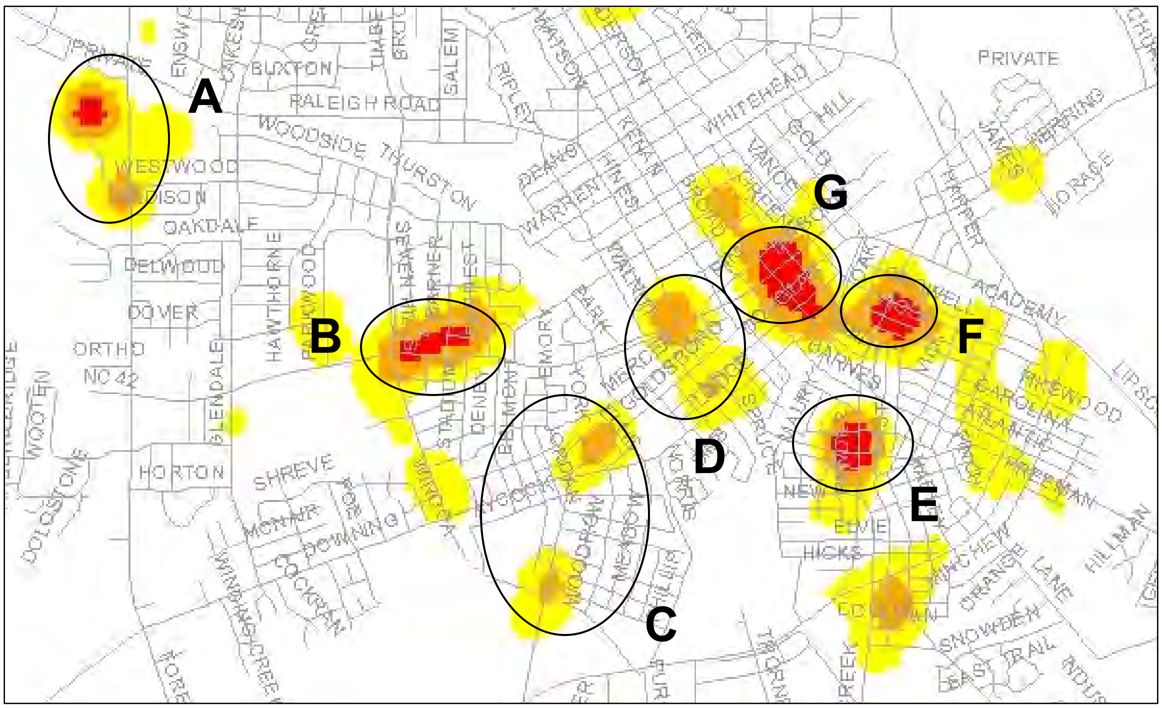
Current	Proposed New Categories
100 - Unusual Circumstances 220 - Driverless Vehicle 230 - Disabled Vehicle-Related 240 - Emergency Vehicle-Related 250 - Play Vehicle-Related	**1. Unusual /Unique Circumstances** 220 - Driverless Vehicle 230 - Disabled Vehicle-Related 240 - Emergency Vehicle-Related 250 - Play Vehicle-Related 320 - Entering / Exiting Parked Vehicle 330 - Mailbox-Related 360 - Ice Cream / Vendor Truck-Related 311 - Working in Roadway 312 - Playing in Roadway 313 - Lying in Roadway 910 - Crossing an Expressway 140 – Vehicle-Vehicle/Object 213 – Backing Vehicle – Roadway 213 – Backing Vehicle – Other/Unknown 150 – Motor Vehicle Loss of Control 610 – Standing in Roadway 130 – Pedestrian On Vehicle 190 – Other Unusual Circumstances 160 – Pedestrian Loss of Control
200 - Backing Vehicle 214 - Backing Vehicle - Parking Lot	N/A; types moved to other categories
310 - Working or Playing in Roadway 311 - Working in Roadway 312 - Playing in Roadway	N/A; types moved to other categories
340 - Bus Related 341 - Commercial Bus-Related 342 - School Bus-Related	**2. Transit or School- Bus Related** 341 - Commercial Bus-Related 342 - School Bus-Related
350 - Unique Midblock 320 - Entering / Exiting Parked Vehicle 330 - Mailbox-Related 360 - Ice Cream / Vendor Truck-Related	N/A; types moved to other categories
400 - Walking Along Roadway 410 - Walking Along Roadway With Traffic - From Behind	**3. Walking Along Roadway** 410 - Walking Along Roadway With Traffic - From Behind 440 - Walking Along Roadway Against Traffic - From Front 620 – Walking in Roadway
460 - Crossing Driveway or Alley 460 - Motorist Entering Driveway or Alley 465 - Motorist Exiting Driveway or Alley	**4. Driveway or Alley** 460 - Motorist Entering Driveway or Alley 465 - Motorist Exiting Driveway or Alley

Current	Proposed New Categories
500 - Waiting to Cross 510 - Waiting to Cross - Vehicle Turning 510 - Waiting to Cross - Vehicle Not Turning	N/A; types moved to other categories
600 - Pedestrian in Roadway - Circumstances Unknown 313 - Lying in Roadway	N/A; types moved to other categories
720 - Multiple Threat / Trapped 710 - Multiple Threat 730–Trapped	**5. Multiple Threat / Trapped** 710 - Multiple Threat 730–Trapped
740 - Dash / Dart-Out 741 – Dash 742– Dart-Out	N/A; types moved to other categories
750 - Crossing Roadway - Vehicle Not Turning 760 - Pedestrian Failed to Yield 770 - Motorist Failed to Yield	**6. Vehicle Going Straight (Intersection or Midblock)** 760 - Pedestrian Failed to Yield 770 - Motorist Failed to Yield 510 - Waiting to Cross - Vehicle Not Turning 741 – Dash 742– Dart-Out
790 - Crossing Roadway - Vehicle Turning 781 - Motorist Left Turn - Parallel Paths 782 - Motorist Left Turn - Perpendicular Paths 791 - Motorist Right Turn - Parallel Paths 795 - Motorist Right Turn - Perpendicular Paths	**7. Turning Vehicle/Intersection** 781 - Motorist Left Turn - Parallel Paths 782 - Motorist Left Turn - Perpendicular Paths 791 - Motorist Right Turn - Parallel Paths 795 - Motorist Right Turn - Perpendicular Paths 510 - Waiting to Cross - Vehicle Turning 212 – Motorist Left Turn – Opposite Direction 211 – Motorist Left Turn – Same Direction 214 – Motorist Right Turn – Opposite Direction 213 – Motorist Right Turn – Same Direction 792 – Motorist Right Turn on Red – Parallel Paths 795 – Motorist Right Turn on Red – Perpendicular Paths
800 - Off Roadway 830 - Off Roadway - Parking Lot	**8. Parking Lot** 830 - Off Roadway - Parking Lot 214 - Backing Vehicle - Parking Lot 890 – Off Roadway – Other / Unknown
910 - Crossing Expressway 910 - Crossing an Expressway	N/A; types moved to other categories

Appendix C: Community Site Visit Report Examples

Wilson Site Visit Notes

June 22, 2010



A – Forest Hills

B – Tarrboro/Ward

C - Goldsboro

D – Hines/Goldsboro

E – Hines/Pender

F – Vick

G – Pine/Green

Site A: Forest Hills

Observations:

- Walmart parking lot had several pedestrian-oriented treatments that appeared relatively new (including wide crosswalk at store entry and pedestrian signage); had angle parking and lighting appeared to be sufficient.
- Forest Hills Rd is 5 lane (2 in each direction with TWLTL) with no sidewalks, high traffic volumes and high speeds; the area is a relatively newer development but is auto-oriented with few or no pedestrian amenities.
- Lowes did not have any crosswalks from parking areas (not angled) to store entry; it did not have any yield or caution signs to drivers or pedestrians; the road in front of the store was wide (1 lane in each direction, striped); traffic was less than at the Walmart

Issues to Discuss:

- Working with Lowes (and other local businesses) to promote pedestrian safety in parking lots (contact: individual businesses, chamber of commerce?)
- Complete Streets ordinances to require new developments to have sidewalks and other ped/bike amenities (contact: planning staff, ped/bike board)

Crash Data:

	101764411	101955006	101591272	101123930	102428489	100815435	101173848	101714538	101914504
Ethnicity	Hispanic	White	Unknown	White		Unknown	White	White	White
Gender	Female	Female	Female	Male		Unknown	Male	Male	Female
Age	4, 9	63	15	20		77	19	64	68
Alcohol?	No	No	No	No	?	No	No	No	No
Date	6/13/2006	2/7/2007	10/20/2005	2/21/2004		1/24/2003	4/27/2004	4/14/2006	12/16/2006
Day	Tuesday	Wednesday	Thursday	Saturday		Friday	Tuesday	Friday	Saturday
Time	6:00 PM - 9:59 PM	2:00 PM - 5:59 PM	7:11 PM	11:33 AM		4:49 PM	3:01 PM	2:00 PM - 5:59 PM	2:00 PM - 5:59 PM
Severity	Possible (C)	Possible (C)	Property Damage Only	Evident (B)	Property Damage Only	Property Damage Only	Property Damage Only	Possible (C)	Possible (C)
Weather	Cloudy	Clear	Clear	Clear		Clear	Clear	Clear	Clear
Road Condition	Wet	Dry	Dry	Wet		Dry	Dry	Dry	Dry
Lighting	Dark - Lighted Roadway	Daylight	Dark - Lighted Roadway	Daylight		Daylight	Daylight	Daylight	Daylight
Ambulance?	Yes	Yes	No	Yes		Yes	Yes	Yes	No
Crash Location	Non-Roadway Location	Non-Roadway Location	Non-Roadway Location	Non-Roadway Location		Non-Roadway Location	Non-Roadway Location	Non-Roadway Location	Non-Roadway Location
Crash Type	Unusual Circumstance	Off Roadway	Off Roadway	Backing Vehicle		Off Roadway	Off Roadway	Backing Vehicle	Off Roadway
Fault	Motorist	Motorist	Motorist	Motorist		Unknown	Unknown	Motorist	Motorist
Notes	Two pedestrians								

Site B: Tarboro and Ward

Observations:

- Both Ward St and Tarboro St are 5 lane (2 in each direction with TWLTL) with many places without sidewalks, high traffic volumes and high speeds (45 MPH), and long distances between signalized intersections.
- There are lots of shopping centers on each road (a destination for drivers and pedestrians) and many driveway access points and turning traffic; crash history indicates that most crashes in this area occur during the day time
- The intersection of Tarboro and Ward is particularly unfriendly toward pedestrians, with wide crossings and turning radii (with many vehicles turning at high speeds) , no pedestrian signals, many large trucks, sidewalks on only 3 legs of the intersection, faded crosswalks, etc..
- There are neighborhoods on either side of the arterial corridor; these are 1950s style houses and apartments (Parkwood Square) that appear to be lower working class, mostly African-American households; most have no sidewalks or sidewalks only on one side of the road, with wide streets, but traffic volumes appear low.
- Several pedestrians and bicyclists were observed; where sidewalks are not present, there appear heavily used goat-trails, indicating significant pedestrian activity
- There are two churches in the area: Bethell Baptist Church and Tabernacle Baptist Church

Issues to Discuss:

- Collaborating with local church health ministries to promote pedestrian safety in the area (main messages: caution at driveways and when crossing the street) (contact churches – Marissa working on contact list)
- Speed of traffic on Tarboro and Ward, and what an appropriate speed should be (contact: engineers and public works)
- Intersection improvements and the potential for midblock crossings (contact: engineers and public works)

Crash Data:

	101215574	101611124	102429076	100942677	101212520	101434310	101998935	102105024	102441797	101077304	101032091
Ethnicity	Black	Black		Black	Black	Black	Hispanic	Black		White	Black
Gender	Male	Male		Male	Female	Male	Male	Female		Female	Female
Age	11	5		29	42	36	14	52		72	70
Alcohol?	No	No		No	No	No	Yes	No		No	No
Date	6/19/2004	11/17/2005		7/12/2003	6/15/2004	3/16/2005	3/30/2007	8/3/2007		12/22/2003	11/1/2003
Day	Saturday	Thursday		Saturday	Tuesday	Wednesday	Friday	Friday		Monday	Saturday
Time	11:15 AM	7:49 AM		08:49 AM	04:28 PM	2:36 PM	6:00 PM - 9:59 PM	10:00 AM - 1:59 PM		2:20 PM	4:42 PM
Severity	Possible (C)	Possible (C)		Evident (B)	Possible (C)	Possible (C)	Unknown	Evident (B)		Property Damage Only	Possible (C)
Weather	Clear	Clear		Clear	Clear	Rain	Clear	Cloudy		Clear	Clear
Road Condition	Dry	Dry		Dry	Dry	Wet	Dry	Dry		Dry	Dry
Lighting	Daylight	Daylight		Daylight	Daylight	Daylight	Dark - Roadway Not Lighted	Daylight		Daylight	Daylight
Ambulance?	Yes	Yes		Yes	No	Yes	Yes	Yes		Yes	Yes
Crash Location	Intersection	Non-Roadway Location		Intersection	Non-Roadway Location	Intersection	Non-Intersection Location	Non-Intersection Location		Non-Roadway Location	Non-Roadway Location
Crash Type	Pedestrian Dart /Dash	Off Roadway		Pedestrian Failure to Yield	Unusual Circumstance	Turning Vehicle	Pedestrian Dart /Dash	Pedestrian Failure to Yield		Off Roadway	Backing Vehicle
Fault	Pedestrian	Pedestrian		Pedestrian	Unknown	Motorist	Pedestrian	Pedestrian		Unknown	Motorist
Notes			2008 No Data						2008 No Data		

Site C: Goldsboro Corridor

Observations:

- Crash history indicates previous multiple threat crash; unclear if midblock crosswalk was installed before or after the crash; a mix of day and night crashes
- Goldsboro St is 3 lane (1 in each direction with TWLTL) with some sidewalks (one or both sides of the road), low traffic volumes and lower to moderate speeds (35 MPH)
- There are many blighted/vacant buildings, houses, and warehouses in this area and poor lighting may be an issue, particularly around the gas station at Barron and Goldsboro
- There is one church in the area (New Hope Ministries) and also a Police Station nearby
- There are lots of driveways and visibility from the driveways may be an issue (would need to do a follow up visit)

Issues to Discuss:

- When crosswalk was installed
- Lighting (contact: engineers and public works)
- Driveway visibility (contact: engineers and public works)
- Collaborate with church and police to promote safety (contact: police and churches)

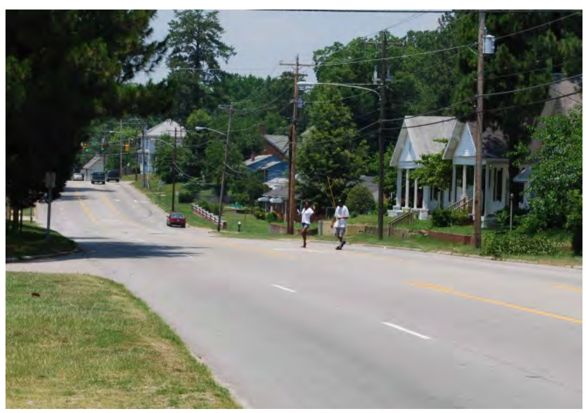
Crash Data:

	101721638	102063302	101040656	100844390	102150597	101174040	101599251	102441828
Ethnicity	White	Hispanic	Black	White	Black	White	Black	
Gender	Male	Female	Male	Female	Female	Male	Male	
Age	70	18	40	28	8	19	38	
Alcohol?	No	No	No	No	No	No	No	
Date	4/25/2006	6/10/2007	11/11/2003	3/5/2003	9/28/2007	4/27/2004	11/2/2005	
Day	Tuesday	Sunday	Tuesday	Wednesday	Friday	Tuesday	Wednesday	
Time	2:00 PM - 5:59 PM	10:00 PM - 1:59 AM	9:02 PM	8:33 AM	6:00 PM - 9:59 PM	1:28 PM	8:57 AM	
Severity	Possible (C)	Disabling (A)	Possible (C)	Evident (B)	Evident (B)	Possible (C)	Property Damage Only	
Weather	Clear	Clear	Clear	Cloudy	Clear	Clear	Clear	
Road Condition	Dry	Dry	Dry	Wet	Dry	Dry	Dry	
Lighting	Daylight	Dark - Lighted Roadway	Dark - Lighted Roadway	Daylight	Dark - Lighted Roadway	Daylight	Daylight	
Ambulance?	Yes	Yes	Yes	Yes	Yes	Yes	No	
Crash Location	Non-Roadway Location	Non-Intersection Location	Non-Intersection Location	Intersection	Intersection	Non-Roadway Location	Intersection	
Crash Type	Backing Vehicle	Unusual Circumstance	Other Roadway Related	Multiple Threat	Pedestrian Failure to Yield	Unusual Circumstance	Pedestrian Dart Out/Dash	
Fault	Motorist	Unknown	Unknown	Motorist	Pedestrian	Unknown	Pedestrian	
Notes								2008 No Data

Site D: Hines and Goldsboro

Observations:

- Crash history indicates several night crashes, some involving alcohol, and lighting may be an issue (would need to do a follow up visit at night)
- Hines (in this area) is 5 lanes (2 in each direction with TWLTL) with many places without sidewalks on either side of the street, high traffic volumes and high speeds (45 MPH), and long distances between signalized intersections; signalized intersections do not have any crossing assistance for pedestrians and lighting appears to be minimal



- There are several convenience stores that may be pedestrian destinations: Thrifty Way Food Shop (has a bus stop in front and is across the street from Whitfield Homes public housing) and Sam's Jiffy Mart
- Appears to be a very low SES area; many blighted houses and abandoned buildings around South and Lodge
- Closer to Nash (going into downtown) the area improves: slower speeds, narrower streets with on-street parking, wide sidewalks, more pedestrian activity

Issues to Discuss:

- Lighting (contact: engineers and public works)
- Working with convenience store operators to promote safety? (contact: owners, chamber of commerce?)
- Improvement of Hines corridor and intersections (contact: engineers and public works)

Crash Data:

	101986286	101288052	101121635	102187649	101927859	101805669	101193192	101786332	100839231	101533921	102245554	101517311
Ethnicity	Black	Black	Black	White	Black	Black	Black	Black	Black	Black		White
Gender	Male	Male	Female	Male	Male	Male	Female	Male	Male	Female		Male
Age	35	60	12	45	61	18	1	14	58	29		75
Alcohol?	No	Yes	No	Yes	No	No	No	No	No	No		No
Date	3/16/2007	9/19/2004	2/18/2004	11/8/2007	1/2/2007	8/11/2006	5/21/2004	7/16/2006	2/26/2003	8/5/2005		7/12/2005
Day	Friday	Sunday	Wednesday	Thursday	Tuesday	Friday	Friday	Sunday	Wednesday	Friday		Tuesday
Time	6:00 PM - 9:59 PM	8:24PM	4:35 PM	2:00 PM - 5:59 PM	10:00 AM - 1:59 PM	6:00 PM - 9:59 PM	1:42 PM	6:00 PM - 9:59 PM	6:29 PM	6:57 PM		9:46 AM
Severity	Evident (B)	Disabling (A)	Possible (C)	No Injury (O)	Possible (C)	Evident (B)	Possible (C)	Possible (C)	Evident (B)	Possible (C)		Evident (B)
Weather	Rain	Cloudy	Clear	Clear	Clear	Clear	Clear	Clear	Cloudy	Clear		Clear
Road Condition	Wet	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Wet	Dry		Dry
Lighting	Dark - Lighted Roadway	Dark - Lighted Roadway	Daylight	Dark - Lighted Roadway	Dark - Roadway Not Lighted	Dark - Lighted Roadway	Daylight	Dark - Lighted Roadway	Dark - Lighted Roadway	Daylight		Daylight
Ambulance?	No	Yes	Yes	Yes	No	Yes	Yes	No	No	No		Yes
Crash Location	Non-Roadway Location	Non-Intersection Location	Non-Intersection Location	Non-Intersection Location	Non-Intersection Location	Non-Intersection Location	Non-Intersection Location	Intersection Related	Intersection	Non-Roadway Location		Non-Roadway Location
Crash Type	Off Roadway	Pedestrian Failure to Yield	Other Roadway Related	Walking Along Roadway	Pedestrian Failure to Yield	Pedestrian Failure to Yield	Pedestrian Failure to Yield	Standing / Walking in Roadway	Pedestrian Dart Out/Dash	Backing Vehicle		Backing Vehicle
Fault	Motorist	Pedestrian	Pedestrian	Pedestrian	Pedestrian	Pedestrian	Motorist	Unknown	Pedestrian	Motorist		Motorist
Notes											2008 No Data	

Site E: Hines and Pender

Observations:

- Crash history indicates a mix of day and night crashes
- The intersection of Hines and Pender is particularly unfriendly toward pedestrians, with wide crossings (Hines is 5 lanes), high speeds (45 MPH on Hines), wide turning radii (i.e., high turning speeds) , no pedestrian signals, sidewalks only on Pender (3-lane road), faded crosswalk markings, etc.
- There are two churches in the area (Mt. Zion Baptist Church at Mt Hebron 7th Day Adventists) and several convenience stores (Midway Convenience Center and Jordan Super Market), a park (at Gay and Pender) and the Daniel's Learning Center that may be pedestrian destinations
- There are many shotgun style houses (mostly in Cemetery st) and a low SES area with few sidewalks and lighting only once per block

Issues to Discuss:

- Intersection improvements and the potential for midblock crossings near convenience stores (contact: engineers/public works)
- Collaborating with local church health ministries to promote pedestrian safety in the area (main messages: drinking and walking and crossing the street) (contact: churches)
- Speed of traffic on Hines, and what an appropriate speed should be (contact: engineers/public works)
- Lighting (contact: engineers/public works)

Crash Data:

	101715764	101503816	101545312	101667365	101299936	101053319	101823649	101591772
Ethnicity	Black	Black	Black	Unknown	Black	Black	Black	Black
Gender	Male	Female	Male	Female	Male	Female	Male	Male
Age	7	45	25	43	53	11	54	17
Alcohol?	No	No	No	Yes	No	No	Yes	No
Date	4/16/2006	6/22/2005	8/20/2005	1/30/2006	10/3/2004	11/25/2003	9/3/2006	10/25/2005
Day	Sunday	Wednesday	Saturday	Monday	Sunday	Tuesday	Sunday	Tuesday
Time	6:00 PM - 9:59 PM	5:50 PM	7:00 PM	6:00 PM - 9:59 PM	8:02 PM	8:00 PM	6:00 PM - 9:59 PM	8:05 AM
Severity	Possible (C)	Possible (C)	Possible (C)	Unknown	Property Damage Only	Evident (B)	Evident (B)	Possible (C)
Weather	Cloudy	Clear	Clear	Clear	Clear	Clear	Clear	Clear
Road Condition	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry
Lighting	Daylight	Daylight	Daylight	Dark - Lighted Roadway	Dark - Lighted Roadway	Dark - Lighted Roadway	Dark - Lighted Roadway	Daylight
Ambulance?	Yes	Yes	No	No	No	Yes	Yes	No
Crash Location	Non-Intersection Location	Intersection	Intersection	Intersection	Intersection	Non-Intersection Location	Non-Intersection Location	Non-Roadway Location
Crash Type	Pedestrian Dart Out/Dash	Pedestrian Failure to Yield	Unusual Circumstance	Turning Vehicle	Pedestrian Failure to Yield	Pedestrian Dart Out/Dash	Standing / Walking in Roadway	Off Roadway
Fault	Pedestrian	Unknown	Motorist	Motorist	Unknown	Pedestrian	Unknown	Unknown
Notes								School bus

Site F: Vick Area

Observations:

- Crash history indicates several crashes involving very young children and many evening/weekend crashes
- Traffic calming area on Reid St. near two crashes – unclear if calming measures in place before or after crashes
- Mostly residential area with houses close to the street, few if any sidewalks, low volume streets, and little pedestrian-level lighting
- There are several churches in the area (Piney Grove, Antioch Outreach Ministries, St. Alphonsus Center, and Contending for the Faith Ministries) and community centers (Opportunities Industrialization Center [OIC] and Reid Street Community Center), a linear trail/pocket park (parallel to Viola) and Vick Elementary School that may be pedestrian destinations (and also community partners)

Issues to Discuss:

- When traffic calming was put into place (contact: planners, engineers/public works
- Lighting (contact: engineers/public works)
- Collaborating with local church health ministries and stakeholders to promote pedestrian safety in the area (main messages: caregiver supervision of child pedestrians) (contact: churches)

Crash Data:

	101338892	102425003	100851240	101781230	100848955	101253914	101167007	102089380	101657065	100865423
Ethnicity	Black		Black	Unknown	Black	Unknown	Black	Black	Black	Black
Gender	Female		Male	Unknown	Male	Unknown	Female	Male	Female	Male
Age	18		41	17	35	1	2	23	46	2
Alcohol?	No		No	No	No	Yes	No	No	Yes	No
Date	11/17/2004		3/15/2003	7/8/2006	3/12/2003	8/8/2004	4/18/2004	7/14/2007	1/15/2006	4/4/2003
Day	Wednesday		Saturday	Saturday	Wednesday	Sunday	Sunday	Saturday	Sunday	Friday
Time	6:09 PM		11:53 PM	10:00 PM - 1:59 AM	12:17 PM	7:54 PM	6:21 PM	2:00 AM - 5:59 AM	6:00 PM - 9:59 PM	5:59 PM
Severity	Evident (B)		Evident (B)	No Injury (O)	Evident (B)	Property Damage Only	Evident (B)	Unknown	Possible (C)	Evident (B)
Weather	Clear		Rain	Clear	Clear	Clear	Clear	Clear	Clear	Clear
Road Condition	Dry		Wet	Dry	Dry	Dry	Dry	Dry	Dry	Dry
Lighting	Dark - Roadway Not Lighted		Dark - Roadway Not Lighted	Dark - Lighted Roadway	Daylight	Daylight	Daylight	Dark - Roadway Not Lighted	Dark - Lighted Roadway	Daylight
Ambulance?	Yes		No	No	No	Yes	Yes	Yes	Yes	Yes
Crash Location	Intersection		Unknown/ Insufficient Information	Intersection Related	Non-Intersection Location	Non-Intersection Location	Non-Intersection Location	Non-Intersection Location	Non-Intersection Location	Intersection
Crash Type	Turning Vehicle		Unknown	Other Unusual Vehicle Type / Vehicle Action	Walking Along Roadway	Pedestrian Failure to Yield	Pedestrian Dart Out/Dash	Walking Along Roadway	Unusual Circumstance	Pedestrian Dart Out/Dash
Fault	Unknown		Unknown	Motorist	Unknown	Pedestrian	Pedestrian	Pedestrian	Motorist	Pedestrian
Notes		2008 No Data								

Site G: Pine and Green

Observations:

- Crash history indicates mostly daylight crashes involving adults; there are several crashes at Pine and Nash involving turning vehicles (motorist failure to yield) at the intersection
- At Pine and Nash, there are worn crosswalks, no signs indicating that drivers must yield to pedestrians, and the pushbuttons for ped signals are rarely activated by pedestrians
- At Nash between Jackson and Park, there are two crashes that occurred at the Pigly Wiggly parking lot

Issues to Discuss:

- Improvements to Pine and Nash intersection (crosswalks and yield signs?)
- Work with local businesses (Pigly Wiggly) to promote pedestrian safety

Crash Data:

	101619898	101276180	102035344	102444946	101787903	101904472	102180436	102132301	101241199	101047768
Ethnicity	Black	Black	Black		Black	White	Unknown	White	White	Black
Gender	Male	Male	Female		Male	Female	Unknown	Male	Female	Male
Age	27	36	35		28	39	61	56	58	14
Alcohol?	No	No	No		No	No	No	No	No	No
Date	11/27/2005	9/5/2004	5/10/2007		7/18/2006	12/4/2006	11/1/2007	9/6/2007	7/23/2004	11/19/2003
Day	Sunday	Sunday	Thursday		Tuesday	Monday	Thursday	Thursday	Friday	Wednesday
Time	6:14 PM	6:42PM	6:00 PM - 9:59 PM		6:00 PM - 9:59 PM	10:00 AM - 1:59 PM	10:00 AM - 1:59 PM	10:00 AM - 1:59 PM	2:11 PM	5:08 PM
Severity	Evident (B)	Property Damage Only	Possible (C)		Disabling (A)	Possible (C)	None (O)	None (O)	Disabling (A)	Property Damage Only
Weather	Clear	Clear	Cloudy		Clear	Clear	Clear	Clear	Cloudy	Rain
Road Condition	Dry	Dry	Dry		Dry	Dry	Dry	Dry	Dry	Wet
Lighting	Dark - Lighted Roadway	Daylight	Daylight		Daylight	Daylight	Daylight	Daylight	Daylight	Dark - Roadway Not Lighted
Ambulance?	No	No	Yes		Yes	Yes	Yes	No	Yes	No
Crash Location	Intersection	Unknown	Non-Roadway Location		Intersection	Intersection	Intersection	Intersection	Intersection	Intersection
Crash Type	Other Roadway Related	Unknown	Off Roadway		Unusual Circumstance	Turning Vehicle	Turning Vehicle	Pedestrian Failure to Yield	Turning Vehicle	Pedestrian Dart Out/Dash
Fault	Unknown	Unknown	Motorist		Unknown	Motorist	Unknown	Pedestrian	Motorist	Pedestrian
Notes				2008 No Data						

Other Corridors

- Main arterials into town are Nash, Tilman, Forest Hills, Downing, Harry, Corbin – visited most of these
- Raleigh Street: 5 lane, lots of large trees that could affect visibility, no sidewalks, 45 MPH
- Downing St: 5 lane, no sidewalks, lots of housing nearby, 45 MPH; later narrows to 2 lane and 25 MPH in school zone then back to 3 lanes with sidewalk and 35 MPH
- Forest Hills: 5 lane, no sidewalks or ped signals, long distances between intersections, 45 MPH, newer development area – could be a rising concern
- Tarboro: 5 lane, has a big speed issue, 45 MPH, patchy sidewalks, lots of foot traffic and some newer development
- Goldsboro: less of a speed problem, 3 wide lanes, some sidewalks, few signals, no pedestrian facilities at intersections, 35 MPH
- 301 Corridor (sometimes Ward St): 2 lanes in each direction (and 2 turn lanes at intersections) with divided (grassy ditch) median; 45 MPH; narrow gravel shoulder; lots of truck traffic; no crosswalks, pedestrian signals, or sidewalks observed; auto-dominated development pattern (strip malls and bog box stores) near the street
- Saw several potential partnership opportunities: United Way, Rotary Club, American Legion, BB&T

Site Visit Report
City of Raleigh
5/16/12 and 6/12/12

Introduction

Based on pedestrian crash data analysis and input from City of Raleigh Planning agency and police staff, several high-crash locations in Raleigh were identified for more detailed investigation. The aim of the investigation was to determine the feasibility of the sites for enforcement activities as well as data collection for the campaign evaluation. Site feasibility was based on several criteria recommended by former law officer Peter Flucke:

- Lower speed roads (25-35 mph)
- Marked crosswalks at uncontrolled intersections or midblock locations
- High pedestrian and traffic volumes
- No more than 1-2 traffic lanes in each direction

Sites were visited during clear weather conditions on Wednesday, May 16, 2012 and during rain/cloudy conditions on Tuesday, June 12, 2012 between the hours of 11AM and 2PM, hours of lunch-time peak pedestrian and vehicle traffic. Sites were visited by a multi-disciplinary team, including HSRC and City of Raleigh Staff.

Following is a summary of the site characteristics and recommendations for sites to be targeted for enforcement and evaluation activities.

Site 1: Wilmington between Hargett and Martin

Summary Table:

Location:	Wilmington between Hargett and Martin
Police District:	TBD
Type:	Midblock
Speed Limit:	Not posted—assume 35 MPH
Number of Lanes:	2 lanes one direction
Number of Legs:	n/a
Crosswalk Type:	High visibility
Pedestrian Generators:	Right in downtown, near businesses, park and bus depot
Transit Presence:	Yes; heavy bus traffic every 15 min
On-Street Parking:	Yes, on both sides of street
Median Type:	None
Signage:	Pedestrian signs
Visibility concerns:	Possibly, due to on street parking
Best Time to Visit:	Anytime; high ped/vehicle volumes all day
Recommendation:	Good for enforcement and data collection
Notes:	Lots of poor pedestrian behaviors as well—walking outside of the x-walk

Images:

Site 2: Blount Street between Martin and Hargett

Summary Table:

Location:	Blount Street between Martin and Hargett
Police District:	TBD
Type:	Midblock
Speed Limit:	Not posted; assume 35 MPH
Number of Lanes:	3 lanes, one direction
Number of Legs:	n/a
Crosswalk Type:	High visibility
Pedestrian Generators:	Right in downtown, near businesses, park and bus depot
Transit Presence:	Yes, near bus depot
On-Street Parking:	On one side of the street
Median Type:	None
Signage:	Pedestrian signs
Visibility concerns:	None
Best Time to Visit:	All day; very similar to site #1
Recommendation:	Good for enforcement and data collection
Notes:	The street is being resurfaced; should be done by June; similar pedestrian issues—many crossings away from crosswalk

Images:

Site 3: Wilmington @ New Bern (by Capitol)

Summary Table:

Location:	Wilmington @ New Bern (by Capitol)
Police District:	TBD
Type:	Midblock
Speed Limit:	Not posted; assume 35 MPH
Number of Lanes:	2-3 one way (one is a bus-only lane)
Number of Legs:	n/a
Crosswalk Type:	High visibility
Pedestrian Generators:	Local businesses, Capitol building
Transit Presence:	Yes, on a major transit corridor
On-Street Parking:	Yes, further down the street from the x-walk
Median Type:	None
Signage:	Advance pedestrian sign
Visibility concerns:	None
Best Time to Visit:	Good for lunch time peak
Recommendation:	Good for enforcement and data collection
Notes:	Observed many drivers and pedestrians on cell phones

Images:

Site 4: South near Fayetteville (between Wilmington and Salsbury)

Summary Table:

Location:	South near Fayetteville (between Wilmington and Salsbury)
Police District:	TBD
Type:	Midblock
Speed Limit:	25 MPH
Number of Lanes:	One lane each direction plus turn lane on one side
Number of Legs:	n/a
Crosswalk Type:	High visibility
Pedestrian Generators:	By Progress Energy Center and Shaw University
Transit Presence:	Bus stop at site
On-Street Parking:	Yes
Median Type:	No raised median
Signage:	No pedestrian yield signs
Visibility concerns:	None
Best Time to Visit:	Seems low volume; may try to visit during peak PM hours
Recommendation:	OK for data collection; maybe slow for enforcement unless there’s an event
Notes:	

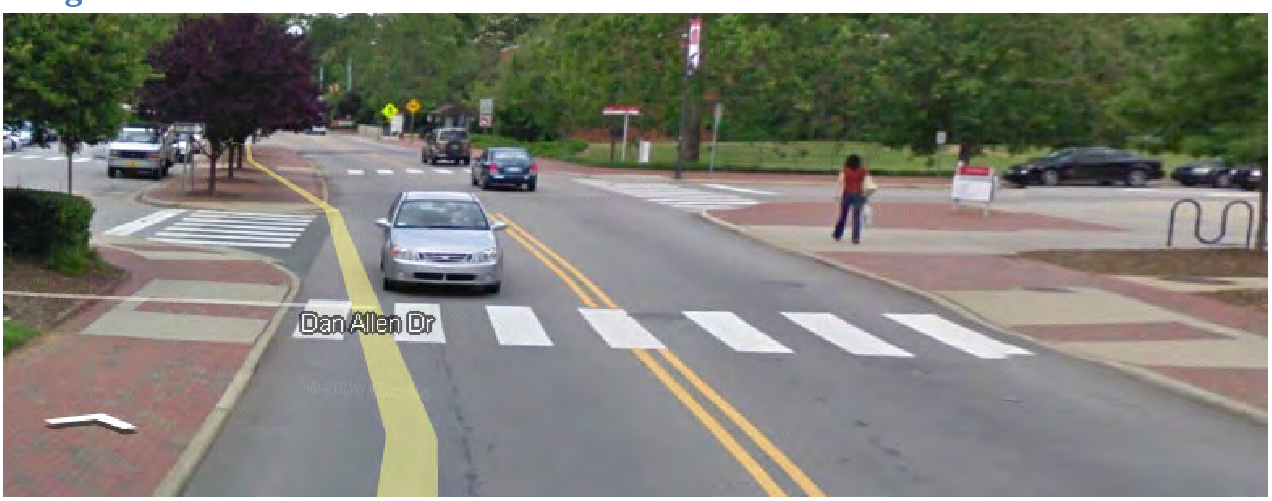
Images:

Site 5: Dan Allen (several midblock and unsignalized x-ings)

Summary Table:

Location:	Dan Allen Dr on NCSU campus
Police District:	TBD; assume NCSU
Type:	Midblock and unsignalized intersections
Speed Limit:	20 MPH
Number of Lanes:	1 in each direction; sometimes painted median
Number of Legs:	n/a or 3,4—depending on crossing
Crosswalk Type:	High vis (some continental)
Pedestrian Generators:	NCSU campus; staff parking lots/decks
Transit Presence:	Likely
On-Street Parking:	No
Median Type:	Sometimes painted median
Signage:	Advance pedestrian signs
Visibility concerns:	None
Best Time to Visit:	Lots of ped activity; OK all day
Recommendation:	OK for enforcement and data collection; would need to select one site
Notes:	There are two raised crosswalks that significantly slow speeds; would want to select sites further away from these so traffic is operating at free-flow speeds

Images:



Site 6: Martin @ Swain, State, or Bloodworth

Summary Table:

Location:	Martin Street at Swain, State, or Bloodworth (East Raleigh)
Police District:	TBD
Type:	Unsignalized intersection
Speed Limit:	25 MPH
Number of Lanes:	1 in each direction
Number of Legs:	4 legs
Crosswalk Type:	Continental (Bloodworth) and High Visibility (Swain and State)
Pedestrian Generators:	Homes and parks nearby; middle school and parking lot (by Bloodworth), school (by Swain), and church (by State)
Transit Presence:	None observed
On-Street Parking:	Yes, both sides of streets
Median Type:	None; painted centerline
Signage:	Pedestrian signs present at all
Visibility concerns:	None
Best Time to Visit:	Not sure; there was little pedestrian/car traffic at midday so could try peak AM/PM
Recommendation:	OK for enforcement and data collection
Notes:	Need to work with city staff to select best location

Images:

Martin @ Bloodworth:

Martin @ State:

Martin@Swain:

Sites Ruled Out

The team visited all of the major crash hot spots identified by the crash density analysis. Most of the crashes in the downtown area occurred at signalized intersections that were not ideal for basic law enforcement, so only midblock locations in the downtown region were selected.

Along the Hillsboro Street crash corridor, there was a potential site at the midblock crosswalk near the Bell Tower (near Maiden). While yielding rates were poor, the team determined that the conditions were not ideal for enforcement at this site, due to the close proximity to the roundabout (which is due for reconstruction), slow speeds (15 MPH advisory sign) and possible visibility issues caused by truck loading zones and on-street parking.

The team also visited the high-crash corridor along Wilmington/Saunders and determined that it was inappropriate for enforcement or data collection operations due to dangerous conditions for pedestrians, in which engineering improvements are needed prior to any enforcement. The road was up to seven lanes, was high speed (45MPH) and high volume and did not have any pedestrian crossings that were at midblock or unsignalized locations. Similar conditions were found along the Falls of Neuse/Spring Forest Corridor and so this crash hotspot was ruled out as well.

Alternative Locations

In addition to the sites visited, Raleigh agency staff identified the Hillsborough St crossing at the YMCA as one other alternative site. Currently the site is in the process of removing a signal so is not appropriate for data collection at this time but could be considered as a site for enforcement at a later date.

Summary & Recommendations

Based on the field visits performed to date, the following sites are recommended for priority enforcement:

1. Wilmington between Hargett and Martin
2. Blount Street between Martin and Hargett
3. Wilmington @ New Bern (by Capitol)
4. South near Fayetteville (between Wilmington and Salsbury)
5. Dan Allen (unsignalized x-ings)
6. Martin @ State

Additional enforcement locations may include:

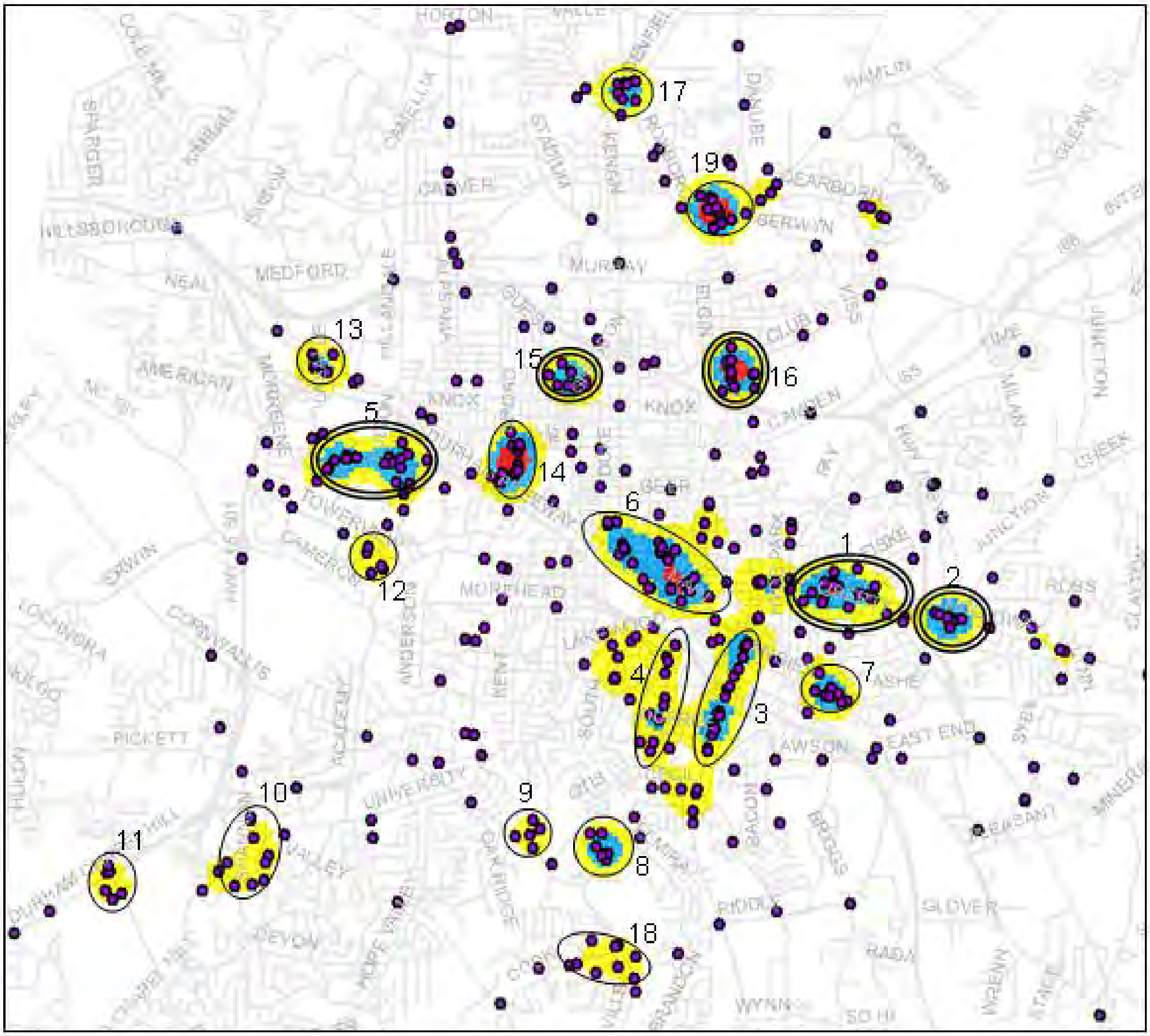
1. Martin @ Swain
2. Martin @ Bloodworth
3. Hillsborough @ YMCA

The following sites are recommended for data collection to support the evaluation efforts:

Site	Crossing Type	Summary Characteristics	Special Notes	Best Time to Visit
Wilmington between Hargett and Martin	Midblock; high vis	One way; 35 mph; 2 lane with parking	Downtown	AM peak
Blount Street between Martin and Hargett	Midblock; high vis	One way; 35 mph; 3 lane with parking	Downtown	PM peak
Wilmington @ New Bern (by Capitol)	Midblock; high vis	One way; 35 mph; 2 lane	Downtown	Midday
South near Fayetteville (between Wilmington and Salsbury)	Midblock; high vis	25 mph; one lane e/d	Near Shaw	PM peak
Dan Allen (unsignalized x-ings)	Unsignalized intersection; TBD	20 mph; one lane e/d	NCSU site	Midday
Martin @ State	Unsignalized intersection; high vis	25 mph; one lane e/d and on street parking	East Raleigh site	AM peak

Durham Site Visit Notes

August 2, 2010



1 – Holloway St. (from N. Alston Ave. to N. Hardee St.)

2 – Holloway St. (from US-70 to Junction Rd.)

5 – Erwin Rd. (from Lasalle St. to Trent Dr.)

15 – Guess Rd. (at W. Club Blvd.)

16 – N. Roxboro St. (from Avondale Dr. to E. Ellerbee St.)

Site 1: Holloway St (from N. Alston to N. Hardee)

Observations:

- Intersection of Alston and Holloway
  - Has faded crosswalks and no pedestrian heads
  - Lots of but a lot of pedestrian and bicycle activity was observed on Holloway
  - Near a school and Boys and Girls Club – park nearby
  - There is a high amount of large truck traffic
  - The intersection has relatively tight curb radii and had curb ramps
  - There are many driveways very close to the intersection
  - Alston is planned to be widened within a couple of years
  - Speed of motor vehicles did not appear to be an issue
  - Reasonable lighting, although we were viewing in daylight
- Intersection of Guthrie and Holloway
  - Has an odd alignment with several closely spaced intersections in the vicinity
  - There's a Big Apples Food Mart that appears to be a big draw for pedestrians, as well as the Antioch Baptist church, which appeared to be a congregating spot – possible partners for intervention
  - East of the intersection the sidewalk ends (for a short distance) and there are goat trails, although there are sidewalks on other corners
  - There are crosswalks on only two sides of the intersection (faded) and no pedestrian heads; there are sidewalks on all legs leading to the intersection
- Intersection of Miami and Holloway
  - Very busy area with several intersections that includes with a wide and skewed 5-legged intersection; intersection does not have pedestrian crosswalks or signal heads, but has wide curb radii and fast-moving traffic
  - Several bus routes pass through this area but don't all pick up and drop off on opposite sides of the street, forcing crossings
  - Holloway east of Miami to be widened to a 5-lane section (currently 4 lanes) – NCDOT controls both of these streets
  - No sidewalks on one side of street on Holloway (near Raynor)
  - Many pedestrians crossed mid-block (near Kerr Drug, Biscuitville, Gas Station, Latino Market, Pat's Pawn shop, and McDonalds and bus stop) to avoid tricky intersections
  - Many commercial buildings with a lot of driveways along the corridor
  - Foot traffic noticed in parking lots (above mentioned destinations and strip mall behind McDonalds)
- Holloway has two lanes in each direction and turn lanes added at intersections; it has sidewalks on both sides of the road and many large trees – may be a sight distance issue; speed limits are set at 35 mph and don't appear to be an issue
- Between Alston and Guthrie on Holloway there is a park, a school, and a day care – possibly a source for the ped crashes in the area, or potential partners for intervention
- Intersection of Park and Holloway
  - There's a large bush planted right on the corner that could be an obstacle blocking sight lines at the intersection
- There are several bus stops along this corridor
- This corridor has a lot of driveways, particularly around the busier intersections

- Overall, we observed many pedestrians walking in the middle of the road on adjacent neighborhood streets (younger pedestrians in groups), even when sidewalks were present on one or both sides of the street

Figure 1: Discontinuous and blocked sidewalks with goat trail along Holloway Street

Figure 2: Midblock pedestrian crossing, missing sidewalks, and driveways along Holloway Street

Figure 3: ***Wide and skewed, 5-legged intersection*** **of Miami Boulevard and Holloway Street**

Crash Data:

Holloway (from Alston to Guthrie)

- Almost ½ of crashes here occur on Friday and Saturday
- Almost all crashes affect African-American pedestrians
- 4 of 17 crashes involve suspected alcohol/drug use among the pedestrian and/or driver
- A number of crashes were "dart/dash," standing in roadway, or walking with traffic from behind – all pedestrian behavior related crash types
- The majority of crashes occurred during the day
- Almost half of the crashes involved pedestrians less than 20 years old

Holloway (from Guthrie to Hardee)

- Crashes occur on all days of the week
- Several non-roadway and non-intersection crashes
- Mostly adult, Black males
- More crashes occurring at night

Issues to Discuss:

- Midblock crossings and walking in road appear to be an issue, though the crossings may be related to the difficult intersection configurations near Miami
- Lighting and visibility is key due to the number of trees and pedestrians along the corridor
- Working with transit agencies for safety around the stops
- Combining driveways may help
- Working with the area churches to encourage safer pedestrian behaviors
- Improving pedestrian facilities (signal heads and crosswalks) at intersections

Site 2: Holloway St. (from US-70 to Junction Rd.)

Observations:

- NCDOT recently completed a project here (within the last 6 months), during which time new facilities (including pedestrian cross walks, sidewalks, signal heads with push buttons, and an island) were added; it was a work zone for a long time that received complaints of how difficult it was to walk through
- A narrow median was added – in place on one side of Hoover but typical 5 lane cross section on other side
- Higher speeds are evident in this section and the road gets congested at peak times
- Wide crossings (5 lane section)
- There is no sidewalk near the US 70 interchange
- There is a midblock bus stop (both sides) at the grocery store (Food Lion) block
- Strong police presence observed, parking near Kangaroo gas station
- Of the three pedestrians observed, none pressed the push button to get a pedestrian signal

Figure 4: Wide crossing that includes new pedestrian signals and crosswalks

Crash Data:

- In August 2010 (right after site visit), there was a pedestrian fatality at Holloway and Junction
- Past crash data indicates Friday/Saturday night crash trend, both during day and evening hours

- Crashes mostly affect adults (male and female) of Black and Hispanic ethnicities
- Some of the crashes could have been construction-related, with pedestrians forced to walk in the street around the construction

Issues to Discuss:

- This location is more difficult to assess due to the recent changes
- The midblock bus stop location may need to be moved to the intersection to encourage safe crossings, and educational efforts are needed to encourage pushbutton use
- Follow up with police regarding speed patterns in this corridor – this may be a good candidate for enforcement

Site 5: Erwin Rd. (from Lasalle St. to Trent Dr.)

Observations:

- At the Duke Medical Center, VA Hospital, Duke University; many housing and retail/dining options
- 5-lane section (with fairly high speeds), no sidewalk buffer
- Large intersection spacing (i.e., distance between adjacent intersections)
- Many pedestrians cross midblock and wait on centerline until clear; appear to be headed toward other hospital buildings, parking lots, and local retail/dining
- Fulton at Erwin intersection
    - Large parking deck on opposite corner from hospital
    - There is a pedestrian underpass nearby
    - Busy bus stop with 3 transit agency routes (Duke, Triangle Transit, DATA)
    - Has pedestrian signals (often ignored) and high visibility crosswalks and a "No Turn on Red" sign
- Lots of traffic (both vehicular and pedestrian) – many pedestrians walk in parking lots
- Lasalle at Erwin intersection
    - Many students crossing here
    - There is a steep hill on the north approach that affects the visibility
    - 2 bus stops in the vicinity
    - Has pedestrian countdown signals and push buttons but push buttons only activate the side of the street where pushed; many pedestrians were observed using the pushbuttons, although some didn't wait for signal
    - There is a long cycle length causing some impatience
    - Erwin has exclusive right-turn lanes causing fast turns, but three is a sign for "turning vehicles yield to pedestrians"
    - Lots of turning traffic (and truck traffic), including right turn on red
    - 6-lane crossing distance
    - Protected-permissive signal phasing

Figure 5: Busy pedestrian crossing at Fulton Street

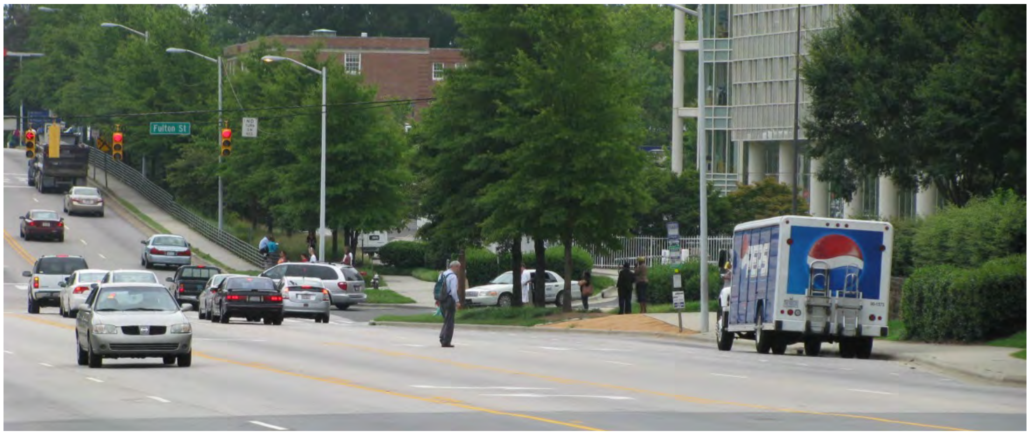


Figure 6: Pedestrian crossing midblock

Figure 7: Pedestrians crossing at Lasalle Street

Crash Data:

Erwin (Lasalle to Douglas/Research)

- Many student age (24-30), male, of all ethnicities (White, Asian, Black, Hispanic)
- Mostly day time crashes, and almost all during the week days (Mon-Fri)
- Most crashes are intersection related (turning vehicles and dart out crashes are most common crash types)

Erwin (Douglas/Research to Trent)

- All adult crashes (24 to 73 years); mix of males and females; mostly white, some black/Hispanic/other
- Intersection has lots of disabling crashes and one fatality
- Mostly day time crashes; many different crash types

Issues to Discuss:

- Permissive signal phasing at Lasalle may cause driver yielding issues
- Midblock pedestrian crossings are a big issue here - Long cycle lengths or other perceived dangers at intersections may lead to midblock crossings
- Possible removal of RTOR at Lasalle?
- More safe crossing locations should be provided
- Midblock crossings should be discouraged; could work with hospital to encourage better behavior (Theresa Cromley or Parking Management staff)

Site 15: Guess Rd. (at W. Club Blvd.)

Observations:

- Sidewalks are in good condition and most are buffered
- Mall entrances have large crossing distances and turning radii, no crosswalks, and poor site distance that may cause drivers to pull out quickly
- Fewer pedestrians observed than at other sites
- There is a very busy midblock bus stop across from the mall
- Free-flow right-turn lane into mall near the bus stop
- E-W crossing on north side has pedestrian recall phasing
- There is a lot of WB right-turning traffic, with a lot of right turns on red
- Wide crossing and turning radius, and many driveways close to the intersection
- There are pedestrian countdown signals and pushbuttons; there are faded crosswalks on 3 legs of the intersection of Guess and Club
- There is no south side crosswalk and the stop bar is close to the intersection
- Traffic speed limits are 35 mph, but vehicles may be traveling faster

Figure 8: The intersection at Guess Road shot from a mall entrance

Crash Data:

- Commercial bus related fatality occurred here
- Several crash types involved driveways or turning vehicles
- A mix of daylight and dark crashes, mostly involving adults (both male and female), mostly Black
- Crashes occurred on all days of the week

Issues to Discuss:

- Midblock crossing from mall to bus stop may be a problem
- Mall entrances encourage high speeds and no yielding due to design and sight distance issues
- Vehicle speeds may be considered
- Restricting right turns on red may be an option
- Access management and driveway design at this site (and most others) appears to be an issue

Site 16: N. Roxboro St. (from Avondale Dr. to E. Ellerbee St.)

Observations:

- Busy commercial area (fast food, checks cashed, auto parts store)
- Many commercial driveways
- Many pedestrians crossed midblock
- There appeared to be a lot of heavy vehicle/truck traffic
- Sidewalks are discontinuous, blocked, and in disrepair in vicinity
- Speeds may be an issue (limit is 35 mph); there is 5-lane cross section
- There are several bus stops in the vicinity
- Club and Roxboro intersection
    - Protected/permissive phasing
    - No crosswalk on the east side, with the stop bar too close to the intersection
    - No sidewalk on east side/minor road
    - Ped heads and push buttons put in within the last year; newer crosswalks on Roxboro and just added one ramp and working on another
- At Avondale and Roxboro the ped signal (pushbutton activated) went immediately to “Don’t Start” and stops all traffic (not a countdown signal)

Figure 9: Pedestrian crossing midblock

Figure 10: New curb ramps to be added, but crosswalk is missing

Crash Data:

- Mostly adult crashes (more male); mix of black, white, and Hispanic
- Several backing vehicle and parking lot related crashes (with one fatality)
- Most crashes are in the day, occurring on all days of the week

Issues to Discuss:

- Driveways may need to be consolidated
- Sidewalks need some improvements
- Midblock crossings need to be discouraged
- Check ped signals to be sure they are operating correctly

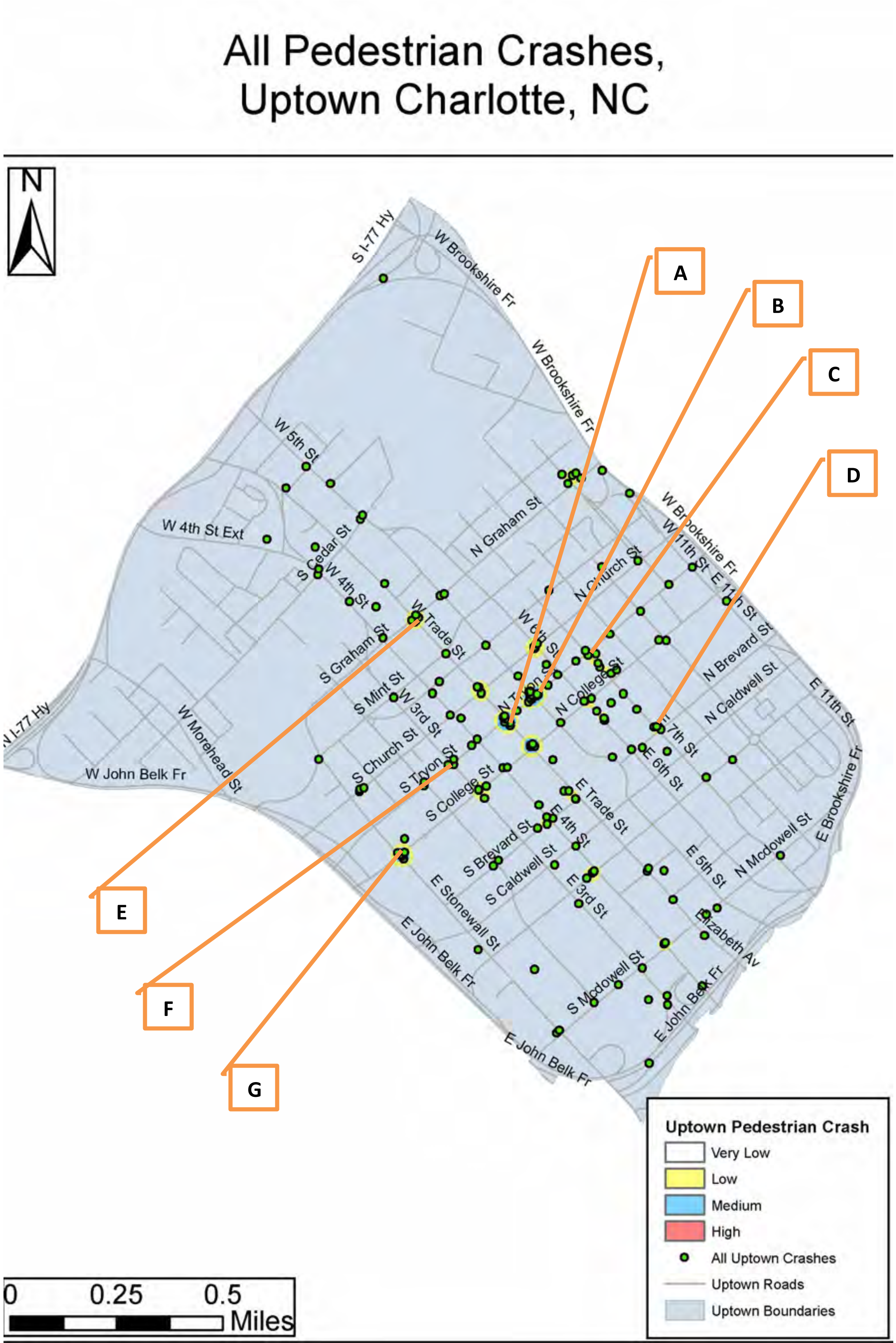
2011

Highway Safety Research Center –
University of North Carolina

Michael Rodgers
Max Bushell

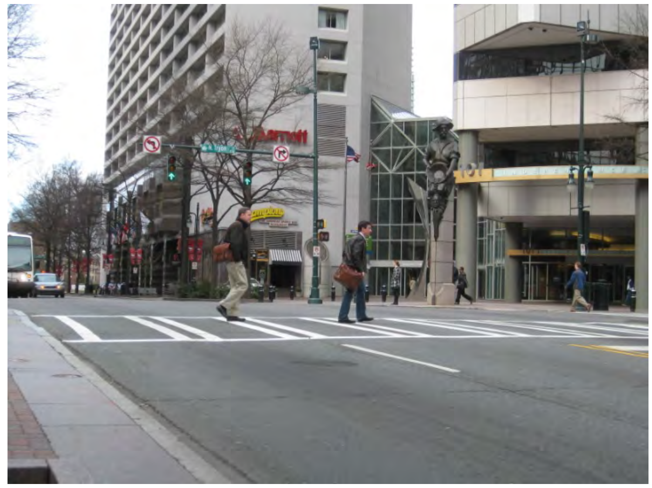
NCFOCUS – CHARLOTTE, NC – UPTOWN SITE VISIT REPORT

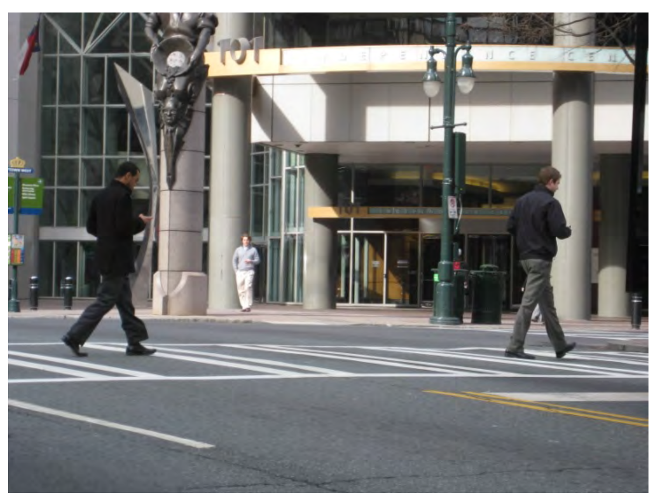
Notes, photographs, and crash data (2004-2008) from a February 2, 2011 site visit.


All Pedestrian Crashes,
Uptown Charlotte, NC
N
A
B
C
D
E
F
G
S I-77 Hy
W Brookshire Fr
W 5th St
W 4th St Ext
S Cedar St
W 4th St
N Graham St
N Church St
W Trade St
S Graham St
W 6th St
N College St
W 11th St
E 11th St
N Brevard St
N Caldwell St
S Mint St
W 3rd St
N I-77 Hy
W Morehead St
W John Belk Fr
S Church St
S Tryon St
S College St
E 7th St
E 6th St
E Trade St
E 4th St
S Brevard St
S Caldwell St
E 3rd St
E 5th St
N Mcdowell St
E Brookshire Fr
E Stonewall St
E John Belk Fr
S Mcdowell St
Elizabeth Av
Uptown Pedestrian Crash
Very Low
Low
Medium
High
All Uptown Crashes
Uptown Roads
Uptown Boundaries
0
0.25
0.5
Miles

Site A: Tryon St. at Trade St.

- There is a permanent no-turning policy on both streets, allowing only through traffic. This appears to be successful in preventing potential conflicts.
- The Uptown area does not use the ladder crosswalk. The current crosswalks don't appear to be as visible.
- Well-designed way-finding signage throughout the area.
- On Tryon (crossing Trade), the signal is a 30 second countdown timer. On Trade (crossing Tryon), the signal is a 38 second countdown timer.
- The speed limit is 25mph. No speed study was conducted, but anecdotally, there is an increase in speed late in the signal timing. The yellow period of the light seemed short.
- There is little differentiation (height, color, etc.) between the street and sidewalk. This is a possible contributor to people waiting in the street or entering early, which were noted frequently.
- There was a high volume of pedestrians hurrying to cross Trade St. against the signal. This same problem did not seem to occur crossing Tryon.
- Significant numbers of distracted pedestrians: crossing while looking at phones, etc.
- During midday, there was a significant bicycle police presence.
- Anecdotal: Talking to nearby bicycle-mounted police officers, they indicated that traffic enforcement was a low priority in the area. Citing nearby restaurant and bars as drivers, they mentioned late-night hours as particularly vulnerable and cab drivers as the most frequent offenders.





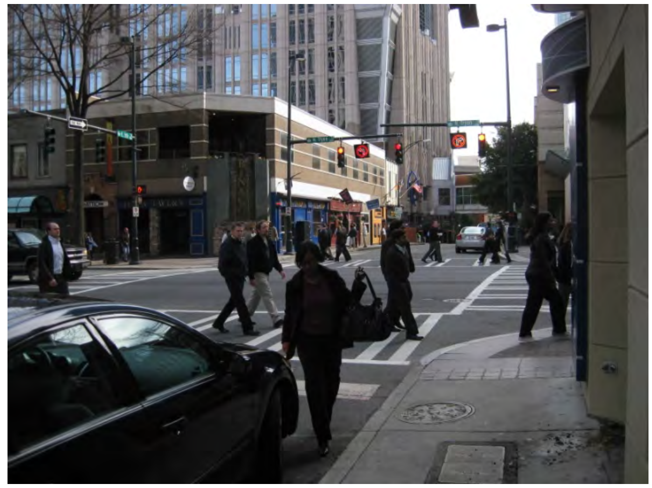
Site A – Crash Data

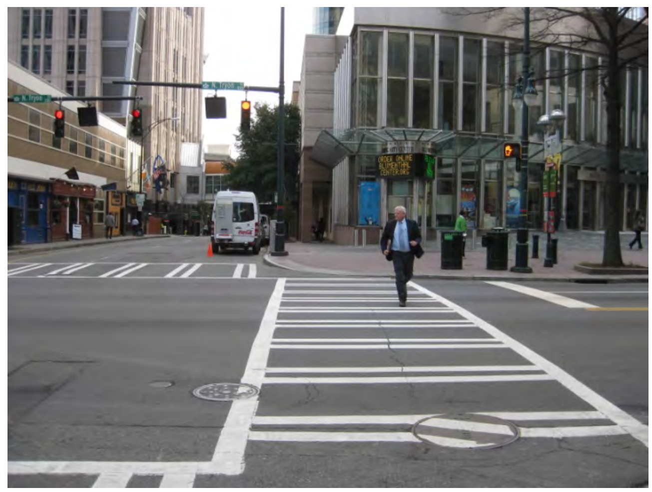
CRSH_ID	101188674	101378529	101399990	101753205	102031051
PedAge_gp	H. 40 - 49	E. 20 - 24	F. 25 - 29	H. 40 - 49	F. 25 - 29
PedAge	47	24	27	49	25
PedSex	Female	Female	Female	Male	Female
PedRace	Black	Black	Black	Black	White
PedAlc	No	No	No	No	No
PedInj	B: Evident Injury	B: Evident Injury	B: Evident Injury	C: Possible Injury	B: Evident Injury
VehType	Passenger Car	Passenger Car	Sport Utility	Passenger Car	Passenger Car
EstSpeed	41-45 mph	11-15 mph	0-5 mph	0-5 mph	21-25 mph
SpeedLMT	30 - 35 MPH	Unknown	5 - 15 MPH	30 - 35 MPH	20 - 25 MPH
Crash_Loc	Non-Intersection	Non-Roadway	Non-Roadway	Non-Intersection	Non-Intersection
Ped_Pos	Not Coded	Not Coded	Not Coded	Not Coded	Travel Lane
CrashTyp	Walking in Roadway	Dispute-Related	Off Roadway - Other / Unknown	Backing Vehicle - Roadway	Commercial Bus-Related
AccDate	5/16/2004	1/3/2005	2/1/2005	6/2/2006	6/4/2007
fault	Unknown	Pedestrian at Fault	Unknown	Motorist at Fault	Pedestrian at Fault
light	Dark - Lighted Roadway	Dusk	Other	Daylight	Daylight
weather	Cloudy	Clear	Cloudy	Cloudy	Clear
hour	21	19	22	17	16
month	May	January	February	June	June
Wkday	Sunday	Monday	Tuesday	Friday	Monday

CRSH_ID	102044996	102254571	102400592	102450453	102455114
PedAge_gp	H. 40 - 49	H. 40 - 49	G. 30 - 39	H. 40 - 49	J. 60 - 69
PedAge	45	45	36	45	60
PedSex	Male	Female	Male	Female	Male
PedRace	White	Black	White	White	Black
PedAlc	No	No	Yes	No	No
PedInj	B: Evident Injury	C: Possible Injury	C: Possible Injury	C: Possible Injury	B: Evident Injury
VehType	Passenger Car	Single Unit Truck (2-Axle, 6-Tire)	Sport Utility	Passenger Car	Passenger Car
EstSpeed	11-15 mph	0-5 mph	21-25 mph	0-5 mph	31-35 mph
SpeedLMT	20 - 25 MPH	5 - 15 MPH	20 - 25 MPH	5 - 15 MPH	40 - 45 MPH
Crash_Loc	Intersection	Non-Roadway	Intersection	Non-Roadway	Non-Intersection
Ped_Pos	Crosswalk Area	Non-Roadway - Parking Lot / Other	Crosswalk Area	Non-Roadway - Parking Lot / Other	Travel Lane
CrashTyp	Motorist Left Turn - Parallel Paths	Off Roadway - Parking Lot	Pedestrian Failed to Yield	Off Roadway - Parking Lot	Dart-Out
AccDate	8/21/2007	3/26/2008	9/14/2008	11/13/2008	11/25/2008
fault	Motorist at Fault	Fault not Coded	Fault not Coded	Fault not Coded	Fault not Coded
light	Daylight	Daylight	Dark - Lighted Roadway	Daylight	Dark - Lighted Roadway
weather	Cloudy	Clear	Clear	Cloudy	Clear
hour	18	11	21	9	19
month	August	March	September	November	November
Wkday	Tuesday	Wednesday	Sunday	Thursday	Tuesday

Site B: Tryon St. at 5th St.

- There are variable no-turn lights that can be activated depending on the time of day. This could be related to turning accidents (check timing of crashes vs. turning times).
- Turning right from 5th onto Tryon, there is a significant visibility impairment (photo).
- On Tryon (crossing 5th), the signal is a 34 second countdown timer. Same timing on 5th (crossing Tryon).
- Adjacent to Performing Arts Center (major activity center).
- Significant volumes of pedestrians crossing against the signal. Most frequently on Tryon.
- Drivers respect crosswalk space at lights, stopping well short of the paint.
- Curb radii are larger than at Tryon/Trade.
- Midblock crashes align with large office building with significant setback and a curb cut for taxi stands.
- Bus stops are after the signal. Bus gives audible warning announcement: "Please do not cross in front of the bus."





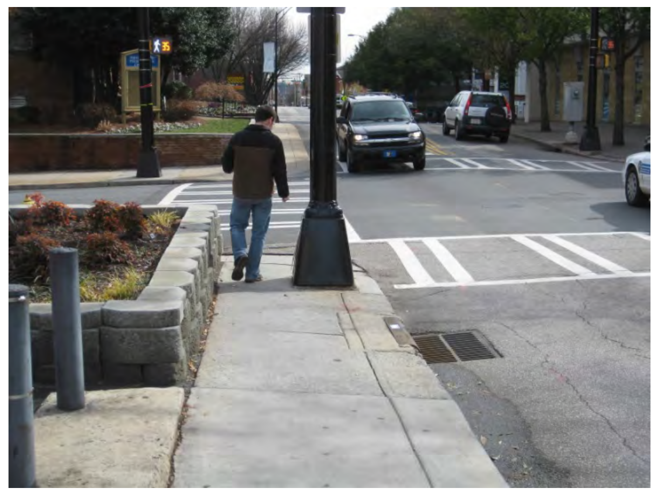
Site B – Crash Data

CRSH_ID	101213341	101254549	101378185	101651803	101751988
PedAge_gp	G. 30 - 39	E. 20 - 24	H. 40 - 49	G. 30 - 39	E. 20 - 24
PedAge	36	22	43	31	20
PedSex	Male	Female	Male	Male	Male
PedRace	White	White	Black	White	White
PedAlc	No	Yes	Yes	Yes	Yes
PedInj	C: Possible Injury	C: Possible Injury	C: Possible Injury	B: Evident Injury	B: Evident Injury
VehType	Unknown	Unknown	Sport Utility	Passenger Car	Unknown
EstSpeed	0-5 mph	Unknown	0-5 mph	11-15 mph	6-10 mph
SpeedLMT	30 - 35 MPH	20 - 25 MPH	20 - 25 MPH	20 - 25 MPH	30 - 35 MPH
Crash_Loc	Non-Intersection	Intersection	Non-Intersection	Intersection-Related	Non-Intersection
Ped_Pos	Not Coded	Not Coded	Not Coded	Not Coded	Not Coded
CrashTyp	Backing Vehicle - Roadway	Motorist Failed to Yield	Dispute-Related	Dash	Dispute-Related
AccDate	6/16/2004	8/9/2004	1/3/2005	1/7/2006	5/26/2006
fault	Motorist at Fault	Motorist at Fault	Unknown	Pedestrian at Fault	Motorist at Fault
hit_run	Yes	Yes	No	No	Yes
light	Daylight	Dark - Lighted Roadway	Dark - Lighted Roadway	Dark - Lighted Roadway	Dark - Lighted Roadway
weather	Clear	Clear	Clear	Clear	Clear
hour	12	3	20	0	1
month	June	August	January	January	May
Wkday	Wednesday	Monday	Monday	Saturday	Friday

CRSH_ID	102139362	102141778	102222096	102312346
PedAge_gp	H. 40 - 49	J. 60 - 69	E. 20 - 24	I. 50 - 59
PedAge	47	62	21	51
PedSex	Male	Male	Male	Male
PedRace	White	White	White	Black
PedAlc	Yes	No	No	No
PedInj	B: Evident Injury	C: Possible Injury	O: No Injury	C: Possible Injury
VehType	Pickup	Passenger Car	Passenger Car	Passenger Car
EstSpeed	16-20 mph	0-5 mph	21-25 mph	0-5 mph
SpeedLMT	20 - 25 MPH	20 - 25 MPH	20 - 25 MPH	30 - 35 MPH
Crash_Loc	Intersection-Related	Intersection	Intersection-Related	Non-Intersection
Ped_Pos	Travel Lane	Crosswalk Area	Travel Lane	Travel Lane
CrashTyp	Dash	Motorist Left Turn - Parallel Paths	Pedestrian Failed to Yield	Backing Vehicle - Roadway
AccDate	12/23/2007	12/28/2007	3/16/2008	6/7/2008
fault	Pedestrian at Fault	Motorist at Fault	Fault not Coded	Fault not Coded
hit_run	No	No	No	No
light	Dark - Lighted Roadway	Dark - Lighted Roadway	Dark - Lighted Roadway	Daylight
weather	Rain	Rain	Rain	Clear
hour	1	20	0	17
month	December	December	March	June
Wkday	Sunday	Friday	Sunday	Saturday

<u>Site C: Tryon St. at 7th St.</u>

- On 7th (crossing Tryon), signal timing is a 34 second countdown timer. On Tryon, it is 35 seconds.
- Bus stops are before the signal.
- Left turn from Tryon onto 7th is forced and drivers seem pressured to turn.
- Pedestrians crossing frequently against signal.
- Despite same speed limit, speed appears to be higher than in the center.
- On 7th, sidewalks are much narrower (4-5 ft.) and are frequently blocked by lights, poles, etc.
- There are a number of parking lot exits in the vicinity, especially on 7th St.
- Crosswalks on 7th are older, different style, and faded.



Site C – Crash Data

CRSH_ID	101330830	101688470	101698204	102022674	102130850
PedAge_gp	D. 16 - 19	E. 20 - 24	I. 50 - 59	H. 40 - 49	G. 30 - 39
PedAge	19	22	54	49	34
PedSex	Male	Female	Female	Female	Male
PedRace	White	Black	White	Black	White
PedAlc	No	No	No	No	No
PedInj	B: Evident Injury	C: Possible Injury	C: Possible Injury	B: Evident Injury	C: Possible Injury
VehType	Passenger Car	Unknown	Sport Utility	Sport Utility	Unknown
EstSpeed	0-5 mph	0-5 mph	26-30 mph	Unknown	Unknown
SpeedLMT	20 - 25 MPH	Unknown	30 - 35 MPH	30 - 35 MPH	Unknown
Crash_Loc	Intersection	Non-Roadway	Intersection	Non-Intersection	Non-Intersection
Ped_Pos	Not Coded	Not Coded	Not Coded	Travel Lane	Sidewalk / Shared Use Path / Driveway Crossing
CrashTyp	Motorist Left Turn - Parallel Paths	Off Roadway - Parking Lot	Motorist Left Turn - Parallel Paths	Backing Vehicle - Roadway	Motorist Exiting Driveway or Alley
AccDate	11/9/2004	3/4/2006	3/16/2006	4/25/2007	12/11/2007
fault	Motorist at Fault	Motorist at Fault	Motorist at Fault	Unknown	Motorist at Fault
light	Daylight	Dark - Roadway Not Lighted	Daylight	Daylight	Daylight
weather	Clear	Clear	Clear	Clear	Clear
hour	8	1	14	10	10
month	November	March	March	April	December
Wkday	Tuesday	Saturday	Thursday	Wednesday	Tuesday

Site D: 7th St. at Brevard St.

- Possible visibility issues contributing to unsafe conditions.
- Signal timing on 7th St. (crossing Brevard) was a 26 second countdown timer. On Brevard, it was a 43 second countdown timer.
- There are a number of large parking lots in the area. Midblock crashes appear to occur near parking lot entrances/exits.
- Directly proximate to the basketball/hockey stadium. *Check timing/day of crashes to possibly correlate with events.*

Site D – Crash Data

CRSH_ID	101914409	101958299	102410241
PedAge_gp	B. 06 - 10	E. 20 - 24	G. 30 - 39
PedAge	9	21	33
PedSex	Male	Male	Female
PedRace	Black	White	Black
PedAlc	No	Yes	No
PedInj	O: No Injury	B: Evident Injury	B: Evident Injury
VehType	Passenger Car	Passenger Car	Sport Utility
EstSpeed	0-5 mph	16-20 mph	0-5 mph
SpeedLMT	20 - 25 MPH	20 - 25 MPH	30 - 35 MPH
Crash_Loc	Non-Intersection	Non-Intersection	Intersection
Ped_Pos	Not Coded	Travel Lane	Crosswalk Area
CrashTyp	Dart-Out	Dash	Motorist Right Turn on Red - Parallel Paths
AccDate	9/28/2006	2/11/2007	10/2/2008
fault	Pedestrian at Fault	Pedestrian at Fault	Fault not Coded
light	Daylight	Dark - Lighted Roadway	Daylight
weather	Cloudy	Clear	Clear
hour	17	2	7
month	September	February	October
Wkday	Thursday	Sunday	Thursday

<u>Site E: Trade St. at Mint St.</u>

- Street profile changes. Heading away from Uptown, there is on-street parking shared with a travel lane depending on time.
- Landscaped median and "gateway" to Uptown.

<u>Site E (cont): Trade St. at Graham St.</u>

- Large intersection with substantial surface parking lots exiting onto both streets.
- Pedestrian signals are WALK (white walking man) →countdown timer →DON'T. There is not a countdown on the initial walk signal.
- Signal timing on Trade (crossing Graham) was 32 seconds (~27 yds.). Timing on Graham (crossing Trade) was 17 seconds (31 yds.) *This seems inadequate for the distance.*
- Making Left onto Trade from Graham, there is no dedicated turn, exposing pedestrians crossing Trade.
- On Trade, there is a No Turn on Red policy.
- Located near Carolina Panthers stadium and Johnson & Webb college. *Check time/day for event correlation.*

Site E – Crash Data

CRSH_ID	101076292	101313646	101872395	102019647	102436009
PedAge_gp	G. 30 - 39	F. 25 - 29	E. 20 - 24	E. 20 - 24	E. 20 - 24
PedAge	37	27	23	20	21
PedSex	Male	Female	Male	Female	Male
PedRace	White	White	White	White	White
PedAlc	No	No	Yes	No	No
PedInj	C: Possible Injury	B: Evident Injury	A: Disabling Injury	B: Evident Injury	C: Possible Injury
VehType	Passenger Car	Passenger Car	Truck/Trailer	Passenger Car	Passenger Car
EstSpeed	0-5 mph	0-5 mph	6-10 mph	0-5 mph	16-20 mph
SpeedLMT	30 - 35 MPH	30 - 35 MPH	20 - 25 MPH	20 - 25 MPH	20 - 25 MPH
Crash_Loc	Intersection	Intersection	Intersection-Related	Intersection	Intersection
Ped_Pos	Not Coded	Not Coded	Not Coded	Crosswalk Area	Crosswalk Area
CrashTyp	Motorist Failed to Yield	Trapped	Intersection - Other / Unknown	Motorist Right Turn on Red - Parallel Paths	Motor Vehicle Loss of Control
AccDate	1/2/2004	10/21/2004	10/30/2006	4/4/2007	11/5/2008
fault	Motorist at Fault	Unknown	Unknown	Motorist at Fault	Fault not Coded
light	Daylight	Dusk	Dark - Lighted Roadway	Daylight	Dusk
weather	Rain	Cloudy	Clear	Clear	Clear
hour	10	17	0	15	16
month	January	October	October	April	November
Wkday	Friday	Thursday	Monday	Wednesday	Wednesday

Site F: Tryon St. at 3rd St.

- On 3rd St., the signal timing is a 40 second countdown timer. There is no countdown timer on Tryon.
- Large hotel and parking are generators of pedestrian activity.
- The bike lane on 3rd was blocked by a bank truck (photo).
- There were a number of taxis parked on Tryon apparently waiting for fares.

Site F – Crash Data

CRSH_ID	101282969	101472429	102256209
PedAge_gp	F. 25 - 29	H. 40 - 49	G. 30 - 39
PedAge	27	43	37
PedSex	Female	Male	Female
PedRace	White	Black	White
PedAlc	No	No	No
PedInj	O: No Injury	C: Possible Injury	B: Evident Injury
VehType	Passenger Car	Unknown	Pickup
EstSpeed	6-10 mph	11-15 mph	11-15 mph
SpeedLMT	20 - 25 MPH	30 - 35 MPH	30 - 35 MPH
Crash_Loc	Intersection	Intersection	Non-Intersection
Ped_Pos	Not Coded	Not Coded	Travel Lane
CrashTyp	Motorist Left Turn - Perpendicular Paths	Standing in Roadway	Pedestrian on Vehicle
AccDate	9/14/2004	5/9/2005	4/19/2008
fault	Motorist at Fault	Unknown	Fault not Coded
light	Dark - Lighted Roadway	Daylight	Dark - Lighted Roadway
weather	Rain	Clear	Clear
hour	0	16	1
month	September	May	April
Wkday	Tuesday	Monday	Saturday

Site G: College St. at Stonewall St.

- Westin Hotel and Charlotte Convention Center generating substantial pedestrian traffic.
- College is 3 lanes wide going one-way toward Uptown.
- Countdown signal is 25 seconds total, but follows the WALK →countdown →DON'T pattern.
- Large parking lots and garage also complicating flow. Gantt Museum loading dock/parking garage is aligned in a such a way that may obscure visibility. There is an electronic "Watch for Pedestrians" sign at the exit, but it could still contribute to a dangerous situation.
- Crosswalk isn't parallel/perpendicular and cuts diagonally across College St.
- Large curb radius making a right turn from Stonewall onto College.
- Curb cuts are irregular. Not all open onto crosswalks and only some are ADA compliant.

Site G – Crash Data

CRSH_ID	101273731	101653574	101828327	101841162
PedAge_gp	G. 30 - 39	G. 30 - 39	K. 70+	J. 60 - 69
PedAge	34	30	74	60
PedSex	Male	Male	Female	Female
PedRace	White	White	Black	White
PedAlc	No	No	No	No
PedInj	C: Possible Injury	C: Possible Injury	A: Disabling Injury	A: Disabling Injury
VehType	Passenger Car	Van	Passenger Car	Passenger Car
EstSpeed	0-5 mph	16-20 mph	31-35 mph	Unknown
SpeedLMT	5 - 15 MPH	30 - 35 MPH	30 - 35 MPH	Unknown
Crash_Loc	Non-Roadway	Intersection	Non-Intersection	Intersection
Ped_Pos	Not Coded	Not Coded	Not Coded	Not Coded
CrashTyp	Vehicle-Vehicle / Object	Pedestrian Failed to Yield	Pedestrian Failed to Yield	Pedestrian Failed to Yield
AccDate	9/3/2004	1/10/2006	9/9/2006	9/26/2006
fault	Unknown	Pedestrian at Fault	Pedestrian at Fault	Pedestrian at Fault
light	Daylight	Dark - Lighted Roadway	Dark - Lighted Roadway	Dark - Roadway Not Lighted
weather	Clear	Clear	Clear	Cloudy
hour	8	19	23	20
month	September	January	September	September
Wkday	Friday	Tuesday	Saturday	Tuesday

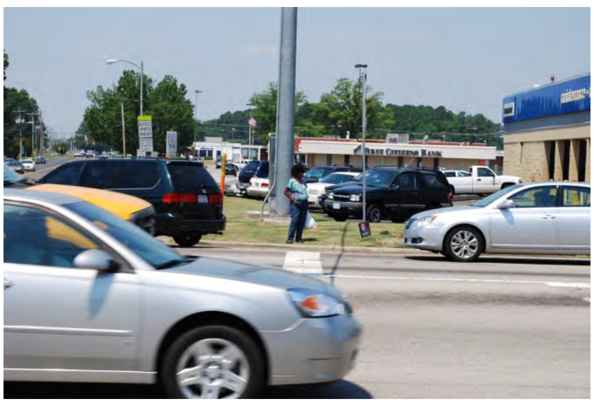
CRSH_ID	101970182	102112669	102270042	102343945
PedAge_gp	G. 30 - 39	E. 20 - 24	I. 50 - 59	H. 40 - 49
PedAge	31	22	52	43
PedSex	Male	Male	Female	Male
PedRace	Asian	White	White	Black
PedAlc	No	No	No	No
PedInj	C: Possible Injury	C: Possible Injury	B: Evident Injury	B: Evident Injury
VehType	Sport Utility	Sport Utility	Sport Utility	Passenger Car
EstSpeed	0-5 mph	0-5 mph	0-5 mph	36-40 mph
SpeedLMT	30 - 35 MPH	30 - 35 MPH	30 - 35 MPH	30 - 35 MPH
Crash_Loc	Intersection	Intersection	Intersection-Related	Non-Intersection
Ped_Pos	Crosswalk Area	Crosswalk Area	Travel Lane	Other / Unknown
CrashTyp	Motorist Right Turn on Red - Perpendicular Paths	Motorist Left Turn - Parallel Paths	Motor Vehicle Loss of Control	Vehicle-Vehicle / Object
AccDate	2/26/2007	11/8/2007	4/30/2008	7/3/2008
fault	Motorist at Fault	Motorist at Fault	Fault not Coded	Fault not Coded
light	Daylight	Daylight	Daylight	Daylight
weather	Clear	Clear	Clear	Clear
hour	17	9	10	10
month	February	November	April	July
Wkday	Monday	Thursday	Wednesday	Thursday

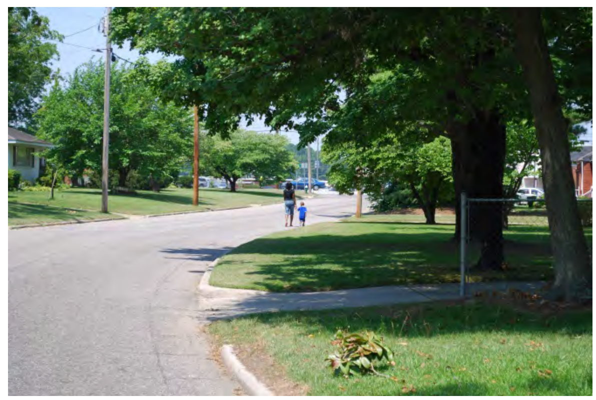
This report was compiled from site visit notes from M. Rodgers and site photos from M. Bushell, taken on February 2, 2011. M. Rodgers and M. Bushell also met with S. Smith to examine site characteristics and pedestrian behaviors in an unofficial capacity.

Appendix D: Community Action Plan Examples

Wilson Pedestrian Safety Action Plan

Revised: May 2011





Developed by UNC Highway Safety Research Center

In Coordination with the City of Wilson and the NCDOT

THE UNIVERSITY OF NORTH CAROLINA HIGHWAY SAFETY RESEARCH CENTER

NCDOT NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

WILSON NORTH CAROLINA

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PURPOSE

The objective of this action plan is to outline potential actions the City of Wilson can take, in coordination with the Highway Safety Research Center (HSRC) project team, to address pedestrian safety issues in the City. The role of HSRC is to analyze crash data and recommend best practices in addressing pedestrian safety issues, as well as facilitate communication and coordination among key City champions and stakeholders as well as the North Carolina Department of Transportation (NC DOT). HSRC staff can also provide direct technical assistance and support in the development of educational and media messages, and training and assistance to police and planning/engineering staff. The City of Wilson will be the primary champion for addressing pedestrian safety issues and a key partner in focusing and implementing this action plan.

BACKGROUND: PEDESTRIAN CRASH OVERVIEW

Who is affected by pedestrian crashes?

About 30 percent of Wilson pedestrians involved in reported collisions identified as White, 54 percent as Black, and about 8 percent as Hispanic. Blacks are therefore over-represented in crashes based on population, compared with whites. The youngest age group – children up to age 5 – have accounted for 11 percent of pedestrians struck in Wilson over this five year time period (with nearly half being struck in 2004). Altogether, children up to age 15 accounted for 24 percent of those struck by motor vehicles; this proportion is higher than the State average of 16 percent for this age group. Adult pedestrian between the ages of 16 and 60 accounted for 61 percent and adults ages 60 and up for 14 percent of those involved in collisions with motor vehicles.

In 2000, there were 42.5 percent black and 7.3 percent Hispanic or Latino residents, higher than the state averages of 21.6 percent and 4.7 percent, respectively. The median household income in Wilson in 1999 was $31,169, less than the state average of $39,184. Also, 21.6 percent of the population was below poverty level, compared with 12.3 percent statewide.[1] Roughly 15 percent of Wilson households do not have access to a motor vehicle, higher than state (7.5) and US (10.3) averages.[2] With such a high rate of households without vehicles, there is a strong need to provide safe pedestrian facilities so that families can meet their primary needs by walking.

To identify other pedestrian safety trends, the project team analyzed pedestrian crash data from 2003 to 2007 (the last year for which data was available at the time of the analysis). Included with the data were all pedestrian crashes reported to the NC Department of Motor

[1] State & County Quick Facts – Wilson. US Census Bureau. 2000. http://quickfacts.census.gov/qfd/states/37/3774540.html
[2] City of Wilson Pedestrian Plan. City of Wilson. August 2008. http://www.wilsonnc.org/downloads/PedPlanFinal.pdf

Vehicles during those years. It should be noted that the data does not take into account crashes that were not reported, such as falls and some private property crashes.

Pedestrian-motor vehicle crashes have fluctuated over the past 10 years, with a general downward trend. Between 2004 and 2008, the City of Wilson experienced 118 pedestrian-vehicle crashes. Wilson's estimated crash rate per population was 5.3 per 10,000. This rate compares with Charlotte (also 5.3 per 10,000), Wilmington (5.6), and Gastonia (6.0). Of the collisions that occurred over this time period, a lower proportion (< two percent) were, however, fatal than for the State as a whole (6.5 percent) or for all cities and towns combined (4.3 percent).

What is the cost of pedestrian crashes?

The cost of pedestrian crashes, for individuals and the community as a whole, is a significant burden. The National Safety Council and the NC Department of Transportation both provide estimates for the average comprehensive cost of a motor-vehicle crash by injury. Applying the NCDOT estimates to the pedestrian crashes that occurred in Wilson during the time period examined (2004-2008), the cost of these crashes to the community is more than $12 million (See Table 1). The crash cost estimates are expected to be higher when children are involved, as children have more life-years lost in crashes compared to other pedestrians.

Table 1. Wilson average comprehensive cost (per person) by injury severity, 2004-2008 (using 2008 cost estimates for all years)

Pedestrian Injury	Totals[3]	Average Comprehensive Cost (Per Person) by Injury Severity	Total Comprehensive Cost
K Killed	2	$3,982,384	$1,197,234
A Type Injury (disabling)	6	$199,539	$1,197,234
B Type Injury (evident)	39	$51,184	$1,996,176
C Type Injury (possible)	47	$24,352	$1,144,544
O No Injury	13	$5,027	$65,351
Unknown	11	unknown	unknown
Totals	**118**		$12,368,073

[3] Pedestrian Injuries. NCDOT Division of Bicycle and Pedestrian Transportation. http://www.pedbikeinfo.org/pbcat/ped_main.htm

What types of pedestrian crashes are occurring, and when?

Over all crash types, the largest proportion (37 percent) of the (reported) pedestrian collisions in Wilson occurred at non-intersection locations, for example midblock locations at or near driveways or in-between junctions. Many of these were pedestrian dart-outs and dashes– attempts to cross a roadway (which accounted for one-third of all crashes), while a smaller group involved pedestrians walking along a roadway. Another 30 percent occurred at or related to an intersection, while 31 percent occurred off the roadway network at locations such as parking lots and commercial driveways. These figures do not reflect other collisions that were not technically reportable or reported to law enforcement.

Fall months accounted for the most pedestrian crashes in Wilson, particularly November and September. Friday has been the highest crash day of the week on average (17 percent), similar to the State as a whole. Sunday has, however, accounted for almost as many crashes with 16 percent over this time period, compared to the state average of 11 percent. Nearly 40 percent of Wilson's pedestrian crashes over this time period occurred at night, far higher than the State average of 22 percent. Almost half of the 40 percent (18 percent) were deemed to be at locations with no supplemental lighting.

Where are these crashes occurring?

The map on the next page (
Figure 1) illustrates where pedestrian collisions were concentrated over the six years from 2003-2008. The areas of red and orange highlight the higher crash density zones (from 50 to 75 percent and 75 to 100 percent above the average crash density). Crashes occurring under conditions of darkness account for 41 percent of Wilson's pedestrian collisions, and some corridors have experienced a number of nighttime collisions.

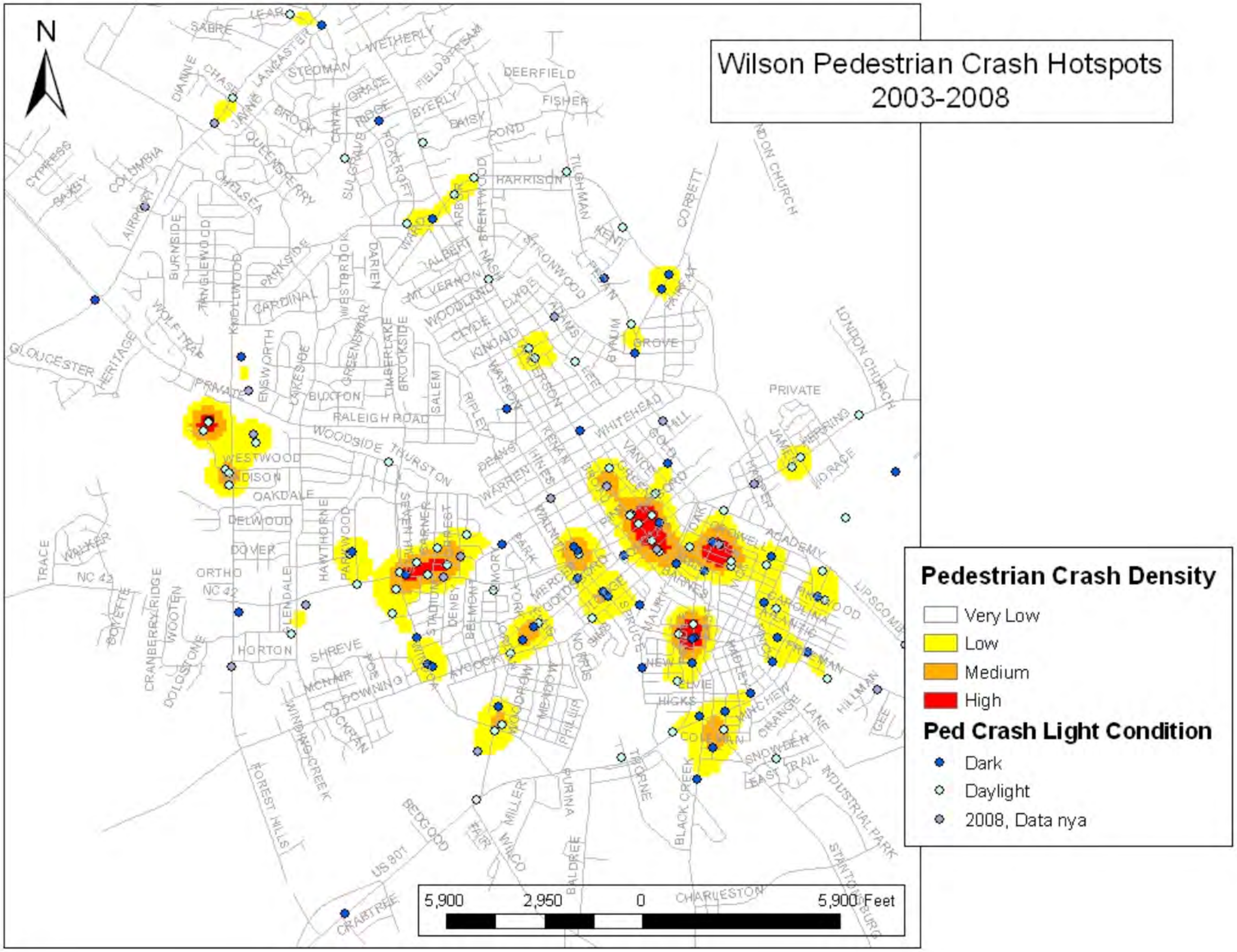


Figure 1. Wilson pedestrian crash hotspots, 2003 – 2008

ACTION PLAN

The action plan is intended to identify specific areas of interest within the City of Wilson, and provide recommendations for potential strategies to address pedestrian safety issues observed in those areas. The project team, in consultation with local partners, has identified eight goals for improving pedestrian safety in Wilson. These goals are presented in no particular order, and one goal should not be considered to be more important than another.

1. **Reduce Child Pedestrian Crashes**
2. **Improve Driver Compliance with Yielding and Pedestrian Laws**
3. **Improve Pedestrian Behaviors**
4. **Increase Inter-Agency Collaborative Response to Pedestrian Concerns**
5. **Improve Pedestrian Amenities, Particularly at Wide Intersections**
6. **Reduce Occurrence of Midblock Crashes, Primarily those Occurring near Mini-Marts**
7. **Reduce Instances of Backing Vehicle and Parking Related Crashes**
8. **Improve Pedestrian Level Lighting**

These goals are supported by safety trends, field observations, and existing priorities and recommendations from Wilson's pedestrian plan. The following section discusses these goals in detail.

The overall action plan must provide a comprehensive set of countermeasures (including education, engineering, enforcement, and planning/policy change) while prioritizing activities based on available resources and partnership interests. The following pedestrian safety focus areas were identified by the HSRC project team through detailed discussion with community stakeholders, review of existing pedestrian resources, analysis of crash data, and preliminary field visits. Additional areas of interest may develop as the project progresses, and the action plan should be a living, working document to accommodate changes to pedestrian safety issues and trends over time.

Goal #1: Reduce Child Pedestrian Crashes

Scope of the problem: The youngest age group, children up to age 5, have accounted for 11 percent of pedestrians struck in Wilson from 2003-2007 (with 43 percent being struck in 2004). By comparison, this age group accounts for only 7.4 percent of Wilson's population, according to the 2000 Census.[4] Altogether, children up to age 15 accounted for 24 percent of those struck by motor vehicles; this proportion is higher than the State average of 16 percent for this age group. An analysis of child pedestrian crashes by school zone is shown in Figure 3. Vick Elementary School District suffered the most child pedestrian collisions, with 11 occurring in that district. Further examination shows that very young, actually below school-aged, children comprise a significant portion (6 of 11 percent) of the child crashes in the district, with 11 to 15 year-olds being next most often involved.

Documentation: During site visits, some young children (approximately age 4 to 9) were observed playing near the street on a neighborhood road near Pine and Green, without apparent adult supervision. The crash history is relatively sparse, but does not indicate a pattern of school-related crashes, at least in terms of location, time of day, or day of week. Rather, many child crashes involve children not of school age and occur in evenings and on weekends. Improving care-giver supervision of extremely young children may be one approach to the issue.

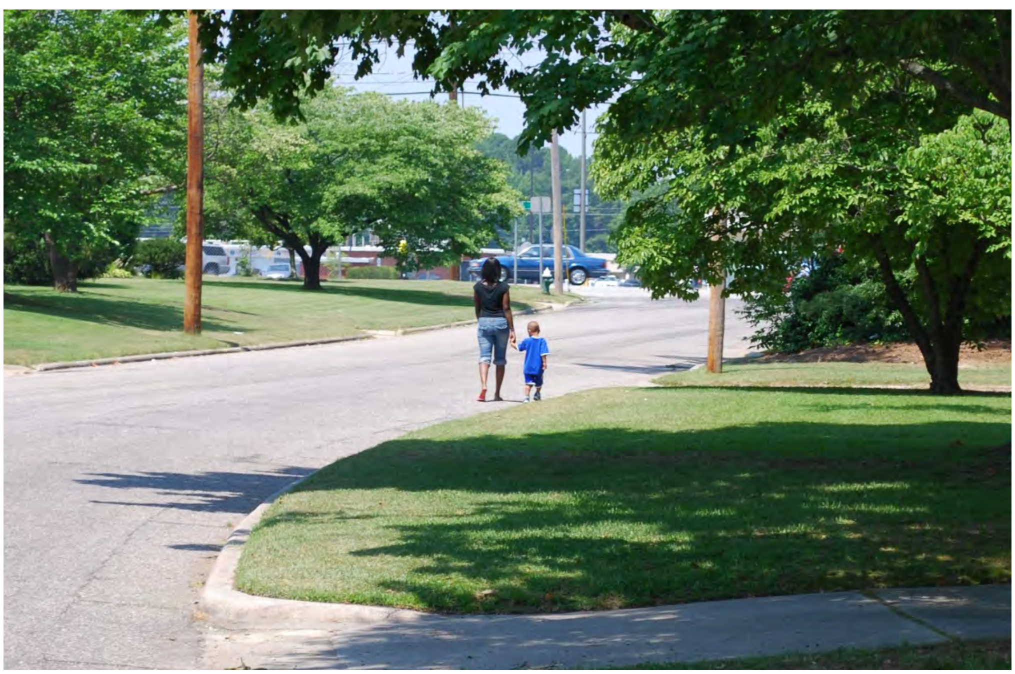


Figure 2. A woman and child walk in a residential area near Ward Blvd, toward the mall.

[4] Profile of General Demographic Characteristics: 2000. US Census Bureau.
http://factfinder.census.gov/servlet/QTTable?_bm=y&-qr_name=DEC_2000_SF1_U_DP1&-ds_name=DEC_2000_SF1_U&-_lang=en&-geo_id=16000US3774540

History: Wilson received state funding to complete a Safe Routes to School (SRTS) Action Plan for six local schools. The process has involved a series of public meetings and outreach efforts to inform the public, as well as a data collection/assessment effort to determine the pedestrian safety needs of the local schools. The final plan will be submitted to City Council for approval in 2011. In addition, several neighborhood streets with a crash history appeared to have undergone traffic calming improvements in recent years, namely traffic calming signs and speed humps on a couple of local streets. The next phase of Wilson's comprehensive planning process will be to develop individual neighborhood plans. This process will involve an extensive community outreach component, and should include pedestrian safety considerations for each neighborhood. A district lieutenant or sergeant usually attends all community meetings and can be a liaison for communicating pedestrian safety information throughout the process. Finally, the Wilson Pedestrian Plan references a school-based curriculum that could be taught to children to increase their skills in pedestrian and bicycle safety. City of Wilson staff has worked to develop educational safety videos about bicycling and walking with a local high school. Once developed, those videos could be shown prior to screenings at local movie theaters, and in other venues.

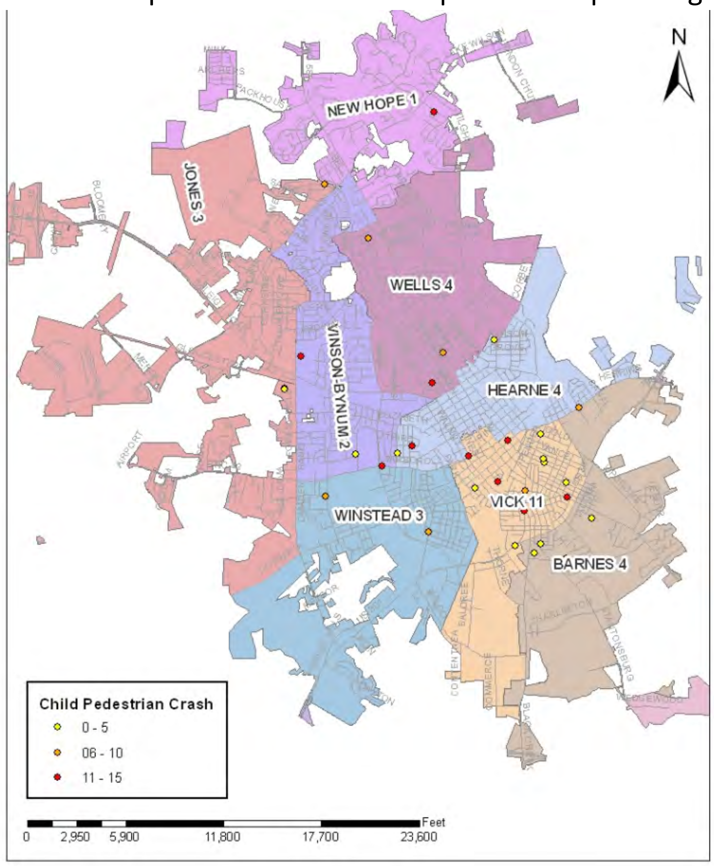


Figure 3. Wilson pedestrian crashes by school zone

Proposed Interventions: Countermeasures for both very young and school-aged child pedestrian crashes should be considered. The Vick district could be a focus area for initial efforts. Specific interventions could include:

- To address crashes among the youngest children, Wilson could consider a city-wide or neighborhood-based campaign to raise care-giver awareness of child pedestrian safety needs, including local and neighborhood-based workshops, community education events, presentations to the PTAs and parent-oriented organizations, and broad media messages. This neighborhood campaign could coordinate with the individual neighborhood plans, which the city is currently developing; the Human Relations department would need to be a key partner in this effort. Attending neighborhood meetings and the annual neighborhood summit would be critical.

- Develop educational materials for distribution at community-wide events, aimed at both parents and children. See Appendix B for a list of community events. Important educational messages include messages about parking around school zones, pick-up/drop-off rules, and general rules of the road. These materials would be branded with the campaign name and logo.
- Coordinate with existing SRTS plan to help implement local school plans, including any recommended engineering improvements to be made or school crossing guard programs. Specifically, HSRC staff will look at the SRTS plan recommendations and coordinate relevant education and enforcement activities around particular schools. Among the interventions recommended in the SRTS plan, the project team may pursue some of the following, in coordination with other partners:
    - School-based traffic safety campaign (including message development and dissemination in and around schools), focusing on parents, children, and school and daycare staff; campaign materials could be promoted at community events, such as walk to school days, bike rodeos, etc.; this could tie in with peer-to-peer educational videos being developed by high school students as well as local radio and TV programs.
    - Initiating neighborhood speed watch programs (or pace car programs) in neighborhoods or at employment centers, including schools
    - Providing training on child pedestrian safety to crossing guards/school zone monitors and public safety patrols.
    - Increased law enforcement, specifically enforcing speed and “no parking” zones around school zones and pedestrian yield laws; media and radio spots could be generated to raise awareness about the enforcement efforts. Promote the activities of the Strategic Traffic Enforcement Patrol (STEP) group through media and other means.
    - Coordinate and promote the development and deployment of child pedestrian/bicycle safety education and skills training at all Wilson elementary schools (at a minimum hold an assembly); could receive training from Gillian Hotz’s Walk Safe program before developing a curriculum.
    - Coordinate the development and implementation of pick-up/drop-off plans for each school, utilizing services from NCDOT.
    - Provide training and technical assistance for school-specific engineering treatments, including traffic calming, flashing signs, and other devices.

Scope of Intervention: SRTS plans and education programs could be focused on the four elementary schools and two middle schools in Wilson. A public education campaign targeting care givers can focus first in the Vick area, as well as be provided city-wide.

Role of HSRC: HSRC can provide expertise in developing and executing a media campaign, including message development for videos or other collateral; developing, purchasing, and distributing materials; collaborating with the SRTS project and sharing/analyzing data; and assisting with workshop/event development. HSRC can also provide training and consultants to foster the development of a child safety curriculum.

Role of community partners: Partners are needed to identify, coordinate, and host local events and workshops, work with school-related stakeholders, and deliver school-based training to children. Partners will likely include representatives of the Wilson school district, the local Safe Kids group, the PTA, etc. Broader, non-school partners will be needed to help develop and disseminate safety messages, including interfaith organizations, local media, the Wilson Housing Authority, and Wilson Human Relations representatives. Partnerships formed with the local high school class for safety video development will also be critical in getting out safety messages. Partners will also keep the project team involved in the ongoing neighborhood planning process.

Timeline: Safety messages and a media/marketing plan can be developed, starting immediately. Further discussion is needed with local partners to determine a realistic schedule for other activities.

Available Tools/Resources:

- Walk Safe Program – Miami, FL (PBIC): This case study provides an overview of a child pedestrian safety campaign (http://www.walkinginfo.org/library/details.cfm?id=2866).
- Pedestrian Safety Campaign (FHWA): The pedestrian safety campaign includes instructions for running a successful campaign and downloadable materials such as posters, brochures, and PSAs (http://safety.fhwa.dot.gov/local_rural/pedcampaign/guide.htm).
- Prevent Pedestrian Crashes: Parents and Caregivers of Elementary School Children (NHTSA): This brochure provides pedestrian safety tips for caregivers and parents, and dispels common pedestrian safety myths (http://www.nhtsa.gov/DOT/NHTSA/Traffic%20Injury%20Control/Articles/Associated%20Files/811027.pdf).
- PBIC Video Library: Examples of pedestrian (and bicycle) safety videos can be found in the PBIC's Video Library (http://www.walkinginfo.org/videos).

Goal #2: Improve Driver Compliance with Yielding and Pedestrian Laws

Scope of the problem: Sixty-six percent of Wilson's crashes occur in the 8 hour time period from 2 PM to 10 PM, a time that largely coincides with the post-work rush hour. "Turning Vehicles" striking pedestrians accounted for seven percent of collisions – eight occurred at intersection locations; one occurred at a non-intersection location such as a driveway/roadway junction.

Figure 4. A vehicle turning at the intersection of Tarboro and Ward.

Documentation: At several intersections observed during the site visits, wide curb radii contributed to high turning speeds, which further increased potential conflicts between drivers and pedestrians.

History: Over the past year, the City of Wilson has developed educational brochures intended to spread safety messages to pedestrians, bicyclists, and motorists. The pedestrian and bicycle safety brochures are complete, and the motorist brochure is still in development.

Figure 5. Several crashes have occurred at the intersection of Pine and Nash, and crash reports indicate the crashes resulted from motorists failing to yield. Pushbutton-activated signals exist at these intersections, but are rarely used by pedestrians.

Proposed Interventions:

- Broad public information campaign, including the dissemination of Wilson's educational brochures, media messages, and community workshops. Several possible programs have been proposed in conversations with the Wilson working group. Those include:
    - Safety Pledge Programs or Pace Car Programs: A program could be developed that allows drivers to pledge their commitment to safe driving and pedestrian safety. The program could start with just City of Wilson employees, and involve some incentive (such as coupons/discounts at local businesses). Other large employment centers (such as fleet drivers, BB&T, Firestone, Bridgestone, or the Wilson Community College) could also be involved in the program. The program could be modeled on an existing safety pledge taken by NC DOT employees.
    - Safety Videos: As previously mentioned in Goal 1, the development of safety videos in coordination with the local high school will help disseminate messages to a variety of audiences. The videos could be shown prior to movie screenings

at local theaters, on public access channels, or in schools as part of regularly-held assemblies.

- Consider infrastructure changes, such as reducing curb radii, traffic calming devices, banning right turns on red, or yielding signage to assist drivers in slowing at intersections and improve the yielding rate to pedestrians.
- Consider enforcement operations, such as targeted yielding law operations, or speed programs to slow speeds and improve driver yielding to pedestrians in signalized intersections. As mentioned, involving the STEP team and highlighting their efforts through the media may help spread the word about pedestrian safety laws.
- Concurrently, signs and targeted pedestrian interventions could encourage pedestrians to use pedestrian walk signals where they are available and to watch for turning motorists.

Scope of the intervention: The media campaign should be city-wide. Specific intersections to target for engineering and/or enforcement programs could include Tarboro and Ward; Hines and Pender; and Pine and Nash. Engineering, education, and enforcement measures should also coordinate with locations and recommendations identified in the SRTS action plan.

Role of HSRC: HSRC can assist with identifying high-crash intersections and corridors to focus enforcement or engineering improvements, and can develop materials and work with local agencies to disseminate a broad public awareness campaign. To support engineering improvements and other project activities, HSRC will assist community partners with identifying and pursuing supplemental funding sources (through local foundations or other groups).

Role of community partners: Local and state traffic engineers would need to consider changes at intersections, and enforcement officers would need to lead any campaigns focused on driver speed or yielding. Broad community partners would be needed to organize, host, and disseminate educational messages. The local high school group and media contacts would need to coordinate the development and dissemination of safety video messages. Some contacts identified by Wilson partners could be instrumental in securing support from local businesses to provide incentives for a driver safety pledge program.

Timeline: Development of media materials could begin immediately. City of Wilson staff have already begun meeting to discuss safety video development. If enforcement or engineering efforts are planned, HSRC staff would need to ensure that baseline data is collected before and after any intervention.

Available Tools/Resources:

- Effects of Driver Enforcement Programs on Yielding to Pedestrians: This report evaluates the effects of a driver enforcement program, aimed at improving safety for pedestrians (http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1284509/pdf/15529891.pdf)
- Pedestrian Safety Enforcement Training and Resource Guide (NHTSA): This interactive training course provides law enforcement officials with a background on enforcing laws for improving pedestrian safety.

Goal #3: Improve Pedestrian Behaviors

Scope of the problem: The largest groups of crash types were “Pedestrian Failure to Yield” and “Dart-Outs and Dashes.” “Dart-outs” involve pedestrians suddenly emerging from a location that was blocked from view by the motorist until an instant before impact – such as from behind a parked car, building, or shrubbery. “Dashes” involve pedestrians running or dashing into the street, but not from an obscured location. “Pedestrian Failure to Yield” implies the pedestrian was crossing the roadway, either against a traffic signal indication, or at an undesignated location (such as a midblock area with no crosswalk) and failed to yield to traffic, but should not necessarily be taken to imply fault. Most (60 percent) of both “Pedestrian Failure to Yield” and “Dashes/Dart-Outs” in Wilson occurred at non-intersection locations, with 40 percent occurring at intersections. Pedestrians may fail to detect a safe opportunity to cross when they lack signalized intersections or other crossing amenities, particularly along higher-volume, multi-lane corridors. It is particularly difficult to judge speed or distances of approaching vehicles at night.

Crashes involving pedestrians “Walking Along a Roadway” and being struck from behind or the front accounted for nearly five percent of collisions. Examination of detailed crash types reveals that four out of six involved pedestrians walking in the same direction as traffic who were struck from behind, while two involved pedestrians walking facing traffic who were struck from the front. These collisions typically occur on roadways lacking sidewalks (or other space) for pedestrians to walk and often occur at night as well.

Documentation: During site visits, project staff observed numerous locations lacking sidewalks, around which many pedestrians were walking, either on goat trails or in the street, with or against traffic. Further, numerous bicyclists were observed riding in the road against traffic or on the sidewalks.

Figure 6. Many of the residential areas near Tarboro St. lack sidewalks, and pedestrians often walk in the roadway.

History: The Community Pedestrian Survey, conducted as the pedestrian plan was developed, indicated that the number one barrier to walking was the lack of sidewalks. The pedestrian plan includes provisions for addressing sidewalk gaps, citing an existing network that lacks sidewalk continuity. The plan included an analysis of sidewalk gaps, current safety and mobility needs, and estimates for future growth and development. Projects were prioritized based on a number of factors, including condition of existing facilities, safety, proximity to schools, and input from the public involvement process. Many of the same corridors identified by the project team – Hines St., Goldsboro St., Tarboro St., Airport Blvd., and Ward Blvd. – were ranked in the plan as Top Priority Corridors.

Proposed Interventions:

- A public education campaign could provide basic walking messages, such as “Walk Against Traffic”, but walking along roadway crashes could be prevented or significantly reduced with the construction or improvement of sidewalks.
- A public education campaign could provide basic crossing messages, such as “Look Both Ways” that might have a limited effect, but dart/dash crashes could be more significantly reduced with the construction of facilities such as high visibility crosswalks, medians or crossing islands, pedestrian countdown signals, or traffic calming measures.
- The public education campaigns could tie in directly with the neighborhood planning process. The community outreach component of that planning process could provide an ideal venue for communicating pedestrian safety messages. As mentioned previously, safety videos and driver pledge programs will also help disseminate safety messages.

Scope of Intervention: City-wide, or at spot intersections/corridors

Role of HSRC: HSRC can assist with identifying high-crash intersections and corridors to focus engineering improvements, and can develop materials and work with local agencies to disseminate a broad public awareness campaign. To support engineering improvements and other project activities, HSRC will assist community partners with identifying and pursuing supplemental funding sources (through local foundations or other groups).

Role of community partners: Local and state traffic engineers would need to consider changes at intersections. Broad community partners would be needed to organize, host, and disseminate educational messages.

Timeline: Development of media materials could begin immediately. If engineering efforts are planned, HSRC staff would need to ensure that baseline data is collected before and after any intervention.

Available Tools/Resources

- Evaluation of the Miami-Dade Pedestrian Safety Demonstration Project (NHTSA): Comprehensive pedestrian safety project in Miami-Dade County, FL (http://www.nhtsa.gov/DOT/NHTSA/Traffic%20Injury%20Control/Articles/Associated%20Files/810964.pdf).

Goal #4: Increase Inter-Agency Collaborative Response to Pedestrian Concerns

Scope of the problem: Relative to other communities, Wilson is very advanced in terms of inter-agency collaboration and community capacity. An increase in communication regarding specific pedestrian safety issues may help balance the attention given to this mode of traffic relative to other travel modes.

Documentation: Not applicable.

History: The Bicycle & Pedestrian Advisory Board meets on the fourth Tuesday of each month, and has been very active in promoting bicycle and pedestrian improvements in Wilson. They have had a hand in a wide variety of projects, from planning bicycle parking facilities to giving input on the Safe Routes to School project. Their focus has traditionally been swayed toward more bicycle projects than pedestrian-oriented initiatives. They will be a very valuable resource during this project.

Proposed Interventions:

- Wilson staff and partners have requested additional training and guidance on pedestrian safety, planning, and design issues. HSRC has committed to providing each community with necessary professional training courses/workshops. Specific proposed training opportunities include:
    - Designing for Pedestrian Safety Course: This two-day course will be taught in December 2010, and some Wilson staff plan to attend. Other similar courses will most likely be taught in North Carolina as well.
    - Data Driven Approaches to Crime and Traffic Safety (DDACTS): This NHTSA training course is available to law enforcement personnel in Wilson, and will provide instruction on how to identify target locations based on crime and traffic safety data.
    - Enforcement Training: Trainings taught by experienced police officers related to targeted pedestrian safety enforcement campaigns are available, and can be offered to all relevant enforcement officers.
    - Creating Livable Communities Course: One-day course taught by Peter Lagerwey; could relate to this and several other goals for this project.
- Police staff recommended the development of an inter-agency pedestrian safety group to review pedestrian crashes quarterly and discuss potential approaches to prevent similar crashes in the future. The following group will meet once each quarter to review all of the pedestrian safety crashes that occurred during that period, and make recommendations for safety improvements.

Organization	Member
Police	Luke Marcum, Eric Smith
Planning	Denise Boswell, Emily Beddingfield
NC DOT	Haywood Daughtry, David Morton
Schools	Tommy Finch, Jim Lewis
City Engineering	Jake Green
HSRC Team	Libby Thomas, Bill Hunter, Laura Sandt, Dan Gelinne

Scope of intervention: Internal to Wilson City staff.

Role of HSRC: HSRC is able to provide training courses upon request, and can also bring in additional subject experts as needed. HSRC can also take notes during regular meetings and distribute these to the members. HSRC staff will attend each of the quarterly review meetings and the monthly Bicycle/Pedestrian Advisory Board meetings. HSRC will participate in the quarterly review of pedestrian crashes.

Role of community partners: A community champion is needed to organize and host monthly meetings.

Timeline: Meetings can begin immediately; training courses will need 1-3 months advance notice to be arranged.

Available Tools/Resources:

- PSAP Training Courses: These courses give participants an understanding of engineering, planning, and policy considerations for pedestrian safety (http://www.walkinginfo.org/training/pbic/index.cfm).
- PBIC Webinars: These free webinars cover a variety of issues related to pedestrian safety (http://www.walkinginfo.org/training/pbic/webinars.cfm).

Goal #5: Improve Pedestrian Amenities, Particularly at Wide Intersections

Scope of the problem: A significant portion of Wilson's pedestrian crashes occur on or near high-volume, higher-speed arterial streets that bisect and separate neighborhoods from nearby commercial centers or pedestrian destinations. Most of these neighborhoods are lower-income, minority areas where access to vehicles is low and the need to walk to nearby businesses for work and shopping is high.

Figure 7. Traffic along Tarboro St.

Documentation: A number of arterial, state-owned corridors (including Tarboro, Ward, and Hines) in Wilson have a similar set of pedestrian concerns: wide, 5-lane roads with high traffic volumes, speed limits of 45 MPH (with actual speeds likely higher), with long distances between signalized intersections and no formal midblock crossings. Along these corridors, there are typically numerous driveways and a fragmented sidewalk system, if sidewalks are present at all. At the intersections, there are typically few pedestrian amenities, such as crosswalks (no high visibility crosswalks observed), pedestrian signals, crossing islands, or facilities to reduce the crossing time or distance for pedestrians.

Figure 8. Goat paths, as seen along Tarboro St., indicate pedestrian use in areas where sidewalks do not exist.

History: As previously mentioned, the pedestrian plan prioritized completing the sidewalk and pedestrian facility network. In a previous survey, residents indicated that a major barrier to walking in Wilson is the lack of signalized crossings. However, specific recommendations were not made for improving specific intersections across the City. Several downtown intersections have installed pedestrian signals, as observed during site visits.

Proposed Interventions:

- Consider intersection improvements, traffic calming measures, and the development of midblock crossing treatments at key pedestrian crossing points
- Work with local engineers to conduct more detailed safety audits, review crash data, and discuss recommendations.
- Speed studies and speed enforcement on roadways with high travel speeds, and propose speed limit reviews when appropriate.

Figure 9. Many intersections, such as this one at Tarboro St. and Ward Blvd., lack pedestrian signals and marked crosswalks.

Figure 10. The intersection of Hines St. and Pender St. shows another example of a wide intersection with few pedestrian amenities. Those that exist (crosswalk markings) are in need of maintenance.

Scope of intervention: City-wide or focused on select high-crash corridors

Role of HSRC: Work with local police and engineers to review data and discuss alternatives; potentially provide some level of funding or collaborate on proposal development to raise funds for capital improvements. Host infrastructure focused meetings and field visits to identify target locations and select improvements. Augment speed data collection if necessary.

Role of community partners: Provide data and community support to identify and pursue funding sources, and participate in safety audits.

Timeline: Engineering-focused meetings and field visits can begin immediately. Additionally, HSRC will begin looking at potential funding sources that could support infrastructure improvements.

Available Tools/Resources:

- Pedestrian Road Safety Audit Guidelines and Prompt Lists (FHWA): This comprehensive guide allows engineers, planners, and other professionals to assess local conditions and identify pedestrian safety concerns (http://www.walkinginfo.org/library/details.cfm?id=3955).
- Toolbox of Countermeasures and their Potential Effectiveness for Pedestrian Crashes (FHWA): This collection of crash reduction factors (CRFs) explains the expected reduction in crashes for a given treatment (http://www.walkinginfo.org/training/collateral/resources/pedToolboxofCountermeasures.pdf).
- Crash Modification Factors Clearinghouse (FHWA): This Web site provides a searchable database of countermeasures and their potential effectiveness for reducing crashes (http://www.cmfclearinghouse.org/).
- Countermeasures that Work (NHTSA): This report provides a comprehensive overview of effective traffic safety countermeasures, including pedestrian safety countermeasures (http://www.walkinginfo.org/library/details.cfm?id=4510).

Goal #6: Reduce Occurrence of Midblock Crashes, Primarily those Occurring near Mini-Marts

Figure 11. Pedestrians cross Hines St. to a convenience store (not shown), from a mostly residential area.

Figure 12. A pedestrian crosses Pender St., from a park to a convenience store (not shown).

Scope of the problem: Over all crash types, the largest proportion, 37 percent, of the (reported) pedestrian collisions in Wilson occurred at non-intersection locations – that is, midblock locations such as at or near driveways or in-between intersections.

Documentation: Crash history indicates that a number of crashes occur at midblock locations, and site visits revealed that mini-marts and convenience stores are often in close proximity to crash sites. Sites identified include points along Hines St. near Goldsboro St. and Nash St. Conflict points also exist along some corridors due to frequent driveway access points, specifically observed along Tarboro St and Ward Blvd. There are many shopping centers on each road (a destination for drivers and pedestrians) and many driveway access points and turning traffic; crash history indicates that most crashes in this area occur during the daytime.

History: The Wilson pedestrian plan identifies various corridors for pedestrian improvements. However, locations were not specifically targeted for midblock crossing improvements or other countermeasures related to access management. Recommendations were made to develop a crosswalk policy, and improve crosswalk design requirements.

Proposed Interventions:

- Consider the development of midblock crossing treatments at key pedestrian crossing points.
- Work with local engineers to conduct more detailed safety audits, review crash data, and discuss recommendations. As previously mentioned, targeted meetings with both City and NCDOT engineers will be used to identify locations for improvements.
- Improve lighting conditions in front of Mini-Marts and at nearby pedestrian crossing points (see goal below).

Scope of intervention: Site-specific.

Role of HSRC: Work with engineering and planning staff to review midblock crossing design guidance and provide resources to engineering staff. Explore funding opportunities for engineering improvements, such as crosswalks and signing.

Role of community partners: Participate in safety audits with project staff. Work with public works department to coordinate installation of lighting.

Timeline: Conduct audits of target locations as needed. Following audits, meet with engineering and public works staff to identify target locations for improvements. Funding opportunities can be explored on an ongoing basis.

Available Tools/Resources:

- Safety Effects of Marked vs. Unmarked Crosswalks at Uncontrolled Locations (FHWA): This report provides details on the effectiveness of different crosswalk treatments (http://www.walkinginfo.org/training/collateral/resources/Effects_Un_MarkedCrosswalks_Summary.pdf).
- Pedestrian Road Safety Audit Guidelines and Prompt Lists (See description/link under Goal 5).

Figure 13. A truck enters the roadway near the intersection of Tarboro St. and Ward Blvd. Frequent access points and some sight distance issues create obstructions for pedestrians.

Goal #7: Reduce Instances of Backing Vehicle and Parking Related Crashes

Scope of the problem: "Backing Vehicle" (predominantly in parking areas and driveways) and other "Off-roadway" collisions together accounted for more than one-quarter (26.5 percent) of collisions.

Documentation: During the site visits, several parking lots (such as Wal-Mart) were observed to have several pedestrian-oriented treatments (including wide crosswalk at store entry and pedestrian signage), while other large commercial parking lots, such as Lowes, did not have any crosswalks from parking areas to store entry, nor signage or other safety facilities for pedestrians.

History: The pedestrian plan makes a recommendation to consider pedestrian safety in the Wilson Zoning Ordinance parking lot design standards. The plan also includes an appendix section on improved parking design standards for pedestrians.

Proposed Intervention:

- Work with Lowes (and other local businesses) to promote pedestrian safety in parking lots
- Complete Streets ordinances to require new developments to have sidewalks and other ped/bike amenities along development and up to store frontage. This would follow on the recommendation in the pedestrian plan to consider pedestrian facilities in all new development, and to consult with the City on pedestrian needs during the development process.
- Parking lot design standards could be included in Wilson's forthcoming Unified Development Ordinance, which could improve the design of future parking lots.

Scope: Site specific

Role of HSRC: Identify priority sites and provide guidance on parking lot design best practices.

Role of community partners: Work with local business owners, chamber of commerce, etc. to review parking design standards and update plans; see about making improvements to retrofit existing parking lots.

Timeline: Work can begin immediately.

Available Tools/Resources:

- Complete Streets Resource Toolkit (SACOG): This CD ROM includes more than 150 resources related to developing and implementing Complete Streets policies (http://www.sacog.org/complete-streets/toolkit/files/order-cdrom.html)

Figure 14. The Wal-Mart parking lot has a number of pavement markings and signs to alert drivers.

Figure 15. The Lowes hardware store has few signs and pavement markings for pedestrians.

Goal #8: Improve Pedestrian Level Lighting

Scope of the problem: A majority of pedestrian crashes (57 percent) have occurred during daylight conditions, somewhat higher than the proportion Statewide; it is likely that crashes under dark conditions are over-represented for the amount of walking that occurs at night, although data are lacking to verify this conjecture. About 30 percent of pedestrian crashes occurred on roadways that were reported to have supplemental lighting, while 11-12 percent occurred at night at locations that were indicated to have no lighting (or unknown lighting).

Documentation: Crashes involving pedestrians and/or drivers that had apparently used alcohol prior to the crash also seem to be spatially concentrated in some areas (see Figure 16; the area circled in bright blue included several crashes involving driver alcohol use). Since these crashes also occurred most often at night (see
Figure 1), these could be areas for enhanced night-time enforcement, as well as assessment of whether roadway lighting is adequate for pedestrian needs.

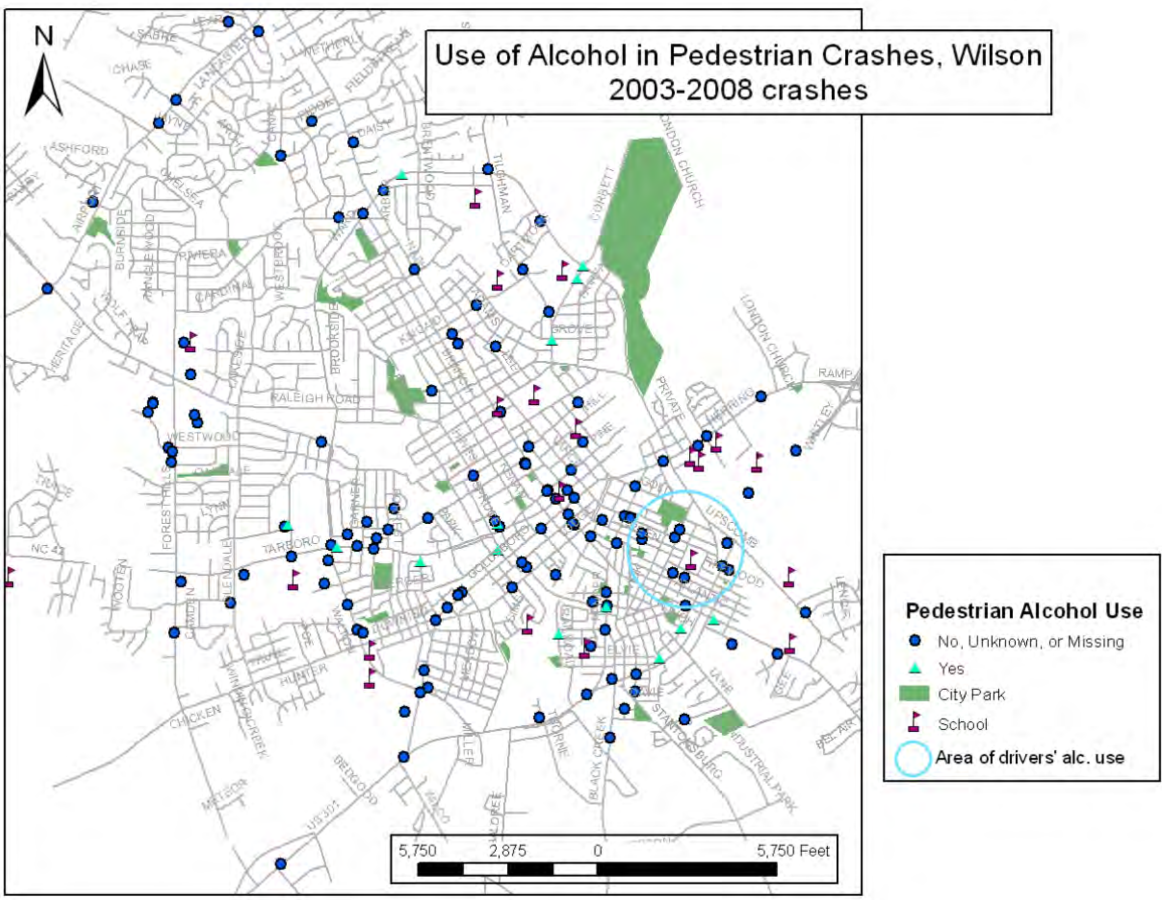


Figure 16. Use of alcohol in pedestrian crashes

History: Lighting improvements have been made in recent years; more information is needed as to what improvements have been made and are planned.

Proposed Interventions:

- Night-time field observations of sites with high pedestrian crashes and/or night activity and development of recommendations for lighting improvements.
- Coordinate with Wilson Energy contact to identify locations where lighting can be upgraded or installed, based on crash history and perceived risk.

Scope: Site-specific.

Role of HSRC: Assist with audits and recommendations.

Role of community partners: Police and Public Works Department to be involved in audits and recommendations, and collaboration with local energy provider.

Timeline: Work can begin immediately.

Available Tools/Resources:

- Pedestrian Road Safety Audit Guidelines and Prompt Lists (See description/link under Goal 5).

Figure 17. Convenience stores in Wilson, like this one near the intersection of Hines and Goldsboro, often lack lighting. Since there aren't many bars in operation, stores like this could be the primary source for alcohol in the community.

INTERVENTIONS AND STRATEGIES

A comprehensive set of measures, both short and longer term, is needed to more effectively address pedestrian safety in Wilson. A combination of interventions and countermeasures will be used to address each of the pedestrian safety goals identified, as shown in Table 2.

Table 2. Matrix of pedestrian safety goals and recommended interventions/countermeasures

		Goal 1	Goal 2	Goal 3	Goal 4	Goal 5	Goal 6	Goal 7	Goal 8
		Reduce Child Crashes	Increase Driver Compliance	Improve Pedestrian Behavior	Increase Interagency Collaboration	Improve Pedestrian Amenities	Reduce Midblock Crashes	Reduce Backing Vehicle Crashes	Improve Pedestrian Lighting
Interventions and Countermeasure Strategies	Community-wide media/education campaign	■	■	■					
	School-based programs	■							
	Coordinate with community planning	■		■	■	■	■	■	■
	Engineering improvements	■	■	■		■	■	■	■
	Yielding and speed enforcement		■	■					
	Training and workshops	■	■	■	■				
	Promote interagency coordination				■	■			
	Audits and field reviews	■				■	■	■	■
	Coordinate with local businesses			■				■	

Many of these measures can dovetail with existing efforts or leverage existing partnerships and resources available in the community.

Within each of the countermeasure categories identified in Table 2, there are specific interventions and programs that can be developed and implemented. Based on existing knowledge related to cost and effectiveness of various programs, the project team will work with community partners to implement the interventions that may have the greatest impact on improving safety. Each of these strategies is presented in Table 3, along with key variables that may assist with prioritization.

While all of the programs and strategies are recommended, only a certain number will be implemented as part of the current NHTSA project. Others can be picked up and implemented by the City as it works to improve safety in other areas. Strategies that will be implemented as part of this project are highlighted in the table.

Note: For each strategy, a column is included for the estimated cost and proven effectiveness in reducing pedestrian crashes, as shown by research. It should be noted that, though the research may find an individual strategy to have a "Low" effectiveness, there are cumulative effects on pedestrian safety when several strategies are used together. Therefore, the combination of interventions may result in a greater impact on pedestrian crashes than the anticipated effectiveness for each individual intervention.

Table 3. Matrix of Intervention Costs and Potential Effectiveness

Category	Program/Intervention	Description	Cost	Effectiveness*	Goal(s) Addressed	Community Partner(s)	Timeline
Community-wide education	Pedestrian safety education for seniors	Elements of the Pedestrian Safety Workshop will be incorporated into presentations given to senior audiences in Wilson to address senior pedestrian crashes as well as child pedestrian crashes, since many children in Wilson are often watched by a grandparent.	Low	Low	1,3	UCP COG/ AAA	Ongoing
	Distribute materials at community events	Volunteers and community partners can help distribute materials at events held in Wilson. These could include fliers, brochures, etc.	Low	Low	1,2,3,6,7	Planning Ped/Bike Board	See Appendix B
	Driver pledge program	To promote safe behavior among motorists, and spread knowledge about pedestrian laws, a model driver program could be developed and implemented. It could begin with City staff.	Med.	Un-known	1,2,6,7	Planning	
	Distribute messages using digital boards	A number of message boards around the community have been identified to post safety messages.	Low	Low	1,2,3,6,7	Public Affairs	
	Distribute messages using ads on City buses	Ads could be developed to help distribute pedestrian safety tips inside City buses.	Low	Low	1,2,3,6,7	Transportation Public Affairs	
Media campaign	Develop/distribute radio public service announcements (PSAs)	PSAs can be distributed via Rocky Mount-based First Media Radio. The City can run 28-second PSAs on these stations at no cost, and rotate in new messages every two to three months. Stations include 98.5 FM, 99.3 FM, 95.5 FM, and 1490 AM.	Med.	Low	1,2,3,6,7	Police Planning	
	Develop/distribute pedestrian safety video	Video will be developed in cooperation with local high school, and can be shown at movie theaters, events, local access channels, and in classrooms.	Med.	Low	1,2,3,6,7	Planning Schools Police	
	Distribute safety messages in newspaper	STEP team has been given space in the local paper to distribute traffic safety messages – can include pedestrian safety messages here.	Low	Low	1,2,3,6,7	Police Planning Public Affairs	
	Highlight efforts of law enforcement in local media	The STEP team and Police will work with local media to highlight their enforcement efforts and distribute pedestrian safety tips and information to a wider audience.	Low	Med.	1,2,3,6,7	Police	Ongoing
School-based programs	SRTS Mini Grant Program	Wilson was awarded a SRTS mini grant to implement programs around one of the elementary schools.	Low	Low/ Med.	1	Planning Schools	
	Expand pedestrian safety material in driver's education curriculum	The school system will expand the material in its driver education program related to pedestrian laws and safety.	Med.	High	1,2,3,6,7	Schools	Coordinate with existing schedule.
	Distribute PSAs and safety messages in schools	Materials developed as part of the wider campaign can be targeted toward child pedestrians and distributed in the schools through in-class television.	Low	Low	1	Schools Principals	
	Promote service learning and pedestrian safety	To meet requirements for public service or service learning, project ideas could be developed to promote pedestrian safety knowledge and skills among participating students.	Med.	Low	1,2,3,6,7	Schools	

Category	Program/Intervention	Description	Cost	Effectiveness*	Goal(s) Addressed	Community Partner(s)	Timeline
Coordinate with community planning	Conduct neighborhood-based walkability audits and workshops	The individual neighborhoods will conduct walkability audits and workshops, and may incorporate the results into their neighborhood plans.	Low	Med.	1,5,8	Neighborhood Associations Planning Human Relations	Coordinate with neighborhood planning process
	Coordinate with the development of a Unified Development Ordinance	HSRC will provide information on model ordinances for pedestrian safety, which can be incorporated in the UDO.	Low	Med.	5,6,7,8	Planning	
	Coordinate with the development of individual neighborhood plans	HSRC will support the development of neighborhood plans, specifically the inclusion of pedestrian safety concerns and goals.	Low	Med.	1,2,3,5,6,7,8	Planning	Coordinate with neighborhood planning process
Engineering improvements	Address school pick-up/drop-off congestion	The Police and school administrators have identified pick-up/drop-off operations as a key issue impacting pedestrian safety. City engineers can analyze these patterns and provide recommendations to the schools to ease congestion and reduce pedestrian/vehicle conflicts.	Med.	Low/ Med.	1	Engineering Police Schools	Early 2011
	Support Implementation of Bicycle and Pedestrian Plans	The City of Wilson has produced high-quality comprehensive planning documents to support the development of bicycle and pedestrian programs and improvements. The project will coordinate its activities and recommendations with the recommendations of those documents.	Low	Un-known	All	Planning	Ongoing
	Explore possible lane reduction on wide, low-volume roads	Several corridors, including Hines, have been identified as potential candidates for road diets or lane reduction. Such improvements could be made in conjunction with resurfacing, which is currently being planned. Lane reductions could be accompanied by expansion of sidewalks.	Med.	High	5	Engineering NCDOT	
	Pursue NC DOT spot safety funds	Areas that show a history of crashes could be eligible for engineering improvement using dedicated state funds. Project team will work with NC DOT to prepare reports necessary to be considered for these funds.	Low	High	1,5,6	Engineering NCDOT	
Enforcement	Targeted speed enforcement in high-speed areas	Other target locations will be based on findings from HSRC speed studies.	Low	High	2,6	Police	Ongoing (began in Aug 2010)
	Submit requests for enforcement equipment	Requests for additional speed enforcement equipment will be submitted to GHSP on behalf of the Wilson Police Department.	Low	High	2,6	Police	Early 2011
	Conduct speed studies	To determine the best locations for both targeted enforcement and engineering improvements, HSRC will collect speed data on a regular basis. Locations identified as having a speeding problem will be recommended for targeted enforcement.	Med.	n/a	2,6	Police	January 2011 – June 2011, and late 2012

Category	Program/Intervention	Description	Cost	Effectiveness*	Goal(s) Addressed	Community Partner(s)	Timeline
Training and workshops	Designing for Pedestrian Safety courses	As these courses are offered in North Carolina by Federal Highway Administration (FHWA) and NHTSA, partners in Wilson will be offered the opportunity to attend. Courses are typically taught in Charlotte and Raleigh, with others offered as needed.	Low	n/a	4	All	Dec. 2010
	Data Driven Approaches to Crime and Traffic Safety (DDACTS) Training (NHTSA)	This course for law enforcement officers is intended to provide an in-depth look at methods for targeting enforcement efforts by identifying locations that experience both high crime and high crash problems. The approach is supported by NHTSA, and could offer law enforcement officers a new method for more efficiently improving safety by targeting these problem areas.	Low	n/a	4	Police	Fall 2010
	Creating Livable Communities through Public Involvement course	This one-day workshop, taught by Peter Lagerwey, could offer pedestrian safety training to both City staff and residents. The course could possibly be offered as a kick-off event.	Med.	n/a	1,2,3,4	All	April 2011
Promote interagency coordination	Hold quarterly Pedestrian Crash Review meetings	The Pedestrian Crash Review Committee, made up of representatives from various City departments, will meet once each quarter to review the previous quarter's pedestrian crashes and identify other pedestrian safety issues. The committee will also use this opportunity to share information about ongoing safety programs to ensure that efforts are coordinated among various departments.	Low	n/a	4	All	Once each quarter
Audits and field reviews	Conduct periodic field reviews and audits with City staff and NCDOT	City staff will conduct audits of high-crash locations on a regular basis to identify safety concerns and make recommendations for improvements. Recommendations can be forwarded to NC DOT or worked into existing plans.	Low	Med.	4,5,8	All	Ongoing
Coordinate with local businesses	Provide information about parking lot safety	Materials on best practices for parking lot safety and design could be distributed to local business owners. This could help address backing vehicle crashes, as well as general information about pedestrian access.	Low	Low	7	Wilson Business Alliance	
	Generate support/sponsorship for driver pledge program	Local businesses could support a driver pledge program by providing incentives/discounts for individuals who participate.	Low	Low/ Med.	2	Wilson Business Alliance	

* Information about countermeasure/intervention effectiveness was taken from traffic safety literature, primarily NCHRP Report 622: Effectiveness of Behavioral Highway Safety Countermeasures and Countermeasures that Work: A Highway Safety Countermeasure Guide for State Highway Safety Offices

Strategies highlighted above are those that will be pursued as part of the NHTSA pedestrian safety project. Other interventions are recommended for the City to incorporate into ongoing and future programs.

APPENDIX A: Wilson Task Force and Community Partners

Wilson Task Force

A number of individuals representing a variety of agencies have been identified to serve as members of the project task force, who will help finalize, update, and implement the action plan. These individuals will provide critical input at key stages of the project, and will assist the project team by identifying resources and strategies that may enhance project activities. Agencies represented include:

Wilson Planning Department – The Planning Department will be the primary partner and champion within the City of Wilson.

- Rodger Lentz - Director of Planning
- Denise Boswell - Senior Planner, SRTS Coordinator, and Lead Project Coordinator
- Janet Holland - Assistant Director of Planning
- Emily Beddingfield - Planner

Wilson Police – The Police Department has been very supportive of the project, and has provided several officers to assist with project activities. The City has added three new officers to a recently-formed five officer unit known as the Strategic Traffic Enforcement Patrol (STEP) team.

- Captain Scott Biddle
- Lieutenant Eric Smith – data collection and analysis
- Sergeant Jacqui Boykin – Crossing Guard Program Coordinator
- Sergeant Luke Marcum – member of STEP team
- Lieutenant Tad Shelton – member of STEP team
- Officer Ryan Mooring – member of STEP team

Wilson Human Relations – The Wilson Office of Human Relations has worked closely with neighborhood groups in the past, and has a solid network of contacts within many of the neighborhoods. If the project uses a neighborhood-based education/enforcement strategy, the team can work closely with HR to communicate with neighborhood leaders and organize events.

- Renee Smith - Director of the Office of Human Relations

Wilson News Media Contact – Wilson Human Relations works closely with the Wilson Media Contact, who is responsible for producing a weekly video newsletter "Around Town" (http://www.wilsonnc.org/living/media/), managing the City's public access channel (cable channel 22), a Facebook page, and a Twitter account. All could be useful sources to disseminate public safety messages.

- Brian Bowman - Public Affairs Manager

Wilson Public Works/NCDOT – Engineers at the City and State level will help identify locations with pedestrian safety concerns, and can lend their perspective on traffic management, speed, design, and other critical issues.

- Bryant Bunn – City Engineer for Wilson Public Works Department
- Bill Bass – NCDOT District Engineer for Wilson and Nash Counties
- Terry Hopkins – NCDOT State Traffic Safety Engineer
- Haywood Daughtry – NCDOT Area Traffic Engineer
- David Morton – NCDOT Area Traffic Engineer
- Jimmy Taylor – Engineering Services Coordinator for Wilson
- Jake Green – City Engineer for Wilson

Wilson Community Partners

A number of individuals have been identified to serve as partners in action plan development, implementation, or evaluation. The partners will provide much needed on-the-ground support for the project team, as well as information about ongoing activities and potential collaborative efforts. As other partners are identified, this group may grow as the project moves forward. To date, Wilson partners include the following groups and individuals:

Schools – Efforts at reducing crashes among children will dovetail with the SRTS Action Plan. Having identified child crashes as a primary area of concern in Wilson, the project team hopes to use this partnership to assist with any education programs targeted toward children in the community.

- Tommy Finch – Assistant Superintendent for Administrative Services
- Jim Lewis – Wilson County Schools Director of Transportation
- Bob Kendall – Public Affairs
- Leondas Hendricks – teacher leading student video project

Safe Kids Wilson County – Coordinating child pedestrian education efforts with the local Safe Kids coalition will be critical to the success of the project. The local Safe Kids coordinator is Tammy Williford.

- Tammy Williford

Local Colleges – Wilson is home to both Barton College and Wilson Community College. These schools might be helpful in providing students for data collection efforts and other project tasks. Dr. Rusty Stevens, of WCC, is especially supportive of sustainability efforts and will be an asset to the project. Dr. Norval Kneten is the President of Barton College.

- Dr. Rusty Stevens/Dr. Rob Holsten
- Dr. Norval Kneten/Dr. Kelly Thompson

Walkable Wilson – This program is intended to encourage active living among individuals over the age of 55, and was set up through the Upper Coastal Plan Area Agency on Aging, the Wilson County Cooperative Extension, and the Wilson County Health Department. Jody Riddle is the AAA Director for the Upper Coastal Plain COG. Cyndi Lauderdale is the Extension Agent for

Wilson County Cooperative Extension. Felix Meyer is the Director of the Wilson County Health Department.

- Jody Riddle
- Cyndi Lauderdale
- Felix Meyer

WilMed Wellness Program – This is the proactive health and wellness arm of the Wilson Medical Center and would be a great partner. Contact Paula Furiness (Coordinator of the Wellness Program) for more info. http://www.wilmed.org/foundation.asp

- Paula Furiness

Bicycle and Pedestrian Advisory Board:

- Bicycle and Pedestrian Advisory Board – 13 members

City of Wilson Housing Authority – The Housing Authority will provide critical insight into pedestrian safety concerns of lower-income individuals, as well as perspective on accessibility and land-use issues. Edward Jagnandan, the Executive Director, will represent this group.

- Edward Jagnandan – Executive Director, Wilson Housing Authority
- Rossalyn Farmer – Director of Housing Management, Wilson Housing Authority

City of Wilson Transportation – As the City's Transportation Manager, Gronna Jones will provide a great deal of expertise on City-wide transportation issues and concerns. Gronna's involvement will ensure that project goals and activities are consistent with City transportation plans and other ongoing activities.

- Gronna Jones – City of Wilson Transportation Manager

Reid Street Community Center – The Community Center provides a safe environment for youth and community activities, specifically in the Vick neighborhood area. A lack of lighting in the area can sometimes result in potentially unsafe walking environments. The Center could be a source for disseminating pedestrian safety messages, and could also be a candidate for pedestrian safety improvements (e.g. lighting).

Wilson Church Organizations – The church community can be a critical link for disseminating safety messages and engaging the community. A directory of Christian churches in Wilson can be found at http://www.ebiblestories.com/church/nc_wilson_church.shtml.

Wilson District Attorney– For issues related to citations and enforcement, the project team can work with the local District Attorney, Robert A. Evans.

Wilson Fire and Rescue – A critical partner for this project, the Fire Department can provide its assistance with distributing educational messages and other input into project activities.

- Ben Huston

Wilson Energy – For issues related to lighting, Wilson Energy may be an important contact.

- Fred Horne, Director

APPENDIX B: Community Event Opportunities

The following events may represent opportunities for public engagement on pedestrian safety topics. Additional community events can be found at: http://www.wilson-nc.com/events.cfm or http://mywilsontimes.com/calendar/2010-08.

- **Downtown Alive Concerts**
  - http://www.wilsondowntownalive.com/
  - All events take place on Wednesday from 5:30-8:30pm
  - 2011 Schedule[5]:
    - May 4 – Spare Change
    - May 18 – Legend of Beach
    - June 1 – The Embers
    - June 15 – Alabama Blues Brothers
    - June 19 – The Monitors
    - July 13 – Three Bands (5:30-9:00pm)
    - July 27 – The Craig Woolard Band
    - August 10 – Liquid Pleasure
    - August 24 – Hip Pocket Band
    - September 7 – Band of Oz

- **Farmers Market Events**
  - May – September, Saturdays, 7:30-noon

- **African American Family Fun Day**
  - Takes place annually; this years was on July 10, 2010 (http://www.wilsonnc.org/events/id/3013/)

- **Hispanic Outreach Summer Festival**
  - Takes place annually; this years was on July 17, 2010 (http://www.wilsonnc.org/events/id/3014/)

- **First Fridays on the Lawn**
  - Free concert series held on the first Friday of July-October at Wilson County Library
  - 2011 Schedule:
    - July 1
    - August 5
    - September 2
    - October 7

[5] Source: Wilson, NC, Event Calendar (http://www.wilson-nc-downtown.com/events.html)

- **National Night Out**
  - 1st Friday in August
  - The Wilson Police Department will host activities and games at this First Friday in honor of communities taking a stand against crime in their neighborhoods, August 6, 2010 (http://www.wilsonnc.org/events/id/3016/)

- **2010 Whirligig Festival**
  - November 6-7, 2010 (http://www.wilsonwhirligigfestival.com/)

- **Wilson County Fair**
  - http://www.wilsoncountyfair.org
  - September 20-25, 2011

- **Pedestrian and Bicycle Advisory Board Meetings**
  - Every fourth Tuesday of the month

- **Annual Neighborhood Summit**

- **Neighborhood Meetings**

Durham Preliminary Action Plan

DRAFT

September 2010

PURPOSE

The objective of this action plan is to outline potential actions the City of Durham can take, in coordination with the HSRC project team, to address pedestrian safety issues in the City. The role of HSRC is to analyze crash data and recommend best practices in addressing pedestrian safety issues, as well as facilitate communication and coordination among key City champions, stakeholders, and the North Carolina Department of Transportation (NCDOT). HSRC staff can also provide direct technical assistance and support in the development of educational and media messages, and training and assistance to police and planning/engineering staff. The City of Durham will be the primary champion for addressing pedestrian safety issues and a key partner in focusing and implementing this action plan.

BACKGROUND: PEDESTRIAN CRASH OVERVIEW

To identify pedestrian safety trends, the project team analyzed pedestrian crash data from 2003 to 2007 (the last year for which data was available at the time of the analysis). Included with the data were all pedestrian crashes reported to the NC Department of Motor Vehicles during those years. It should be noted that the data does not take into account crashes that were not reported to police or other authorities. These figures do also do not reflect falls, crashes with other bicycles or pedestrians, or other incidents such as those occurring on private property that were not reported to the State Division of Motor Vehicles.

Who is affected by pedestrian crashes?

While Durham is the 5th largest city in North Carolina in terms of population, it ranked fourth in terms of the municipality with the highest number of pedestrian crashes on average over the past 10 years and third over the most recent five years. While the majority of North Carolina communities that rank in the top 10 for pedestrian crashes have generally been trending downward in the number of crashes, Durham has seen an increasing trend. The proportion reported to suffer disabling injuries in Durham is higher than for other urban areas of the State at 11.5 percent and is more comparable to rural areas.

Durham also ranked higher than the State as a whole in the proportions of children involved in pedestrian collisions. From 2003-2007, children up to age 15 accounted for 18 percent of pedestrians reported struck in Durham compared with 16 percent Statewide. In 2004, 11 children 5 and under were struck. Other groups that are more highly represented than for the State as a whole include young adults ages 26 to 30, adults aged 41 to 50, and adults over the age of 70.

Blacks accounted for 59 percent of pedestrians involved in collisions over this time period, which is over-representative of the population (44 percent in 2000) and much higher than the state average of 21.6 percent. White residents account edfor 25 percent of pedestrian collisions (and are under-represented based on population), and Hispanics 10.4 percent (compared to 6.6 percent Statewide).

What is the cost of pedestrian crashes?

In 2007, the most recent year compiled and analyzed to date, 112 pedestrians were reported to be involved in crashes in the City of Durham. Three pedestrians were killed and 10 were reported to be seriously injured. The cost of these pedestrian crashes, for individuals and the community as a whole, is a significant burden. The National Safety Council estimates the average comprehensive cost of a motor-vehicle crash, by injury. Applying these costs to the pedestrian crashes that occurred in Durham in 2007 alone, the cost of these injuries is nearly $18 million (see Table 1). The crash costs are higher when children are involved, as children have more life-years lost in crashes compared to other pedestrians.

Table 1. Durham Average Comprehensive Cost (Per Person) by Injury Severity, 2007

Pedestrian Injury	2007 Totals[1]	Average Comprehensive Cost (Per Person) by Injury Severity, 2007[2]	Total Comprehensive Cost
K Killed	3	$4,100,000	$12,300,000
A Type Injury (disabling)	10	$208,500	$2,085,000
B Type Injury (evident)	41	$53,200	$2,181,200
C Type Injury (possible)	48	$25,300	$1,214,400
O No Injury	6	$2,300	$13,800
Unknown	4	unknown	
Totals	**112**		**$17,794,400**

What types of pedestrian crashes are occurring, and when?

Over all pedestrian-motor vehicle crash types, a similar proportion of the (reported) pedestrian collisions in Durham occurred at non-intersection locations (36 percent) - that is midblock locations such as at or near driveways or in-between junctions - and locations at or related to an intersection (35 percent). Parking lots, driveways and other off-roadway areas together accounted for the remainder, with 29 percent of collisions occurring in those areas.

Pedestrians of different ages tend to be differentially involved in different types of collisions in Durham. Adults in general were over-represented in collisions in which the motorist did not

[1] Pedestrian Injuries. NCDOT Division of Bicycle and Pedestrian Transportation. http://www.pedbikeinfo.org/pbcat/ped_main.htm

[2] National Safety Council. http://www.nsc.org/resources/issues/estcost.aspx

yield, while younger pedestrians were especially observed in collisions in which they darted out from behind something into the roadway.

Fall months accounted for the most pedestrian crashes in Durham, particularly September, followed by December and October. Friday is the highest crash day on average. The peak time of day for pedestrian crashes was evening hours from 6 to 10 pm. One-third (33% percent) of all of Durham's pedestrian collisions occurred during those hours, compared to 26 percent that occurred from 6 to 9 pm for the State as a whole.

Where are these crashes occurring?

The map below (Figure 1) illustrates where pedestrian collisions were concentrated over the five years from 2004-2008. (Note that since the preceding crash factors were analyzed, 2008 data were processed and available for analysis, thus, the spatial analyses focus on 2004-2008.). The areas of blue and red highlight the higher crash density zones (from 50 to 75 percent and 75 to 100 percent, respectively, above the average crash density across the entire city).

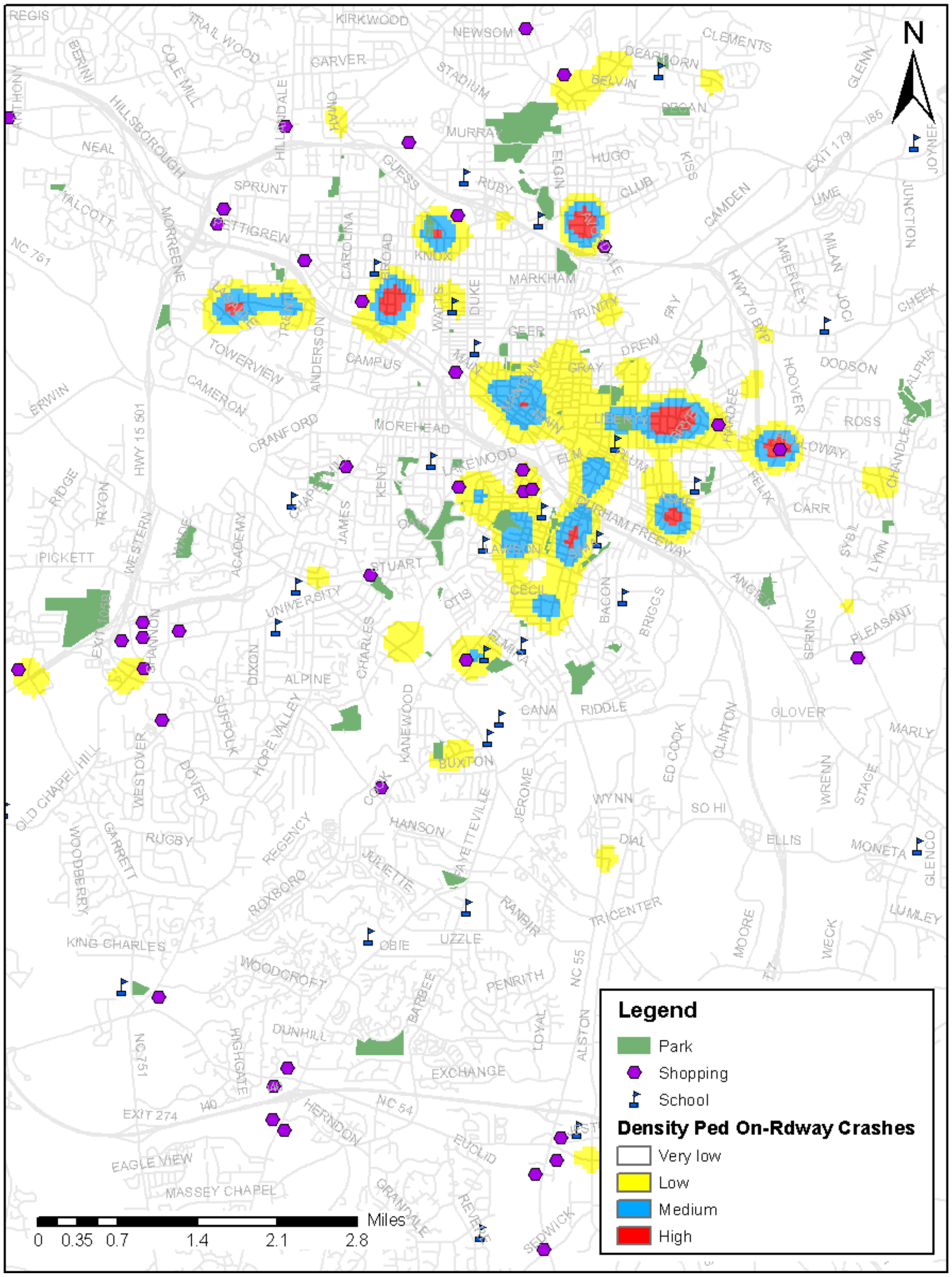


Figure 1. Durham On-Roadway Pedestrian Crash Hotspots, 2004 – 2008

The map in Figure 2 shows off-roadway areas in Durham where pedestrian crashes are concentrated. Many of these seem to be associated with shopping center/area parking.

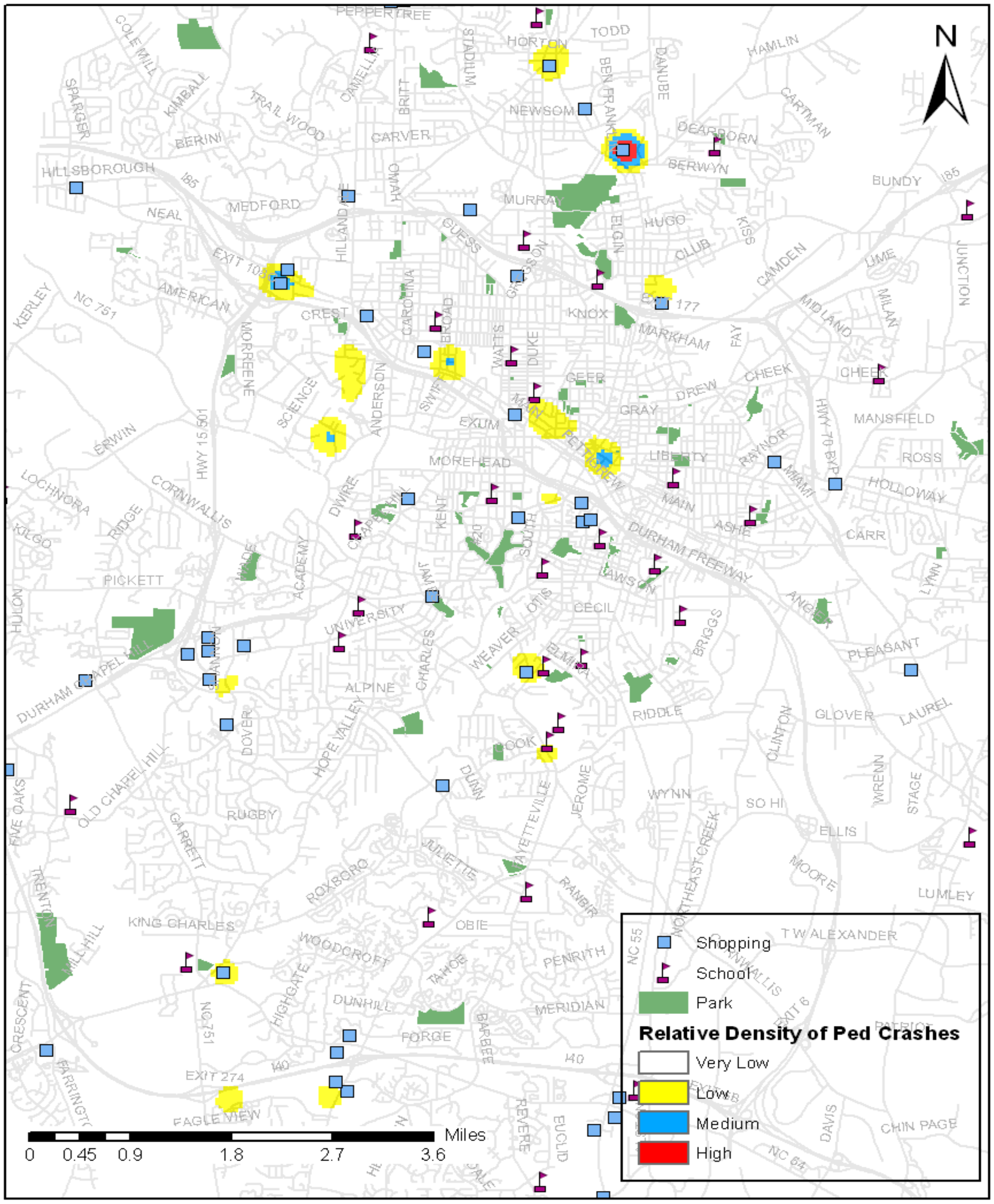


Figure 2. Pedestrian Off-Roadway Crash Hotspots, 2004-2008.

What can be done about these issues?

The project team, in consultation with local partners, has identified seven goals for improving pedestrian safety in Durham:

1. Reduce child pedestrian crashes
2. Increase driver awareness of pedestrians and improve driver yielding and compliance with other traffic laws
3. Improve pedestrian behaviors

4. Improve safety around bus stops
5. Reduce occurrence of midblock crashes
6. Reduce instances of backing vehicle and parking related crashes
7. Improve safety at intersections

These goals are supported by crash data analyses, field observations, and existing priorities and recommendations from Durham's pedestrian plan. The following section discusses these goals in detail.

ACTION PLAN

The action plan is intended to identify specific areas of interest within the City of Durham, and provide recommendations for potential strategies to address pedestrian safety issues observed in those areas. The overall action plan must provide a comprehensive set of countermeasures (including education, engineering, enforcement, and planning/policy change) while prioritizing activities based on available resources and partnership interests. The following pedestrian safety focus areas were identified by the HSRC project team through detailed discussion with community stakeholders, review of existing pedestrian resources, analysis of crash data, and preliminary field visits. Additional areas of interest may develop as the project progresses, and the action plan should be a living, working document to accommodate changes to pedestrian safety issues and trends over time. The following goals listed in this action are not listed in a prioritized order, and each of these goals and actions are equally important.

Goal #1: Reduce Child Pedestrian Crashes

- **Scope of the problem:** Children up to age 15 have accounted for 18 percent of pedestrians struck in Durham from 2003-2007 which is slightly higher than the State average of 16 percent for this age group. An analysis of child pedestrian crashes near schools is shown (Figure 3) and identifies several schools in east Durham. There were 20 schools altogether with one or more collisions involving children from 5 to 15 years within ½ mile of the school. Child pedestrian crashes citywide were also analyzed to identify the areas most prone to child pedestrian crashes (Figure 4). East Durham, particularly the Alston Avenue corridor, is identified as an area with a higher than average child crash problem.

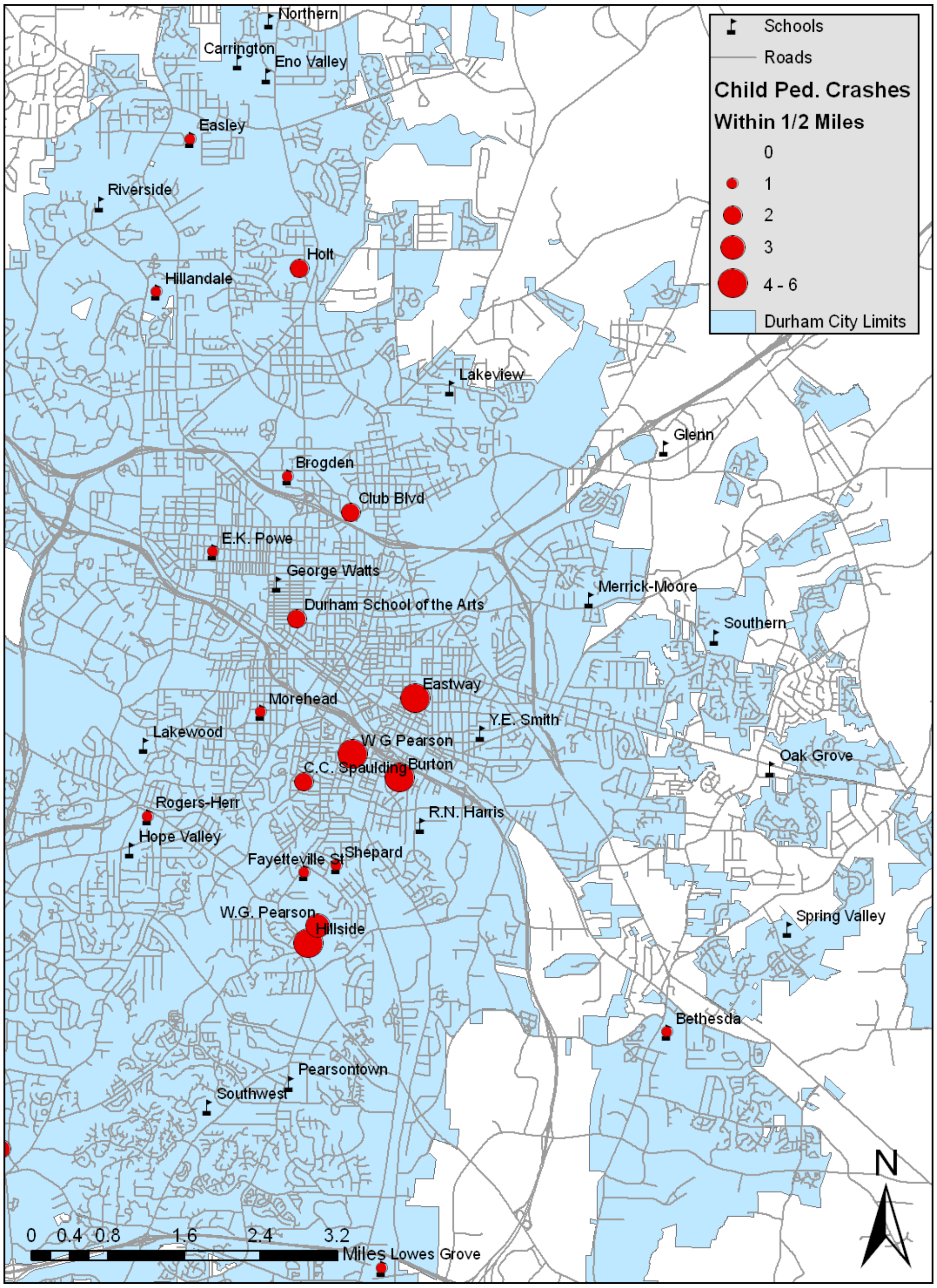


Figure 3. Durham Pedestrian Crashes Within ½ Mile of a School

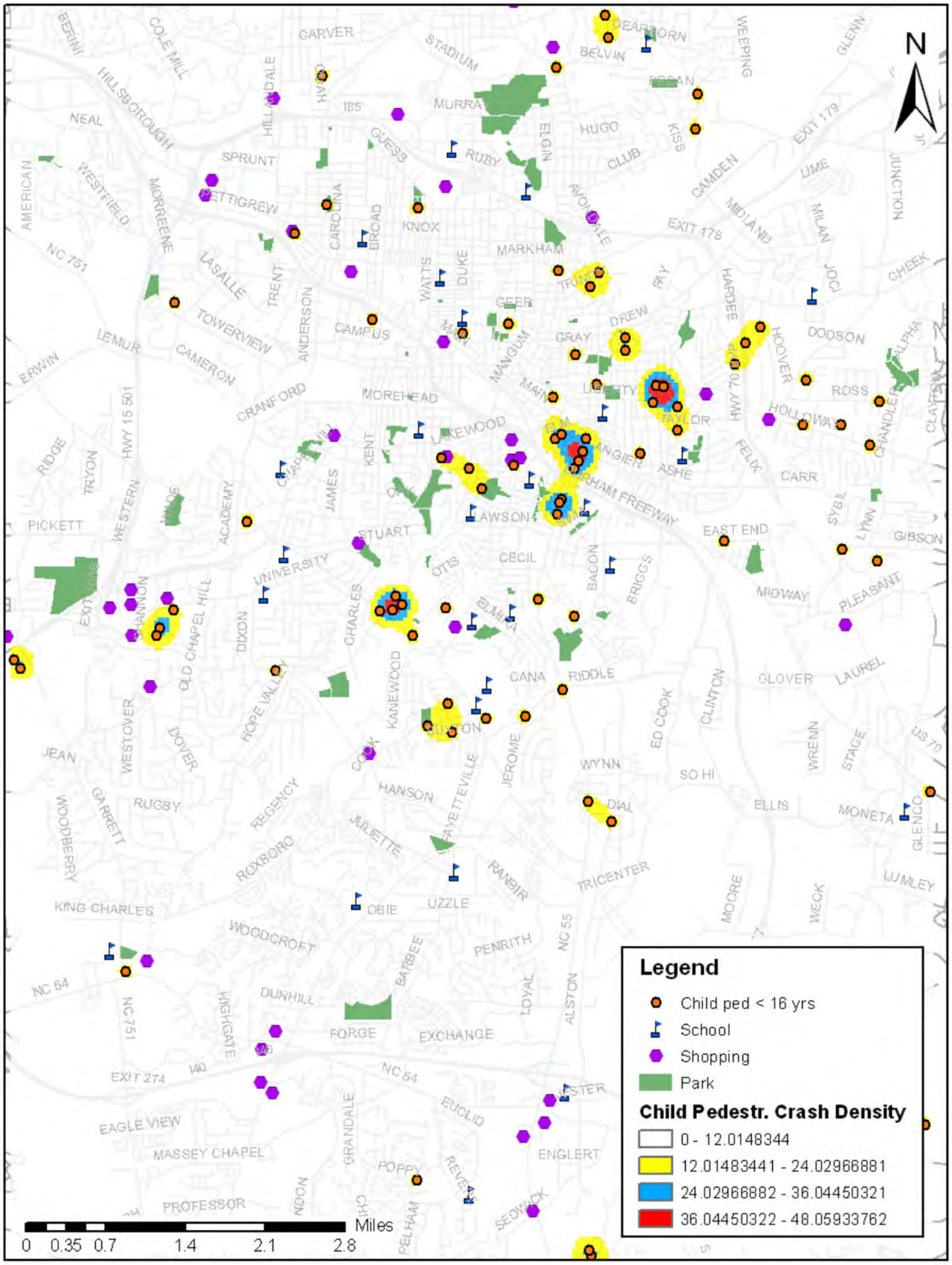


Figure 4. Child Pedestrian Crashes, 2004-2008

- **Documentation:** During site visits, some teenagers in east Durham were observed walking and standing in roads, even where sidewalks were provided. The crash history identifies younger pedestrians as over-represented in collisions where they ran or darted out into the roadway and in walking along the roadway crashes. The majority of child pedestrian crashes are not located near schools but do tend to cluster in neighborhoods.
- **History:** Durham has received state funding for Safe Routes to School (SRTS) at several local elementary schools. These programs have focused mostly on infrastructure improvements in the school area, though some elementary schools have organized Walk to School Days. The City also has a comprehensive traffic calming program that regularly installs speed humps. In addition, the Durham Pedestrian Plan places a top priority on child safety. One of the primary goals of the plan is to increase the safety and security of pedestrian facilities, with a focus on schools, while another goal seeks to ensure that pedestrian considerations are included in all transportation and land use decisions. In particular, priority for pedestrian improvements should be granted to areas within a quarter mile of schools and for projects that link existing greenway and pedestrian systems. New proposals for schools should also emphasize pedestrian connectivity and safety.
- **Proposed Interventions:** Countermeasures for both very young and school-aged child pedestrian crashes should be considered. East Durham could be a focus area for initial efforts. Specific interventions could include:
    - To address crashes among the youngest children, Durham could consider a city-wide or neighborhood-based campaign to raise care-giver awareness of child pedestrian safety needs, including local workshops, community education events, presentations to the PTAs and parent-oriented organizations, and broad media messages.
    - Coordinate with existing SRTS project to help implement local school plans, including any recommended engineering improvements to be made or school crossing guard programs.
    - Coordinate and promote the development and deployment of child pedestrian/bicycle safety education and skills training at all Durham elementary schools.

Figure 5: Child Pedestrian Darting Out Into the Roadway

- **Scope of Intervention:** SRTS plans and education programs could be focused on the 29 elementary schools in Durham. A public education campaign targeting care givers can focus first in east Durham, as well as be provided city-wide.
- **Role of HSRC:** HSRC can provide expertise in developing and executing a media campaign; developing, purchasing, and distributing materials; collaborating with the SRTS project and sharing/analyzing data; and assisting with workshop/event development. HSRC can also provide training and consultants to foster the development of a child safety curriculum.
- **Role of community partners:** Partners are needed to identify, coordinate, and host local events and workshops, work with school-related stakeholders, and deliver school-based training to children. Partners will likely include representatives of the Durham school district, the local SafeKids group, the PTA, etc. Broader, non-school partners will be needed to help develop and disseminate safety messages, including interfaith organizations, local media, the Partners Against Crime group, and the InterNeighborhood Council.
- **Timeline:** Development of safety messages and a media/marketing plan can be developed, starting immediately. Further discussion is needed with local partners to determine a realistic schedule for other activities.
- **Available Resources:**
  - Walking Safely (NHTSA): Tip sheets that provide safety information to parents of children ages (http://www.nhtsa.gov/people/injury/childps/newtips/pages/Tip7.htm) and 5-10 (http://www.nhtsa.gov/people/injury/childps/newtips/pages/Tip8.htm)

- A Kid's Guide to Safe Walking (NHTSA): Brochure containing important pedestrian safety messages for children (http://www.nhtsa.gov/DOT/NHTSA/Traffic%20Injury%20Control/Articles/Associated%20Files/811026.pdf)
- Pedestrian Safer Journey (FHWA): Interactive web site focusing on safety awareness (http://safety.fhwa.dot.gov/saferjourney/index.htm)
- Prevent Pedestrian Crashes: Parents and Caregivers of Elementary School Children (NHTSA): This brochure provides pedestrian safety tips for caregivers and parents, and dispels common pedestrian safety myths (http://www.nhtsa.gov/DOT/NHTSA/Traffic%20Injury%20Control/Articles/Associated%20Files/811027.pdf)

Goal #2: Increase Driver Awareness of Pedestrians and Yielding Laws

- **Scope of the problem:** Sixty-one percent of Durham's crashes occurred in the 8 hour time period from 2pm to 10pm, a time that largely coincides with the post-work peak travel period. Nearly 30 percent of pedestrian crashes occurred at intersections and "Turning Vehicles" striking pedestrians accounted for nearly nine percent of collisions. Older adult pedestrians were over-represented in collisions with turning vehicles.
- **Documentation:** At several intersections observed during the site visits, wide curb radii and exclusive turn lanes contribute to high turning speeds, which further increase potential conflicts between drivers and pedestrians.

Figure 6: Driver Yielding to Pedestrians in Crosswalk

- **History:** Recently, pedestrian yield signs have been installed both in-road and near signal heads at key crossings in Durham. The Durham Pedestrian Plan also includes language stipulating the implementation of both driver and pedestrian safety awareness and enforcement programs. In addition, engineering treatments are also discussed in the Plan, including narrowing the roadway, installing pedestrian refuge islands, and creating pedestrian-oriented roadway lighting, among others. Via these treatments and roadway design changes, a strong message is conveyed to motorists that pedestrians have equal access to the roadway.

- **Proposed Interventions:**
  - Broad public information campaign, including the dissemination of Durham's educational brochures, media messages, and community workshops
  - Consider infrastructure changes, such as reducing curb radii, traffic calming devices, consolidating driveways, banning right turns on red, or yielding signage to assist drivers in slowing at intersections and improve the yielding rate to pedestrians.
  - Consider enforcement operations, such as sting operations, or speed programs to slow speeds and improve driver yielding to pedestrians in signalized intersections; these operations could be focused on peak hours where traffic volumes and potential collisions with pedestrians are highest.

Figure 7: Yield to Pedestrians Sign at LaSalle Street

- **Scope of the intervention:** The media campaign will be city-wide. Specific intersections to target for engineering and/or enforcement programs could include Erwin and Lasalle, Northgate Mall entrances on Guess Road, and Club and Roxboro.
- **Role of HSRC:** HSRC can assist with identifying high-crash intersections and corridors to focus enforcement or engineering improvements, and can develop materials and work with local agencies to disseminate a broad public awareness campaign.

- **Role of community partners:** Local and state traffic engineers would need to consider changes at intersections, and enforcement officers would need to lead any speed or yielding focused campaigns. Broad community partners would be needed to organize, host, and disseminate educational messages.
- **Timeline:** Development of media materials could begin immediately. If enforcement or engineering efforts are planned, HSRC staff would need to ensure that baseline data is collected before and after any intervention.
- **Available Resources:**
    - Educating Adult Pedestrians (PBC): This page provides links and resources for educating adults about pedestrian safety (http://www.walkinginfo.org/education/messages-adult.cfm)
    - Pedestrian Safety Campaign (FHWA): The pedestrian safety campaign includes instructions for running a successful campaign and downloadable materials such as posters, brochures, and PSAs (http://safety.fhwa.dot.gov/local_rural/pedcampaign/guide.htm)
    - Walk Wise, Drive Smart (NHTSA): This pedestrian safety program was aimed at improving walkability for older adults in Hendersonville, NC (http://www.walkinginfo.org/library/details.cfm?id=4350)

Goal #3: Improve Pedestrian Behaviors

- **Scope of the problem:** Some of the largest groups of crash types were "Pedestrian Failure to Yield" and "Dart-Outs and Dashes." "Dart-outs" involve pedestrians suddenly emerging from a location that was blocked from view by the motorist until an instant before impact – such as from behind a parked car, building or shrubbery. "Dashes" involve pedestrians running or dashing into the street, but not from an obscured location. Children were over-represented in dart-out and dash types of collisions. "Pedestrian Failure to Yield" implies the pedestrian was crossing the roadway, either against a traffic signal indication, or at an undesignated location (such as a midblock area with no crosswalk) and failed to yield to traffic, but should not necessarily be taken to imply fault.
- About 25 percent of Durham pedestrians involved in reported collisions identified as White, 59 percent as Black, and about 10 percent as Hispanic; Black pedestrians are overrepresented in crashes, relative to their makeup in the community.
- Unsafe pedestrian behaviors may be exacerbated by poor pedestrian accommodation, such as lack of (or poorly maintained) sidewalks that force pedestrians into the road, or unsafe intersections or widely-spaced pedestrian crossings that lead pedestrians to choose to dart across a street midblock.
- **Documentation:** During site visits, project staff observed numerous locations lacking sidewalks or locations with broken or obstructed sidewalks, around which many pedestrians were still walking, either on goat trails or in the street, with or against traffic. Additionally, young adults were seen walking in the street even when sidewalks were provided. The site visits and crash mapping has also identified several corridors

with midblock crossing problems. In particular, Erwin Road near the Duke and VA Medical Centers has a crash problem with many pedestrians choosing to cross midblock.

- **History:** The City has been working to fill the missing gaps in the sidewalk network as identified by the Pedestrian Plan. The primary funding sources have been a sidewalk bond and Federal stimulus funding. Additionally, the Plan calls for higher quality standards and better maintenance of pedestrian facilities. Pedestrian-friendly improvements can also help improve pedestrian behavior through engineering, according to the Plan.

Figure 8: Midblock Crossing to Access McDonald's

- **Proposed Interventions:**
    - A public education campaign could provide basic walking messages, such as "Walk Against Traffic" that might have a limited effect, but Walking along roadway crashes could be prevented or significantly reduced with the construction or improvement of sidewalks.
    - A public education campaign could provide basic crossing messages, such as "Look Both Ways" that might have a limited effect, but dart/dash crashes could be more significantly reduced with the construction of facilities such as high visibility crosswalks, medians or crossing islands, pedestrian countdown signals, or traffic calming measures.
  - **Scope of Intervention:** City-wide, or at spot intersections/corridors
  - **Role of HSRC:** HSRC can assist with identifying high-crash intersections and corridors to focus engineering improvements, and can develop materials and work with local agencies to disseminate a broad public awareness campaign.

- **Role of community partners:** Local and state traffic engineers would need to consider changes at intersections. Broad community partners would be needed to organize, host, and disseminate educational messages.
- **Timeline:** Development of media materials could begin immediately. If engineering efforts are planned, HSRC staff would need to ensure that baseline data is collected before and after any intervention.
- **Available Resources:**
    - Educating Adult Pedestrians (PBC): This page provides links and resources for educating adults about pedestrian safety (http://www.walkinginfo.org/education/messages-adult.cfm)
    - Pedestrian Safety Campaign (FHWA): The pedestrian safety campaign includes instructions for running a successful campaign and downloadable materials such as posters, brochures, and PSAs (http://safety.fhwa.dot.gov/local_rural/pedcampaign/guide.htm)
    - Walk Wise, Drive Smart (NHTSA): This pedestrian safety program was aimed at improving walkability for older adults in Hendersonville, NC (http://www.walkinginfo.org/library/details.cfm?id=4350)

Figure 9: Midblock Crossing

Goal #4: Improve Safety Around Bus Stops

- **Scope of the problem:** Durham has bus service provided by several agencies. Local service is provided by the Durham Area Transit Agency (DATA), regional service is provided by Triangle Transit, and Duke University runs many routes both on- and off-campus. Several pedestrian crashes, including fatalities, have occurred near midblock bus stops.

- **Documentation:** Field visits confirmed that many transit users will cross midblock to reach a bus stop.
- **History:** The Durham Pedestrian Plan includes provisions to increase connectivity between transportation systems, specifically between transit, and walking, but also with bicycling. Education and encouragement initiatives are also called for in the Plan, but specific measures to improve safety around bus stops are not explicitly mentioned, except with regard to locating bus stops in close proximity to each other to avoid requiring patrons to cross the street when transferring between buses.

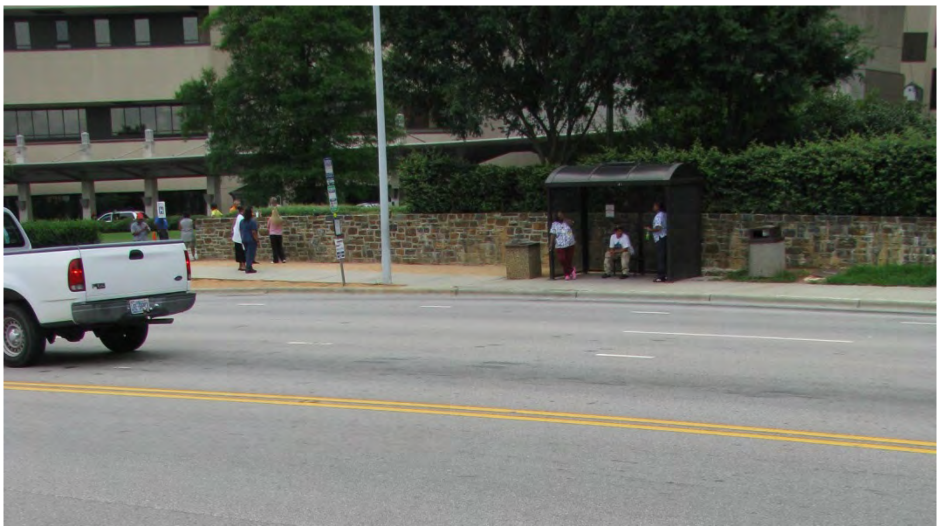


Figure 10: Busy Bus Stop

- **Proposed Interventions:**
    - Durham staff and partners have requested additional training and guidance on pedestrian safety, planning, and design issues. HSRC has committed to providing each community up to two professional training courses/workshops
    - Development of an inter-agency pedestrian safety group to review pedestrian crashes at the end of the month and discuss potential approaches to prevent similar crashes in the future. The group could be comprised of HSRC researchers, Durham Planning and Public Works Staff, and City Police.

Figure 11: Midblock Transit Stop

- **Scope of intervention:** Internal to Durham City staff
- **Role of HSRC:** HSRC can assist with identifying high-crash and dangerously located stops to focus engineering improvements, and can develop materials and work with local agencies to disseminate a broad public awareness campaign.
- **Role of community partners:** Local and state traffic engineers would need to consider changes at intersections. Broad community partners would be needed to organize, host, and disseminate educational messages. The transit agencies will need to provide support and training.
- **Timeline:** Must discuss with local partners
- **Available Resources:**
    - Pedestrian Safety Guide for Transit Agencies (FHWA): This guide provides an overview of pedestrian safety issues related to transit stops and routes (http://www.walkinginfo.org/library/details.cfm?id=4231)
    - Toolkit for the Assessment of Bus Stop Accessibility and Safety (Easter Seals Project ACTION): This tool can be used to identify and address accessibility concerns around transit stops (http://projectaction.easterseals.com/site/PageServer?pagename=ESPA_BusStopToolkit)

Figure 12: Crossing to a Bus Stop

Goal #5: Reduce Occurrence of Midblock Crashes

- **Scope of the problem:** A significant portion of Durham's pedestrian crashes occur on or near high-volume, higher-speed arterial streets that bisect and separate neighborhoods from nearby commercial centers or pedestrian destinations. Many of these neighborhoods are lower-income, minority areas where access to vehicles is low and the need to walk to nearby businesses for work and for shopping is high. The largest proportion, 36 percent, of the (reported) pedestrian collisions in Durham occurred at non-intersection locations – that is, midblock locations such as at or near driveways or in-between intersections.
- **Documentation:** A number of arterial, state-owned corridors (including Erwin, Alston, Roxboro, and Miami) in Durham have a similar set of pedestrian concerns: wide, 5-lane roads with high traffic volumes, likely speed problems, and long distances between signalized intersections and with no formal midblock crossings. Along these corridors, there are typically numerous driveways and a fragmented sidewalk system, if sidewalks are present at all. At the intersections, there are typically few pedestrian amenities, such as crosswalks (no high visibility crosswalks observed), pedestrian signals, crossing islands, or facilities to reduce the crossing time or distance for pedestrians.

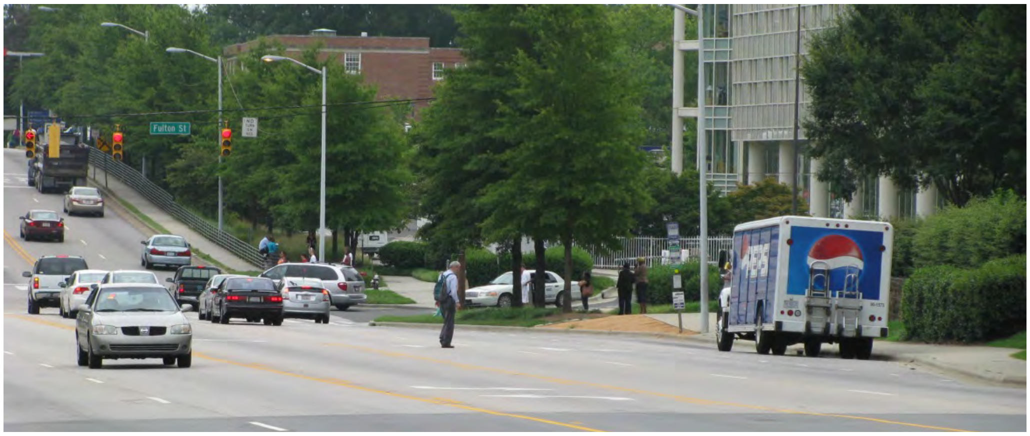


Figure 13. Pedestrian Crossing Midblock at Erwin Road near the Duke Medical Center

Figure 14. Pedestrian Crossing Midblock on Roxboro Road near Club Boulevard

- **History:** The Durham Pedestrian Plan contains some guidance, referenced from a Charlotte Department of Transportation and Federal Highway Administration research project, on the conditions necessary to install midblock crossings. The Plan indicates that locations with higher pedestrian volumes, lower numbers of vehicles, and low vehicle speeds could benefit from midblock crossings if designed and located properly. Each of these locations, however, would have to be examined and evaluated individually by the City of Durham Transportation and Engineering Divisions.

- **Proposed Interventions:**
  - Consider intersection improvements, traffic calming measures, and the development of midblock crossing points at key pedestrian crossing points
  - Work with local engineers to conduct more detailed safety audits, review crash data, and discuss recommendations
  - Speed studies and speed enforcement on roadways with high travel speeds
- **Scope of intervention:** City-wide or focused on select high-crash corridors. Enforcement could also be focused during times of day and months when more collisions occur.
- **Role of HSRC:** Work with local police and engineers to review data and discuss alternatives; potentially provide some level of funding or collaborate on proposal development to raise funds for capital improvements
- **Role of community partners:**
- **Timeline:** Must discuss with local partners
- **Available Resources:**
  - Walkability Checklist (NHTSA/FHWA): This tool can be used by community members to assess local pedestrian safety and walkability (http://www.walkinginfo.org/library/details.cfm?id=12)
  - Pedestrian Road Safety Audit Guidelines and Prompt Lists (FHWA): This comprehensive guide allows engineers, planners, and other professionals to assess local conditions and identify pedestrian safety concerns (http://www.walkinginfo.org/library/details.cfm?id=3955)
  - Countermeasures that Work (NHTSA): This report provides a comprehensive overview of effective traffic safety countermeasures, including pedestrian safety countermeasures (http://www.walkinginfo.org/library/details.cfm?id=4510)
  - Safety Effects of Marked vs. Unmarked Crosswalks at Uncontrolled Locations (FHWA): This report provides details on the effectiveness of different crosswalk treatments.(http://www.walkinginfo.org/training/collateral/resources/Effects_Un_MarkedCrosswalks_Summary.pdf)

Goal #6: Reduce Instances of Backing Vehicle and Parking Related Crashes

- **Scope of the problem:** “Backing Vehicle” (predominantly in parking areas and driveways) and other “Off-roadway” collisions together accounted for more than one-quarter (27.4 percent) of collisions. Overall, 29.2 percent of crashes occurred at non-roadway locations.
- **Documentation:** Several parking lots in Durham show clusters of pedestrian crashes.
- **History:** Guidelines for the design of parking facilities with a focus on pedestrian safety is provided in the Durham Pedestrian Plan. The recommendations include providing seamless transitions between the street and the parking lot, maintaining sightlines in

parking lots, ensuring that the crossing to the store entrance is clearly delineated, and that lighting should be adequate for the use of the parking lot.

Figure 15: Driveway Exit onto Road

- **Proposed Intervention:**
    - Working with local businesses and developers to promote pedestrian safety in parking lots
    - Complete Streets ordinances to require new developments to have sidewalks and other ped/bike amenities along development and up to store frontage
- **Scope: site specific**
- **Role of HSRC:** Identify priority sites and provide guidance on parking lot design best practices
- **Role of community partners:** Work with local business owners, chamber of commerce, etc., and town staff and boards to review parking design standards and update plans; see about making improvements to retrofit existing parking lots
- **Timeline:** Work can start immediately
- **Available Resources:**
    - Complete Streets Resource Toolkit (SACOG): This CD ROM includes more than 150 resources related to developing and implementing Complete Streets policies (http://www.sacog.org/complete-streets/toolkit/files/order-cdrom.html)

Goal #7: Improve Safety at Intersections

- **Scope of the problem:** Intersection or intersection related crashes account for over one third (34.9 percent) of all pedestrian crashes in Durham. This rate is much higher than the statewide average of 23.7 percent.
- **Documentation:** Site visits revealed many intersection hazards including turning vehicles not yielding to pedestrians, missing crosswalks, and long cycle lengths causing impatient pedestrians to cross against the light.
- **History:** The first goal of the Pedestrian Plan is to increase the number of pedestrian facilities, which includes pedestrian safety improvements at intersections. The plan outlines a method for prioritizing improvements and lists numerous projects that have involved improving intersection safety for pedestrians.

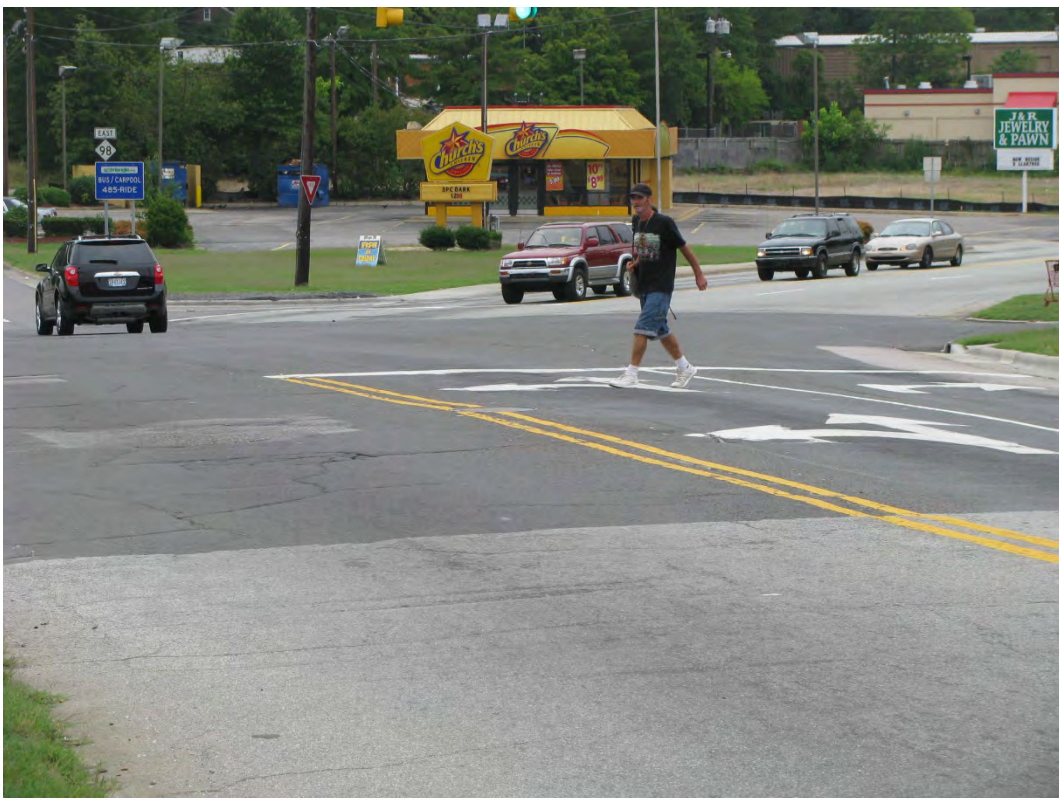


Figure 16: Intersection Lacking Striped Crosswalk

- **Proposed Interventions:**
  - Consider infrastructure changes, such as reducing curb radii, traffic calming devices, consolidating driveways, banning right turns on red, or yielding signage to assist drivers in slowing at intersections and improve the yielding rate to pedestrians

    - Consider enforcement operations, such as sting operations, or speed programs to slow speeds and improve driver yielding to pedestrians in signalized intersections.
- **Scope of the intervention:** The media campaign will be city-wide. Specific intersections to target for engineering and/or enforcement programs could include Erwin and Lasalle, Northgate Mall entrances on Guess Road, and Club and Roxboro.
- **Role of HSRC:** HSRC can assist with identifying high-crash intersections and corridors to focus enforcement or engineering improvements, can develop materials and work with local agencies to disseminate a broad public awareness campaign, and can provide training.

Figure 17: Crossing a Wide Intersection

- **Role of community partners:** Local and state traffic engineers would need to consider changes at intersections, and enforcement officers would need to lead any speed or yielding focused campaigns. Broad community partners would be needed to organize, host, and disseminate educational messages.
- **Timeline:** Development of media materials could begin immediately. If enforcement or engineering efforts are planned, HSRC staff would need to ensure that baseline data is collected before and after any intervention. Training will be provided as needed.
- **Available Resources:**
    - Pedestrian Safety Training and Resource Guide (NHTSA): This interactive training course provides law enforcement officials with a background on enforcing laws for improving pedestrian safety

- Toolbox of Countermeasures and their Potential Effectiveness for Pedestrian Crashes (FHWA): This collection of crash reduction factors (CRFs) explains the expected reduction in crashes for a given treatment (http://www.walkinginfo.org/training/collateral/resources/pedToolboxofCountermeasures.pdf)
- Countermeasures that Work (NHTSA): This report provides a comprehensive overview of effective traffic safety countermeasures, including pedestrian safety countermeasures (http://www.walkinginfo.org/library/details.cfm?id=4510)

Figure 18: Faded Crosswalks

CONCLUSION

In sum, a comprehensive set of measures, both short and longer term, is needed to more effectively address pedestrian safety in Durham. Many of these measures can dovetail with existing efforts or leverage existing partnerships and resources available in the community. The following matrix provides a graphic representation of which types of products or programs are most appropriate for each goal, based on the proposed interventions.

Table 2. Matrix of pedestrian safety goals and recommended interventions/countermeasures

Interventions and Countermeasure Strategies	Goal 1	Goal 2	Goal 3	Goal 4	Goal 5	Goal 6	Goal 7
	Reduce Child Crashes	Improve Driver Behavior	Improve Pedestrian Behavior	Improve Safety around Bus Stops	Reduce Midblock Crashes	Reduce Backing Vehicle Crashes	Improve Safety at Intersections
Community-wide media/education campaign	■	■	■	■			
School-based programs	■						
Coordinate with community planning	■			■	■	■	■
Engineering improvements		■	■	■	■		■
Yielding and speed enforcement		■	■	■	■		■
Training and workshops	■	■		■			■
Promote interagency coordination				■			■
Audits and field reviews				■	■		■
Coordinate with local businesses						■	

Many of these measures can dovetail with existing efforts or leverage existing partnerships and resources available in the community.

APPENDIX A: Durham Partners

A number of individuals representing a variety of agencies have been identified to serve as members of the project working group, who will help finalize, update, and implement the action plan. These individuals will provide critical input at key stages of the project, and will assist the project team by identifying resources and strategies that may enhance project activities. Agencies represented include:

Durham Department of Transportation – The Department of Transportation will be the primary partner and champion within the City of Durham. The Director is Mark Ahrendsen, the Chief Traffic Engineer is Phil Loziuk, the Bicycle and Pedestrian Coordinator is Dale McKeel, and the Planning Director is Steven Medlin.

Durham Police – The Police Department has been very supportive of the project, and has provided a staff member to assist with project activities. In particular, we will be working with the Traffic Services unit, Sergeant Todd Willett. Additionally, DPD runs the Partners Against Crime program which is a valuable community outreach and education mechanism.

Durham SafeKids – The Durham SafeKids Coordinator is Theresa Cromling

Durham Public Works/NCDOT – Engineers at the City and State level will help identify locations with pedestrian safety concerns, and can lend their perspective on traffic management, speed, design, and other critical issues.

Schools – As the SRTS project moves forward, the City of Durham will be relying upon its relationship with local schools and the school board. Having identified child crashes as a primary area of concern in Durham, the project team hopes to use this partnership to assist with any education programs targeted toward children in the community. Hugh Osteen is the Deputy Superintendent for Facilities and Transportation and Heidi Carter is a School Board member.

Local Colleges – The largest colleges in Durham are Duke University and North Carolina Central University. These schools might be helpful for education opportunities and in providing students for data collection efforts and other project tasks. Eric Hester with the Duke Police Department, Phail Wynn with the Intergovernmental Relations department, Starla Huggins with the NCCU Government Affairs, Kevin Rome, NCCU Vice Chancellor for Student Affairs, and Erica Dixon, Director of NCCU Campus Recreation and Wellness, may provide help.

Bicycle and Pedestrian Advisory Commission: This commission, chaired by Alan Dippy, meets monthly and has a Pedestrian Plan subcommittee chaired by Greg Garneau.

Durham City Council: Durham City Council has historically been in favor of pedestrian improvements in the city. Councilman Mike Woodard regularly attends the Bicycle and Pedestrian Advisory Commission meetings

Transit Agencies: Chassem Anderson with the Durham Area Transit Agency and John Tallmadge with Triangle Transit will be important contacts.

Durham CAN: Durham CAN (Congregations, Associations and Neighborhoods) is a multi-racial, multi-faith, strictly non-partisan, countywide citizens' organization that has a vast network within the City. Ivan Kohar is the lead organizer.

InterNeighborhood Council: The Durham InterNeighborhood Council is a coalition of Durham's neighborhood and homeowner's associations. This organization could be an effective tool for disseminating information to specific neighborhoods or all of Durham. The President is Tom Miller.

Clean Energy Durham: Clean Energy Durham is a non-profit organization promoting safer and cleaner energy by creating neighborhood level organizations that allow neighbors to help other neighbors save energy. Clean Energy Durham provides educational materials, workshops, networking, and training. http://www.cleanenergydurham.org/
Judy Kincaid – Executive Director

Durham Open Space and Trails Commission (DOST): The Durham Open Space and Trials Commission is an advisory board whose primary purpose is to provide information and advice to the City Council and the County Board of Commissioners on trail development and open space preservation issues such as maintaining the natural resources of Durham and developing recreational trails and transportation facilities for pedestrians and bicyclists. DOST has prepared several greenways, pedestrian, and bicycle plans and founded the Bicycle and Pedestrian Advisory Commission in 2000. http://www.bikewalkdurham.org/dost/
Tom Stark – Chair
R. Kelly Bryant – Chair-Trails
Josie Owen-McNeil – Chair-Open Space

Partnership for a Healthy Durham (Health Dept): The Partnership for a Healthy Durham is made up of community members and organizations all working towards improving the health and well-being of the residents of Durham. There are seven committees focusing on health issues including issues like injury prevention or obesity and chronic disease.
http://www.healthydurham.org/
Mel Downey-Piper - Coordinator

Northeast Central Durham Leadership Council: The Northeast Central Durham Leadership Council is an 18 member group of community leaders, residents, and business owners that represent more than 10 neighborhoods. Their main mission is to promote and facilitate the revitalization of Northeast Central Durham.
http://www.ci.durham.nc.us/departments/nis/necd/leadershipcouncil.cfm

Tobin Freid – Sustainability Manager: Tobin Freid is the Sustainability Manager for the City and County of Durham. Fried is responsible for implementing the recommendations in the City of Durham and Durham County Greenhouse Gas Emissions Plan (2007).
http://www.co.durham.nc.us/departments/publ/News_Releases/News_Release.cfm?ID=812

APPENDIX B: COMMUNITY EVENT OPPORTUNITIES

The following events may represent opportunities for public engagement on pedestrian safety topics. Additional community events can be found at: http://www.durhamnc.gov/events/ or http://www.durhameventcalendar.com/.

- **Back Porch Music On the Lawn Concert Series**
  - http://wunc.org/events/back-porch-music-concert-series
  - April – October each year

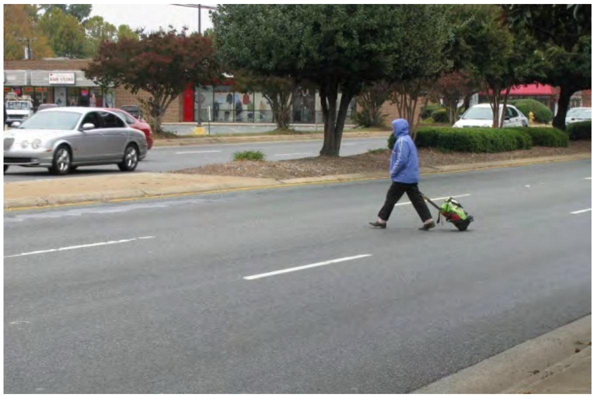
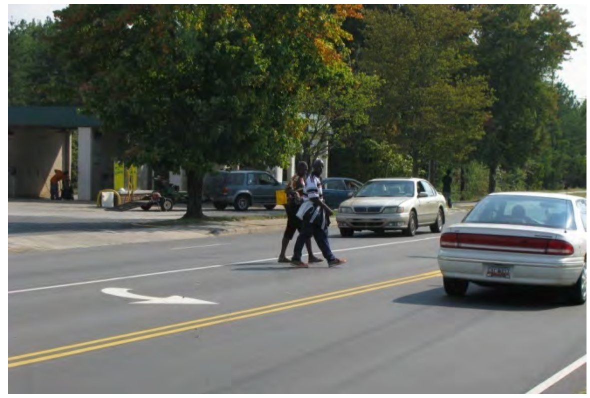
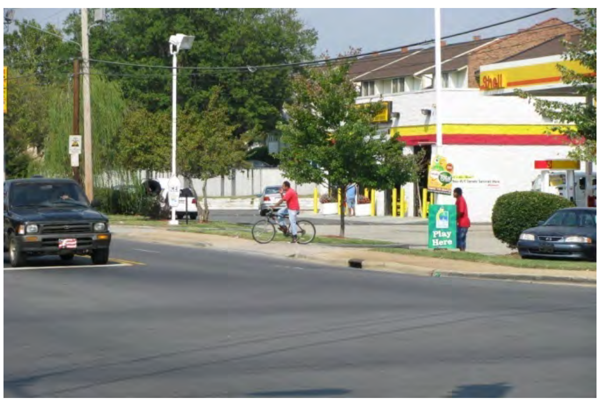
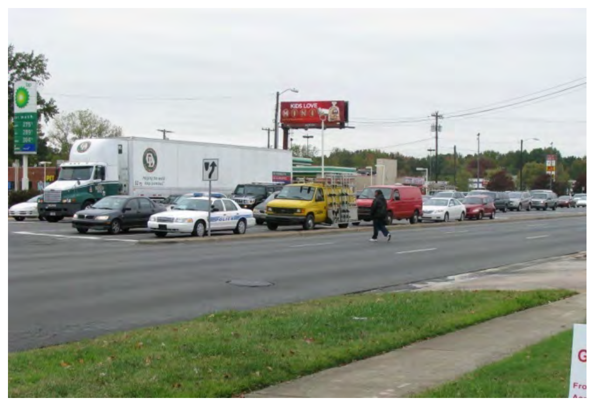
- **Farmers Market**
  - http://www.durhamfarmersmarket.com/

- **Arts Council's CenterFest**
  - Takes place annually; this years occurs September 18-19

APPENDIX C: SITE VISIT DETAILS

Charlotte Pedestrian Safety Action Plan

DRAFT – August 2011

Developed by UNC Highway Safety Research Center

In Coordination with the City of Charlotte and the NCDOT

THE UNIVERSITY OF NORTH CAROLINA HIGHWAY SAFETY RESEARCH CENTER

NCDOT NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

CHARLOTTE

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PURPOSE
The objective of this action plan is to outline potential actions the City of Charlotte can take, in coordination with other partners and the technical support of the UNC Highway Safety Research Center (HSRC) project team, to address pedestrian safety issues in the City. The analysis of pedestrian crash data facilitates and informs the discussion of policies and practices, training, and other initiatives that might be improved to further help pedestrian safety and mobility. The City of Charlotte will be the primary champion for addressing pedestrian safety issues and a key partner in focusing and implementing this action plan.

The main objective of the current project is to identify, prioritize and implement strategies to help reduce pedestrian crashes in the City. The approach proven most successful includes a comprehensive program that incorporates engineering, education/encouragement, enforcement, and evaluation to create built environments that encourage and enhance walking.

In addition to a multifaceted approach, another central theme of the Pedestrian Safety Action Plan (PSAP) is coordination within and between agencies. How can CDOT, Neighborhood Improvements, Planning and Economic Development effectively include pedestrian safety improvements in their overall programs as part of sidewalk implementation, area planning and streetscape projects? How can law enforcement address traffic safety and pedestrian safety outside of traffic units? What can be done to coordinate law enforcement, education, and engineering efforts to work together along a corridor to maximize results? Consideration of the following questions is a crucial component of the PSAP.

BACKGROUND
To identify pedestrian safety trends, the project team analyzed pedestrian crash data from 2004 to 2008 (the last year for which data was available at the time of the analysis) in conjunction with a variety of other data from Charlotte. Additionally the project team visited a number of high crash intersections and corridors and discussed issues with Charlotte agency staff members.

Included with the crash data were all pedestrian crashes reported to the NC Department of Motor Vehicles during those years. It should be noted that the data do not take into account crashes that were not reported to police or other authorities. These figures also do not reflect falls, crashes with bicycles, or other incidents such as those occurring on private property that were not reported to the State Division of Motor Vehicles.

Charlotte/Mecklenburg County is the largest urban area in the State, with a diverse city population of 731,000. In 2000, roughly seven percent of Charlotte households did not own a motor vehicle. It is anticipated that the population in Charlotte will grow by approximately 350,000 people over the next 25 years.

In 2007, the Federal Highway Administration ranked Charlotte 33rd among U.S. cities for pedestrian fatalities over the 1997-2006 decade. Charlotte accounts for an average of 16 percent of the State's reported pedestrian victims ages 15 years and older and nearly 16 percent of collisions overall. Mecklenburg County also had the highest rate of adult involvement per capita among the high crash counties (5.2/10,000 population/year for the years 2003-2007). Of the 63 pedestrians killed in Charlotte between 2004 and 2008, 2 were children 5 and younger, 8 were between the ages of 16 and 24, and 53 were 25 and older.

THE COST OF PEDESTRIAN CRASHES

In 2008, the most recent year when complete pedestrian crash data is available, 389 pedestrians were reported to be involved in 375 crashes in the City of Charlotte. Twelve pedestrians were killed and 23 more were reported to be seriously injured. The cost of these pedestrian crashes, for individuals and the community as a whole, is a significant burden. The National Safety Council and the NC Department of Transportation both provide estimates for the average comprehensive cost of motor-vehicle crashes by injury. Applying the NCDOT estimates to the pedestrian crashes that occurred in Charlotte during the time period examined (2004-2008), the cost of these crashes to the community is more than 340 million dollars (see Table 1).

Table 1. Charlotte average comprehensive cost (per person) by injury severity, 2004-2008 (Using 2008 cost estimates for all years)

The crash costs are higher when children are involved, as children have more life-years lost in crashes compared to other pedestrians. Obviously, there may be disagreement about assigning a distinct dollar value to each life lost and whether the estimates capture all the costs of such traumatic injuries. Certainly they do not capture all emotional costs, effects on the perceptions of safety in the community and the quality of life. These dollar estimates are shown here simply to provide some illustration of some of the costs to the community and individuals and show that the price of inaction in addressing Charlotte's pedestrian crashes is not free.

Every pedestrian fatality and traumatic injury is a tragedy that is theoretically preventable.

Table 1. Charlotte average comprehensive cost (per person) by injury severity, 2004-2008 (Using 2008 cost estimates for all years)

Pedestrian Injury	Totals[1]	Average Comprehensive Cost (Per Person) by Injury Severity	Total Comprehensive Cost
K Killed	63	$3,982,384	$250,890,192
A Type Injury (disabling)	188	$199,539	$37,513,332
B Type Injury (evident)	662	$51,184	$33,883,808
C Type Injury (possible)	729	$24,352	$17,752,608
O No Injury	123	$5,027	$618,321
Unknown	33	Unknown	unknown
Totals	**1,798**		**$340,658,261**

CRASH TYPES OVERVIEW

Similar to the State as a whole, nearly 30 percent of Charlotte crashes involved pedestrians crossing, dashing or darting out from behind other vehicles or objects across roadways and into the path of oncoming, through vehicles. It isn't always clear from crash reports whether an implied or marked crosswalk existed or which party failed to yield right-of-way. A majority (about two-thirds) of these crashes occurred at mid-block locations with about one-third occurring at or near intersections.

Pedestrians being struck by turning vehicles at intersections and driveways are another common occurrence (10 percent of all Charlotte pedestrian collisions). Most of these collisions occur at intersections, and some involve right turns on a red indication. A similar problem involves motorists not yielding and striking pedestrians on a driveway crossing as they turn in and out of driveways or alleys. About four percent were this latter type. Charlotte has a relatively low rate of crashes involving pedestrians walking along a roadway and being struck from behind or the front (nearly four percent).

Crashes occurring in off-roadway areas are of concern with about 19 percent of *reported* crashes occurring on private vehicular areas or involving backing vehicles in driveways and parking areas. Private Vehicle Access /parking lots and public driveway design is also deserving of attention in Charlotte and the State as a whole, as many pedestrians are struck in such areas. Finally, dispute and assault-related crashes occur with significant frequency – accounting for about 7 percent of all pedestrian crashes. Many of these types also occur in off-road areas.

Fall months accounted for the most pedestrian crashes in Charlotte (29 percent) with proportionally fewer in other seasons. Thursday has been the highest crash day on average (16 percent). Sunday, on average the lowest crash day across the state, has accounted for about 11 percent in Charlotte. The afternoon and evening peak travel periods spanning from 3:00 to 6:00 pm (22 percent) and 6:00 to 9:00 pm (18 percent) accounted for the largest proportion of crashes but a lower than average proportion occurred during later evening and night-time

[1] Pedestrian injuries. NCDOT Division of Bicycle and Pedestrian Transportation. http://www.pedbikeinfo.org/pbcat/ped_main.htm

compared with the State on average. There were also fewer crashes during periods of darkness than typical for the State with proportionally more during morning and mid-day hours. However 75 percent of fatalities occurred at night with 43 percent indicated to be on roadways with no supplemental lighting. Twelve (19 percent) of pedestrians killed were struck at night on interstate highways. Since these crash problems are common in a number of other communities in NC, Charlotte will serve well as a model for the rest of the State as it seeks to address these issues and improve pedestrian safety.

The following pedestrian focus areas were identified by the HSRC project team through detailed discussion with community stakeholders (Appendix A), review of existing pedestrian resources, analysis of crash data, and preliminary field visits.

The project team, in consultation with local partners, has identified broad target areas for improving pedestrian safety in Charlotte. These issues are presented in no particular order and are supported by crash data analyses, field observations, and maps.

1. Mid-Block
2. Private Vehicle Access (Parking Lots)
3. Driveways
4. Intersections
5. Transit Stops
6. Uptown
7. Speed-Related

The map on the following page (Figure 1) illustrates where pedestrian collisions were concentrated over the five years from 2004-2008. Using the City's maps of "Centers, Corridors, and Wedges" planning areas, the areas of blue and red highlight the higher crash density per square mile zones.

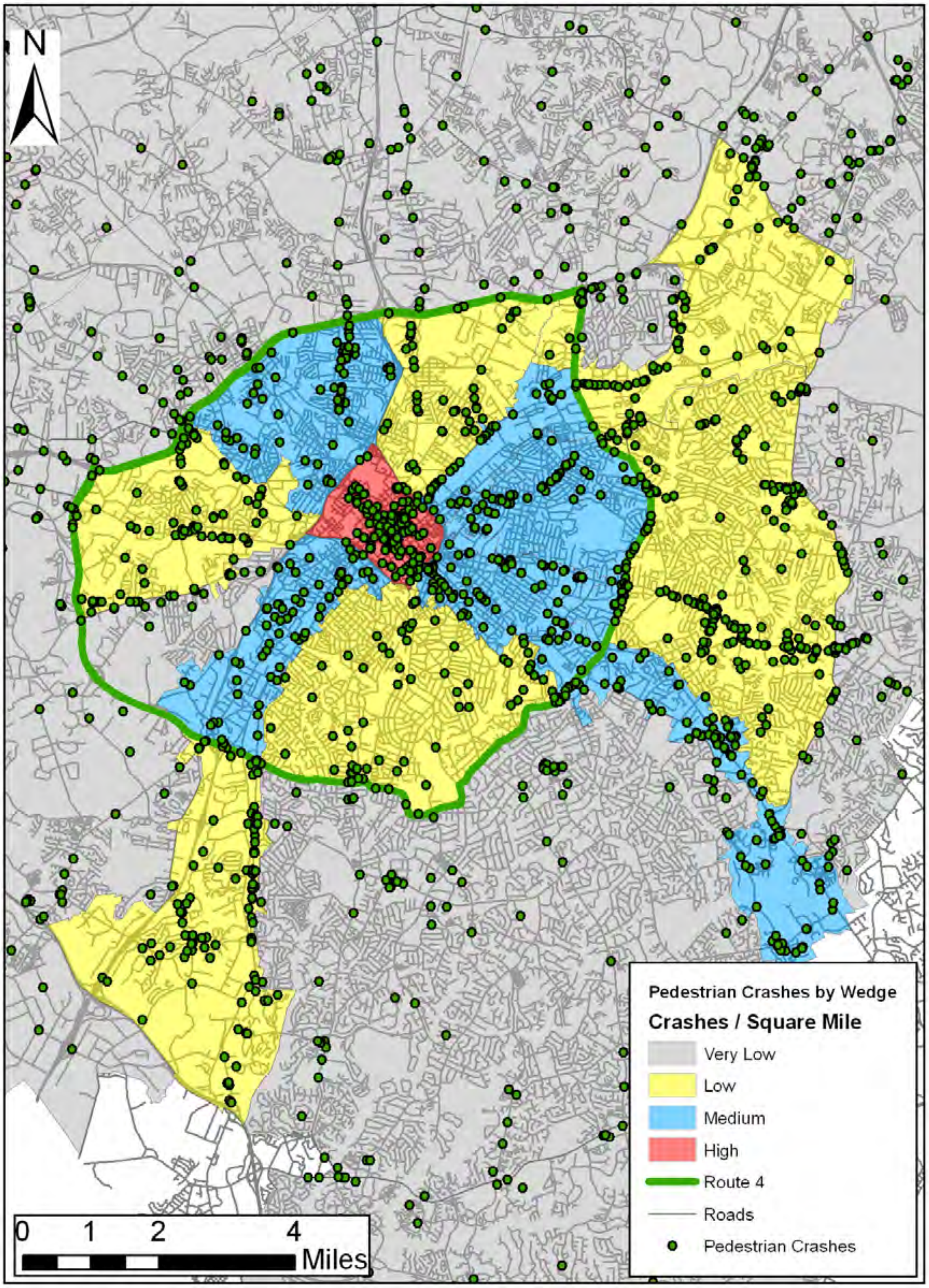


Figure 1. Pedestrian Crashes by Wedge

TARGET AREAS

Target Area #1: Mid-Block Crashes

Mid-block crashes occur when a pedestrian crosses the street in the middle of a roadway block, not at an intersection (Figure 2 and Figure 3). Mid-block crashes are typically higher in severity since the motorist is not likely to be slowing for an intersection or turn, and especially if they occur at night. Pedestrians typically have to cross mid-block if distances are far between signalized or protected crossings or conflicts at intersections inhibit crossing.

Figure 2. Pedestrians crossing mid-block near the intersection of Arrowood Rd and Nation's Ford Rd.

Figure 3. Person crossing mid-block at Albemarle Rd

Overall, 40 percent of Charlotte's pedestrian crashes occurred at mid-block locations. The largest groups of crash types overall were "Pedestrian Failure to Yield" and "Dart-Outs and Dashes." "Dart-outs" involve pedestrians suddenly emerging from a location that was blocked from view by the motorist until an instant before impact – such as from behind a parked car, building, or shrubbery. "Dashes" involve pedestrians running or dashing into the street, but not from an obscured location. "Pedestrian Failure to Yield" implies the pedestrian was crossing the roadway, either against a traffic signal indication, or at an undesignated location (such as a midblock area with no crosswalk) and failed to yield to traffic, but should not necessarily be taken to imply fault.

Over two-thirds (67.5 percent) of the "Pedestrian Failure to Yield" and "Dart/Dash" crashes in Charlotte occurred at mid-block locations. A number of arterial, state-owned corridors in Charlotte have a similar set of pedestrian concerns: wide, 5+ lane roads with high traffic volumes, speed limits of 45 MPH (with actual speeds higher), and often long distances between signalized intersections and few formal mid-block crossings. Along these corridors, there is some pedestrian consideration with sidewalks, marked crosswalks and pedestrian signals provided; however, crossing the street can still be a challenge due to the number of lanes, limited availability of crossing islands, and signal phasing that often puts turning vehicles in conflict with crossing pedestrians.

Regarding time, pedestrians were at higher risk of mid-block and transit related crashes between 5:00 and 7:00 PM, as these times constituted 18 percent of all Target Area #1 crashes. Finally, mid-block had significantly higher rates of pedestrian alcohol use than the rest of Charlotte crashes, noted in 17.1 percent of mid-block incidents. Other mid-block crash types including motorists failing to yield when turning in and out of driveways and alleys (64 or 3.5 percent were this type), and pedestrians walking along the roadway and being struck from behind or the front (4 percent). A substantial portion of mid-block crashes occurred at night time with 59 percent of pedestrian fatalities resulting from crashes at non-intersection locations at night.

During site visits, the project team observed many pedestrians crossing at mid-block locations where crosswalks did not exist. Crossing at mid-block locations may indicate a need or demand for a marked mid-block crossing point (i.e. a crossing at a more convenient location), shorter block lengths, additional crossing facilities, or that pedestrians perceive the nearby intersection to be unsafe.

Target Area #2: Private Vehicle Access (Parking Lot)

Interestingly, parking lot crashes (Off Roadway – Parking Lot, 8.1 percent and Backing Vehicle - Parking Lot, 7 percent), account for more than 15 percent of Charlotte area crashes (Figure 4). Twelve percent of children five and under collisions were this type. Twenty-eight percent of adults 70 and older crashes were this type, compared to 10 – 11 percent for all ages. Two fatalities resulted from off-roadway collisions (not backing vehicle). These off-roadway crash types may be addressed with parking and commercial driveway planning policies and design. In addition to these more “typical” driving-related parking lot crashes, most assault and dispute-related crashes occur off the roadway network, primarily in parking lots.

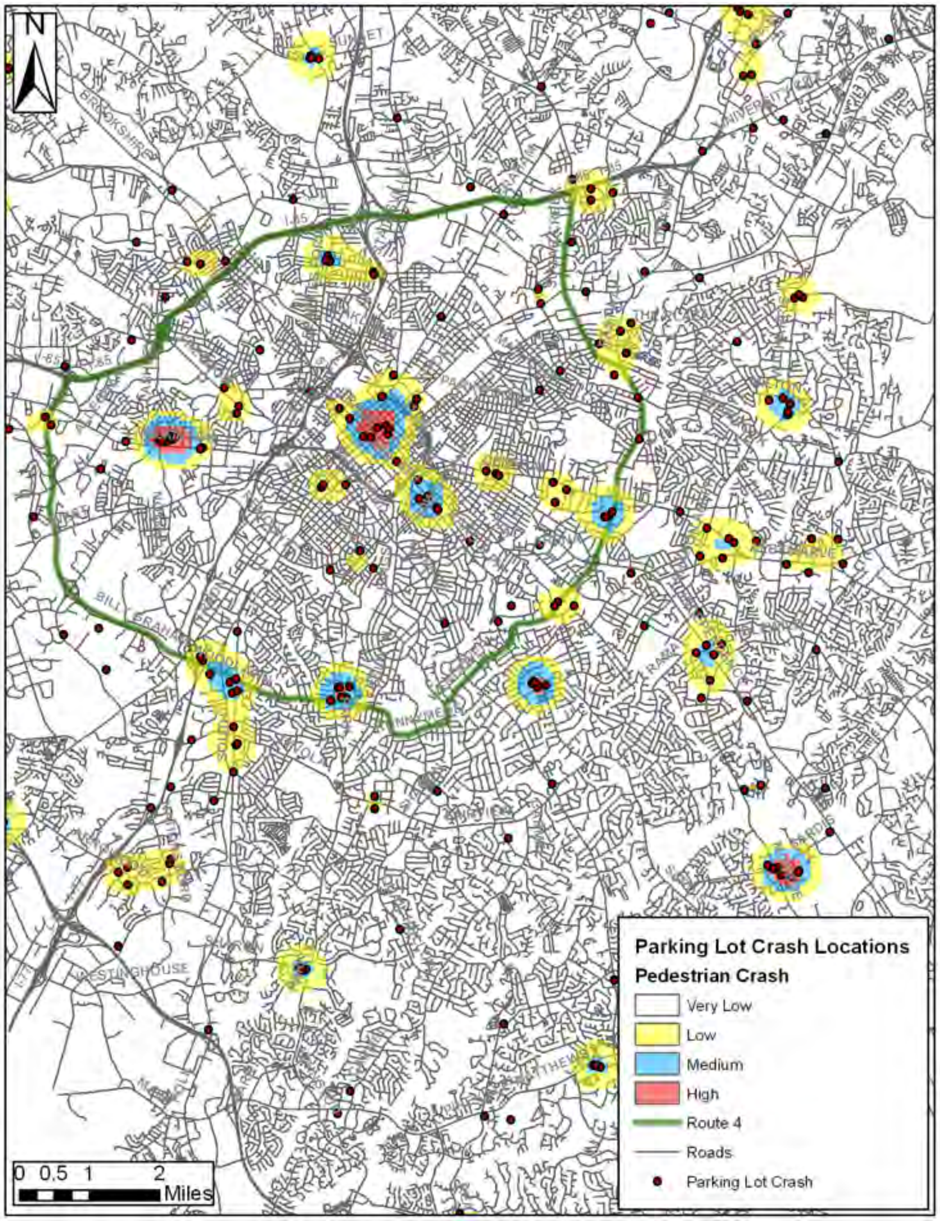
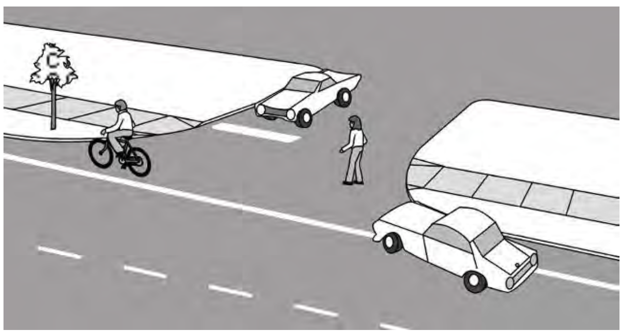
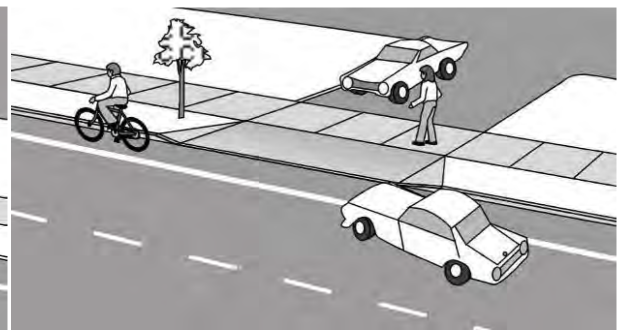


Figure 4. Parking Lot Crashes

Target Area #3: Driveway Crashes

A majority of Motorist Entering or Exiting Driveway or Alley (59 of 64 crashes) involved motorists pulling out at driveways or alleys and striking pedestrians in the area of the driveway sidewalk crossing (Figure 5). These types of crashes may involve motorists looking to the left for a gap in traffic and pulling out and striking pedestrians coming from the right. Measures include driveway and crossing design improvements, as shown in the graphics below; as well as, checking for and correcting sight-distance issues.. These types of crashes have yielded few serious and no fatal injuries during this time period, but they can potentially be serious, particularly at driveways with high turning speed designs or free-flow right turn lanes.





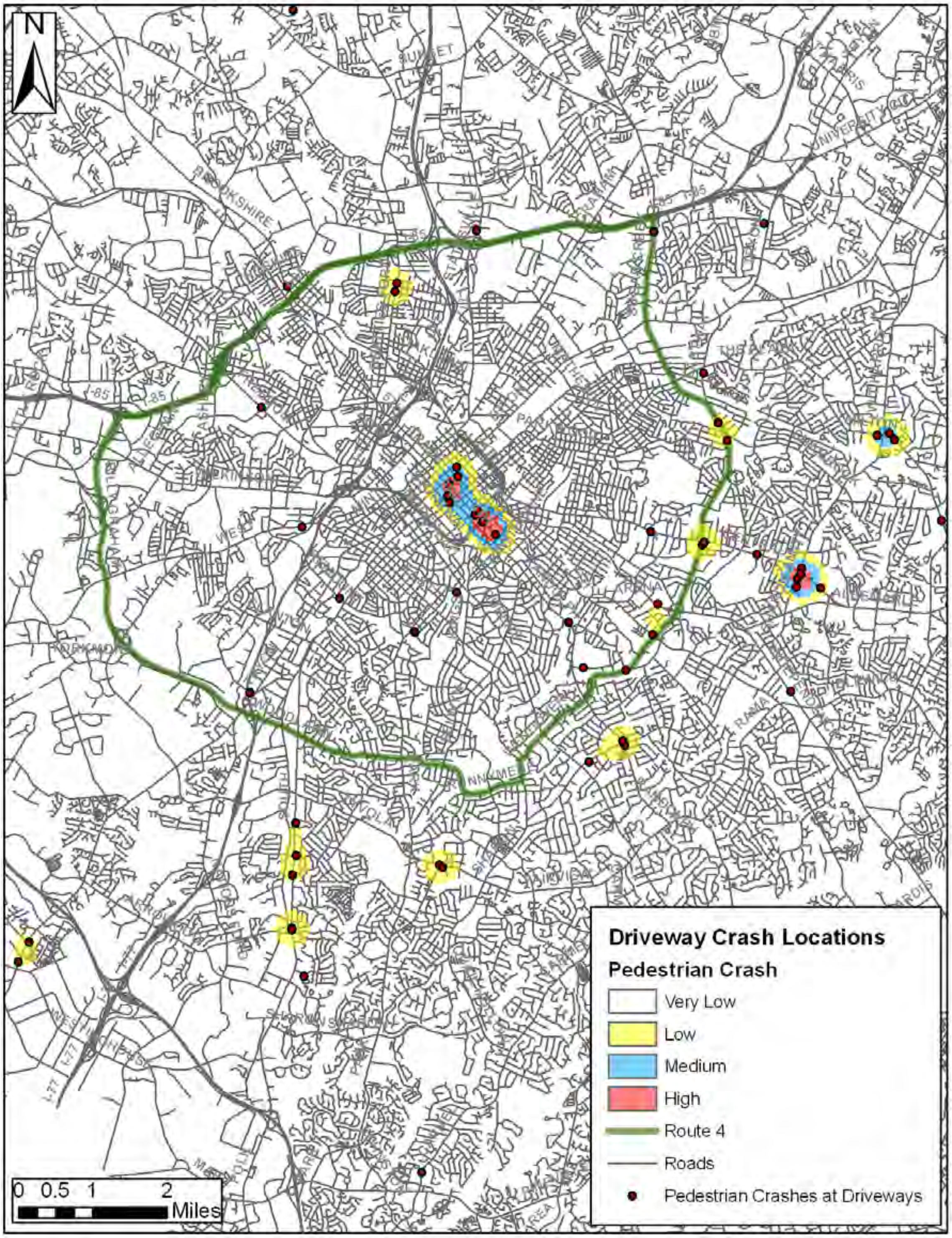


Figure 5. Driveway Crashes

Target Area #4: High-Crash Intersections

About 30 percent of the most common types of roadway crashes, “Pedestrian Failure to Yield” and “Dart/Dash” crashes,” occurred at or near intersections. Pedestrians may be walking against signal indications, attempting to cross where pedestrian signals may be lacking, failing to use push buttons for a pedestrian Walk indication, or attempting to cross away from the crosswalk area. More than one-third of motorist right turn crashes involved motorists making right turns on a red signal indication. At several intersections observed during the site visits, vehicles turning right failed to yield to pedestrians in crosswalks (Figure 6). Additionally, the project team observed situations where pedestrians were failing to use push buttons for a pedestrian Walk indication.

Figure 6. Vehicle failing to yield to pedestrian at the intersection of Independence Blvd and Idlewild Rd.

Forty percent of Charlotte’s crashes occurred in the 6 hour time period from 3pm to 9pm, a time that largely coincides with the post-work peak travel period. “Turning Vehicles” (motorist left and right turns) striking pedestrians accounted for just over ten percent of collisions. A significant portion of Charlotte’s pedestrian crashes occur on or near high-volume, higher-speed arterial streets that bisect and separate residential neighborhoods from nearby commercial centers and pedestrian destinations. (Figure 7 and Figure 8).

Additionally two vulnerable age ranges have been highlighted: ages 20-29 and 40-49, which were both involved at seemingly significant higher percentages than other groups. Analysis also identified significant time periods during which populations are more vulnerable. The morning rush hours from 8:00-10:00 AM had higher intersection-related rates than at other times, as did the hour between 2:00-3:00 PM.

Figure 7. A woman crossing mid-block across 7 lanes of traffic at the intersection of Independence Blvd and Idlewild Rd.

Figure 8. Person crossing in the crosswalk at the intersection of Independence Blvd and Idlewild Rd (crossing 7 lanes of traffic).

Figure 9 shows the map resulting from a spatial analysis of intersection crashes. Thirteen intersections were identified with 5 or more pedestrian collisions within 100 feet over the 2004-2008 time period (Table 2). Five more were identified with 4 collisions. These intersections could be targeted for engineering and/or enforcement.

Table 2. Intersections with 4+ Pedestrian Crashes

Number of Pedestrian Crashes	Intersection
10	E 5th St & N Tryon St & W 5th St
9	E Trade St & N Tryon St & S Tryon St & W Trade St
7	E Trade St & N College St & S College St
7	E Stonewall St & S College St
7	Central Ave & Eastway Dr
6	Beatties Ford Rd & Lasalle St
6	Central Ave & Pecan Ave
5	Electra Ln & Idlewild Rd
5	E 36th St & The Plaza
5	N Graham St & S Graham St & W Trade St
5	N Church St & W 6th St
5	N Church St & S Church St & W Trade St
5	Elizabeth Ave & N Kings Dr
4	Beatties Ford Rd & Catherine Simmons Ave
4	Allen St & Belmont Ave
4	Central Ave & Pecan Ave
4	Albemarle Rd & Regal Oaks Dr
4	E Woodlawn Rd & South Blvd

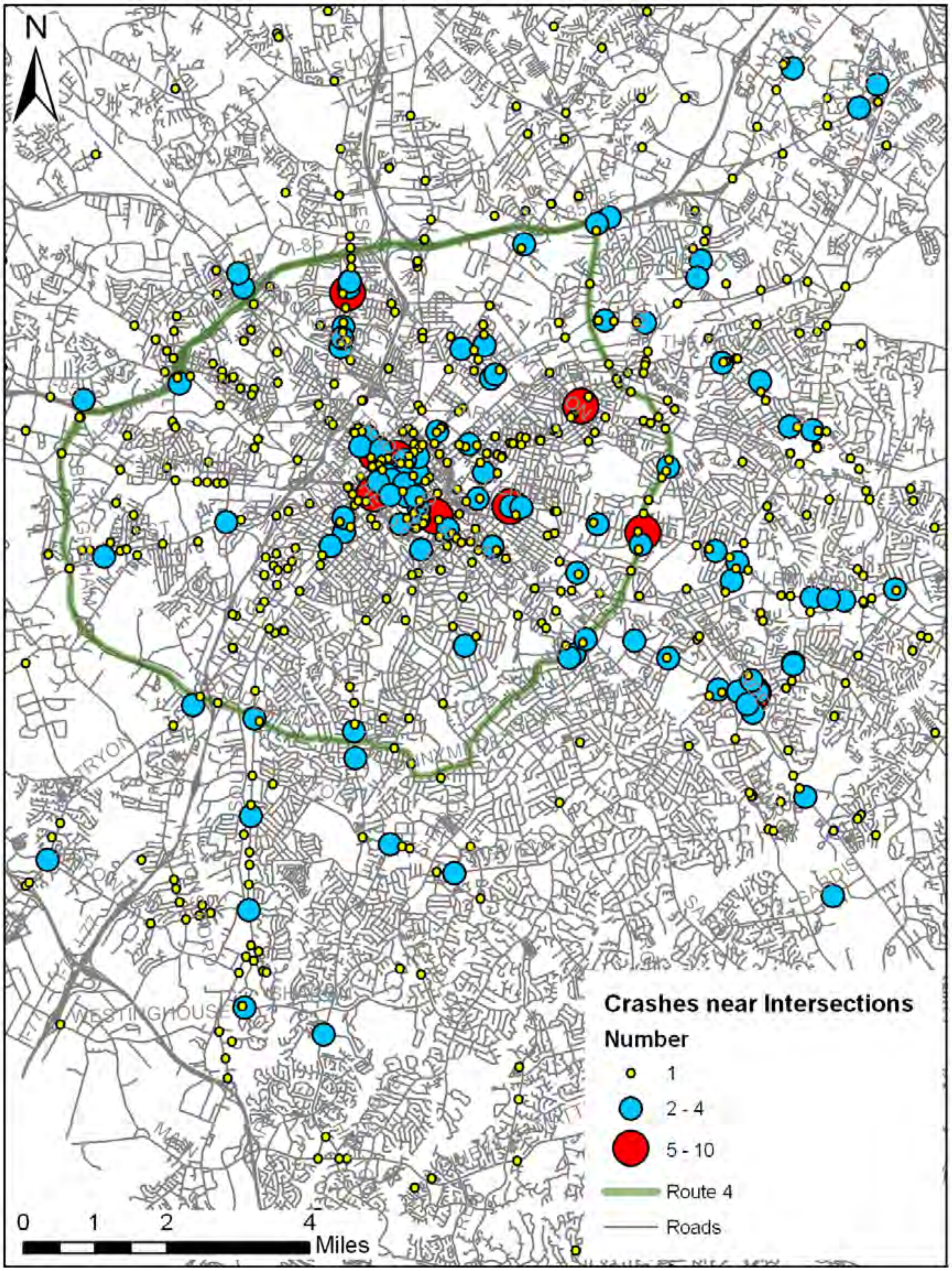


Figure 9. Pedestrian Crashes within 100 Feet of Intersections

Target Area #5: Transit Related Crashes

Charlotte Area Transit System (CATS) operates an extensive bus service as well as a light rail system that travels from inside the city center to the south. An analysis of crashes near bus and light rail stops identified locations where multiple crashes had occurred within 100 feet of a stop location (Figure 10). Table 3 shows the top locations were at bus stops in terms of crash frequency, although we cannot state with certainty that the pedestrians involved were attempting to access transit. A total of 24 crashes clearly involved the presence of a transit bus, blocking the view of approaching vehicles when the pedestrian was struck.

Table 3. Bus stops with 3+ pedestrian crashes within 100 feet of stop

Num of Crashes	Stop ID	Stop Description	Nearest Intersection
6	45093	Tryon & Trade	Trade & 4th
5	45399	College & Stonewall	Stonewall & Hill
4	05140	Central & Pecan	Pecan & Thomas
3	02470	Beattie’s Ford & Sanders	Sanders & Oaklawn
3	02530	Beattie’s Ford & Celia	Celia & Russell
3	02600	Beattie’s Ford & LaSalle	LaSalle & Catherine Simmons
3	02630	Beattie’s Ford & Keller	Keller & Holly
3	07380	4th & Davidson	Davidson & Alexander
3	09330	Eastway & Central	Burgin & Central
3	18110	Tryon & 5th	5th & 6th
3	18710	Tryon & Wellingford	Beechway & Wellingford
3	31080	Sugar Creak & Reagan	Wilson & Reagan
3	45021	Belmont & Allen	Allen & Pegram
3	45351	McDowell & 4th	Trade & 4th
3	45908	Harris & Hickory Grove	Hickory Grove & Trysting
3	45909	Harris & Hickory Grove	Hickory Grove & Trysting
3	45937	Tryon & Arrowhead	Austin & Arrowhead

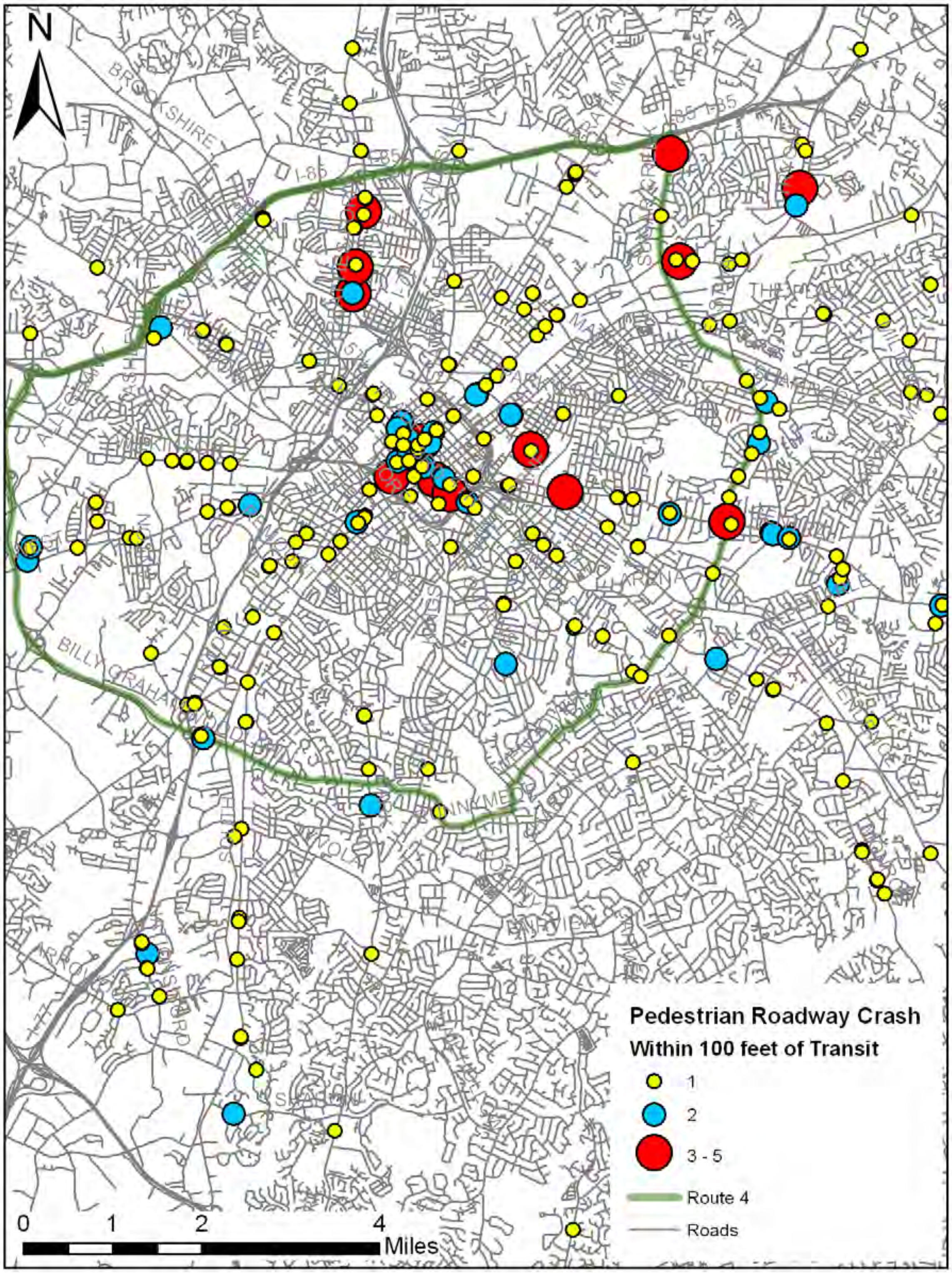


Figure 10. Pedestrian Crashes within 100 feet of Transit Stops

The research team observed many pedestrians crossing at mid-block to access bus stops or light rail transit stops across the roadway (Figure 11). Age presents a factor, as pedestrians between the ages of 40-49 were involved in crashes at higher rates than other age groups. This age group was particularly vulnerable in transit-related crashes, accounting for 26.2 percent of transit crashes while only comprising 14.6% of the population.

Figure 11. Woman crossing Albemarle Rd to access the bus stop across the street.

Target Area #6: Uptown

The Uptown area of Charlotte accounts for 182, or more than 10 percent of Charlotte crashes. Only a small portion of Uptown area crashes involve children 15 and under (5.5 percent); the vast majority of pedestrian crashes in Uptown involve adults of age 20 and above. Four pedestrians were killed in the Uptown area; one fatality involved a pedestrian crossing an expressway and one involved an unusual type where a prior crash resulted in the pedestrian being struck.

About 54 percent of Uptown crashes occurred at or related to an intersection, 34 percent occurred at mid-block locations, and 12 percent occurred in off-roadway areas such as parking lots and driveways. Further analysis of these crashes indicates that motorists turning right across the path of pedestrians accounts for 21 percent of all Uptown pedestrian-motor vehicle crashes; virtually all of these occurred at intersections and during daylight hours. About 14 percent of the total Uptown crashes involved pedestrians dashing, darting out, or otherwise failing to yield to traffic when crossing at mid-block locations. A disproportionate number of this latter group occurred at night. Pedestrian darts, dashing, and failure to yield also occurred with some frequency (less than 8 percent) at intersections. A variety of other crash types, including 4 commercial bus related, were represented in crashes Uptown as well.

During an informal site visit in Charlotte, it became clear that Uptown has very high levels of pedestrian exposure. In terms of pedestrian amenities, almost every intersection has a pedestrian signal, motor vehicle speeds are limited to 25 miles per hour, and some intersections prevent motorist turning movements (Trade Street and Tryon Street), which should create a safe environment for pedestrians. The research team observed, however, that many pedestrians failed to yield to vehicles at intersections and crossed against the signal at mid-block locations, which corresponds to the crash types for Uptown pedestrian crashes and to the anecdotal evidence (Figure 12, Figure 13, and Figure 14). It was noted that many pedestrians were not paying attention (on the phone) while walking as well.

In addition, the research team noticed that pedestrian signalization became less forgiving (i.e. signal times were shorter), vehicle speeds increased, and that large surface parking lots and underground parking entrances created possible unsafe situations for pedestrians away from the center of Uptown. Sidewalk widths also decreased farther away from the city center. Commercial bus stops were located before intersections, however, and also audibly warned pedestrians against crossing in front of the bus, indicating sensitivity to pedestrian crashes related to commercial buses.

Figure 12. Woman walking against pedestrian signal

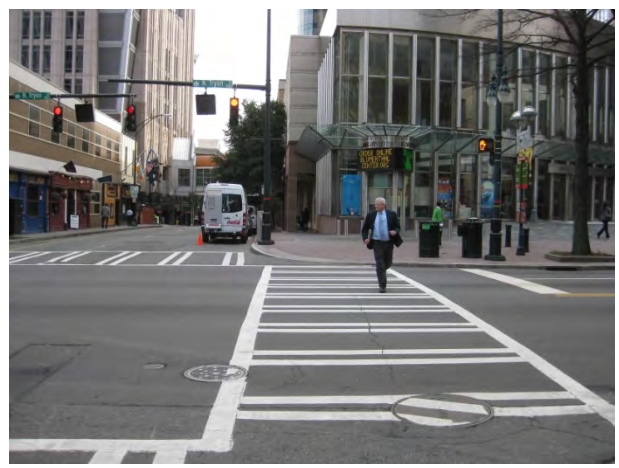


Figure 13. Man dashing out into the roadway

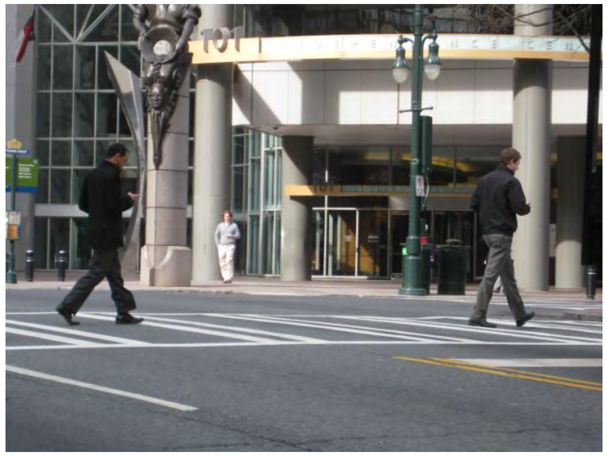


Figure 14. Men walking and texting

Population affected:

The crash types occurring in the Uptown area are composed of some unique identifiers, in particular, people ages 20-29 were extremely vulnerable, comprising 30.2 percent of all Uptown crashes. Ages 30-39, a previously unmentioned demographic, is also highly involved in Uptown crashes (20.3 percent). This is consistent with the temporal indicators and suggests a strong connection to commuting patterns. Wednesday and Thursday have uncharacteristically high proportions of crashes (23.1 and 20.9 percent respectively) compared to their representation within the total crash data. Crash times also match these patterns, as morning hours between 8:00-11:00AM and the afternoon rush hour between 5:00-6:00PM have disproportionate crash figures. The activity centers in Uptown also appear to be driving higher than average crash totals between midnight and 2:00AM.

Target Area #7: Speed-Related Crashes

Thirty-six percent of Charlotte pedestrian collisions over this time period (2004-2008) occurred on roadways with 35 mph speed limits; 35 mph is the urban statutory limit in NC and local limits require special speed zone ordinances. Another 16 percent of crashes were each reported from 20 to 25 mph roads and 40 to 45 mph roads. Nearly 16 percent were also reported from areas with 5 to 15 mph speed limits, but a cross-tabulation reveals that a majority of these were on non-roadway areas such as public vehicular areas or commercial driveways. Finally, small percentages (less than 2 percent each) were reported on higher speed limit roads. Fourteen percent of cases had no speed limits indicated, predominantly for non-roadway crash locations.

Although relatively few pedestrian crashes were reported from roadways with speed limits of 50 mph and higher, 25 percent of people struck on 50 to 55 mph roadways were killed, and 40 percent of those struck at 60 to 75 mph roads were killed (Figure 15). The 17 killed on higher speed roads represent 27 percent of those killed. Figure 16 shows crashes on interstates and expressways. These crashes are not related to a disabled vehicle or prior crash (apparently). Nineteen pedestrians were killed on 30 to 35 mph roads and 20 were killed on 40 to 45 mph roads. Three pedestrians were reported killed on very low-speed roads or driveways.

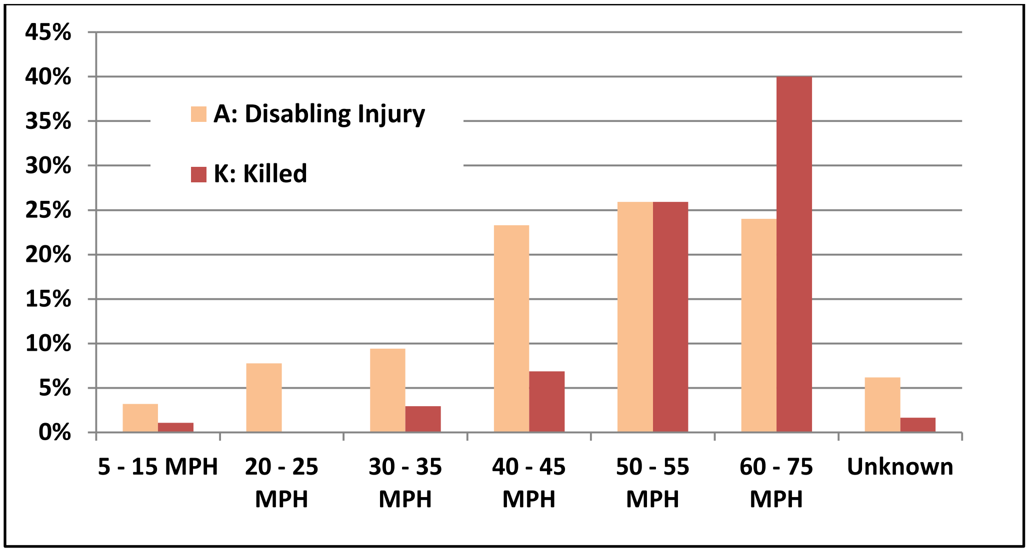


Figure 15. Percentage of pedestrians killed or seriously injured (A-type) by speed limit

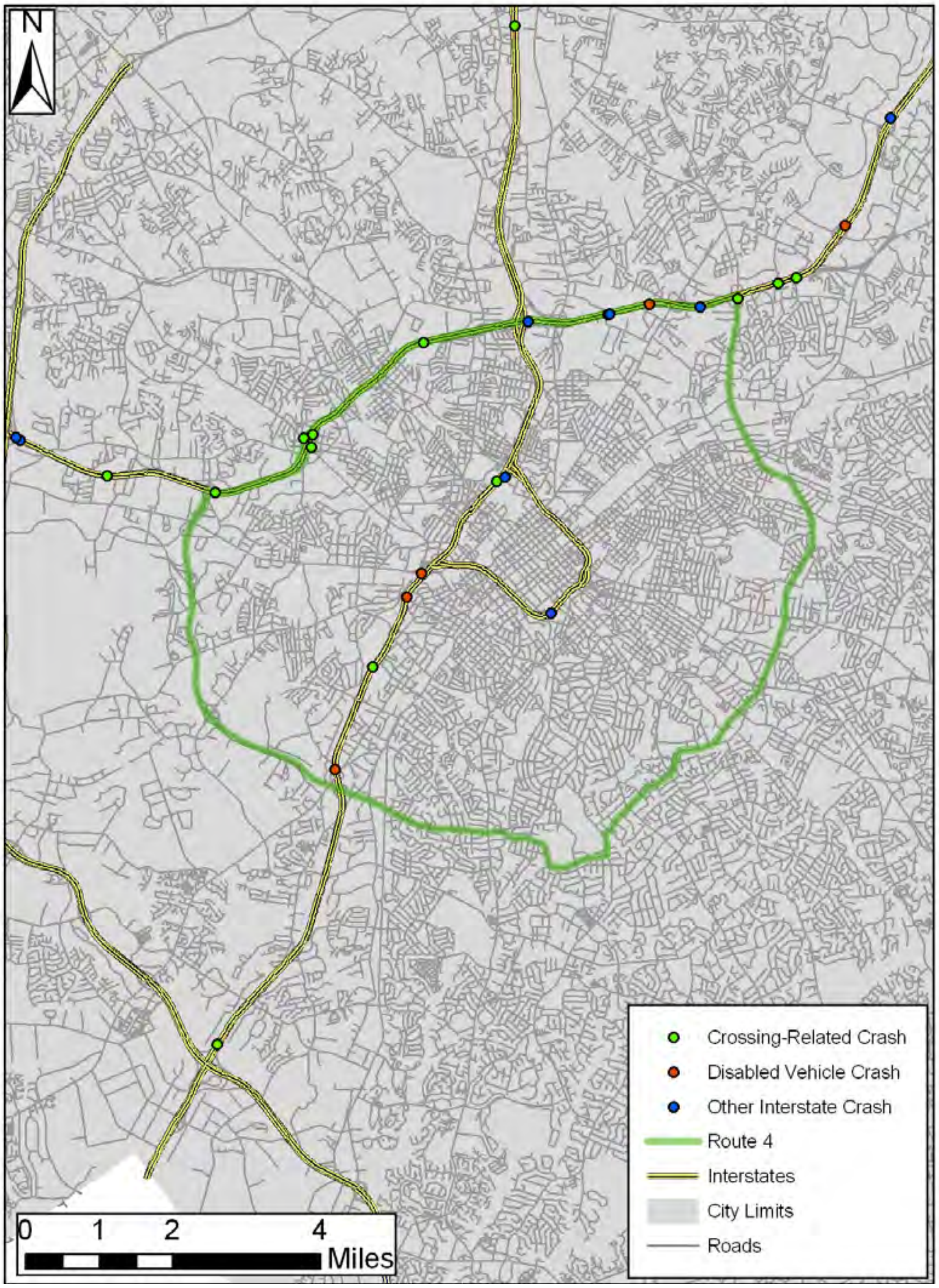


Figure 16. Crashes Occurring on Interstates

ACTION PLAN

Charlotte Department of Transportation is transforming the existing transportation network to create a more walkable community, changing the character of roadways to allow safe and convenient pedestrian accommodation. Led by the Traffic Safety Division within CDOT, there is a traffic safety committee, pedestrian crossing committee, and participation on a regional disabilities rights and resources committee to identify and address existing barriers to walking. When a pedestrian fatality occurs, a field review is conducted and an analysis of the built environment completed. The ultimate goal of the Pedestrian Safety Action Plan is to reduce the citywide per capita rate of pedestrian crashes, injuries, and fatalities while encouraging walkability of the built environment, building on existing efforts.

Pedestrian crash fatality rates increase significantly above 30 mph. While it is challenging to reduce travel speeds to 30 mph on all arterial and collector roadways, a general reduction in travel speeds allows drivers and pedestrians more time to react when a conflict occurs. Reduction in travel speeds also lessens the severity of automobile versus automobile crashes and enables the safe installation of un-signalized midblock crossing features in a wider range of roadway settings.

This Action Plan is a mechanism intended to identify specific areas of interest within the City of Charlotte, bringing together all existing policies and plans while providing recommendations for additional strategies to address pedestrian safety issues observed in those areas through engineering, education/encouragement, enforcement, and evaluation.

ENGINEERING

CDOT crafts policy and plans with input from many partners internal and external to the organization such as Neighborhood & Business Services, Planning, Economic Development, Charlotte Mecklenburg Police Department, elected officials, Charlotte Area Transit System, various committees, the Department of Health, and the general public. Working within the policy frameworks set forth in the adopted Sidewalk Retrofit Policy, Subdivision Ordinance, Urban Street Design Guidelines, Center City Transportation Plan and the Transportation Action Plan, pedestrian safety is specifically addressed within the built environment through the following policies:

<u>Sidewalk Retrofit Policy June 2011</u>

- IV. Sidewalk Retrofit Policy Statement
  It is the policy of the City of Charlotte to:
    A. Install sidewalks on both sides of all existing thoroughfares and one side of all existing local and collector streets in accordance with the prioritization procedure set forth in this policy.
- Definitions: Roadway Design Safety Need – A condition that warrants consideration of a sidewalk due to roadway design features such as limited horizontal and/or vertical curves that obstruct driver and pedestrian visibility. Engineering judgment by City staff will be used to determine if increased risks are present on roadway.

Subdivision Ordinance December 2010

Sec. 20-55. - Sidewalks.

- Sidewalks are required in all subdivisions as follows:
  (1) Sidewalks are required on both sides of all new or existing major and minor thoroughfares in accordance with other improvement requirements of this section.
  (2) Sidewalks are required on both sides of all new or existing collectors in accordance with other improvement requirements of this section.
  (3) Sidewalks are required on both sides of all new or existing local residential streets in accordance with other improvement requirements of this section.
- (b) Location. Approval of sidewalk construction plans must be obtained as part of the subdivision review process. The Charlotte Land Development Standards Manual and Appendix A of this code (where applicable), or any adopted Streetscape Plan or Area Plan indicate the required location of the sidewalks. If existing public street right-of-way is not available, the developer will be required to construct the sidewalk outside the street rightof-way on a permanent easement.
  (1) Sidewalks may be located on private property, thereby reducing the width of the required right-of-way, where an easement for access, utilities, and other required functions acceptable to the city is proposed and accepted.
  (2) Location of sidewalks. Where nonresidential or multifamily development occurs, sidewalks shall be placed in their conforming locations, and a transition to any adjacent existing sidewalks shall be made. All other residential development shall place sidewalks in their conforming location to the maximum extent determined feasible by city staff. In cases where the sidewalk is not located in its conforming location, an easement shall be granted for future location of the sidewalk, and all street tree and other landscape planting shall respect the location of the future sidewalk.

Charlotte Transportation Action Plan Technical Document August 2011

- 2.1.3 The City will prioritize intersection improvements in the Capital Investment Plan based on crash rates, congestion levels, pedestrian level of service and bicycle level of service as described in the urban Street Design Guidelines.
- 2.1.4. The city will build complete streets (i.e. by designing transportation projects within the context of adjacent land uses to improve safety and neighborhood livability, promote transportation choices and meet land use objectives) consistent with the City's Urban Street Design Guidelines.
- 2.1.5. The City will work with NCDOT to create context-based streets that include transit, bicycle and pedestrian design features as part of new or widened NCDOT street construction projects or on State-maintained streets.
- 2.2.1. The City will monitor levels of service for motorists, bicyclists, and pedestrians at signalized intersections.
- 2.5.1. The City will identify and analyze roadways where speed-related collisions constitute a higher percentage of all crashes in order to prescribe engineering or

enforcement countermeasures, consistent with the Urban Street Design Guidelines, to address excessive vehicle speeds.

- 2.5.2. The City will analyze locations with significantly higher crash rates to develop projects and programs, consistent with the Urban Street Design Guidelines, to reduce both the number of crashes and the overall crash rate.
- 2.5.3. The City will track and report the results of safety improvements programs and projects annually.
- 2.7.3. The City will provide sidewalks, crosswalks, pedestrian signals, lighting and other facilities, consistent with the Urban Street Design Guidelines, to make it easier, safer, and more comfortable for people to walk.
- 2.7.4. The City will require new development to construct sidewalks consistent with City Code.
- 2.7.6. By 2012, the City will adopt a pedestrian plan.
- 2.7.7. In 2011, the City will consider appointing a Pedestrian Advisory Committee to create a more walkable city and to promote a better pedestrian environment.
- 2.8.1. The City will implement neighborhood traffic calming, where requested and in accordance with City policy, to help minimize speeding through a variety of approved remedies, including: speed limit reductions, multi-way stops, speed humps, and other traffic calming measures as deemed appropriate.
- 2.8.3. The City will continue implementing traffic calming measures on non-local streets, as deemed appropriate, to improve safety, livability, transportation choices and meet land use objectives.
- 2.8.5. The City intends for all school speed zones to meet the standards for signs, markings, and other safety features set forth in the School Speed Zone and Crossing Policy as adopted in June 2004.
- 2.10.6. The City will continue refining the existing CDOT Traffic Impact Study Guidelines so that any site development that generates 2500 or more vehicular trips per day will be required to complete a multi-modal transportation impact analysis.

<u>Center City Transportation Plan</u>
Pedestrian related recommendations:

- 1. Use transportation and parking strategies to support growth and intensification of various land uses, with emphasis on office employment.
- 3. Promote pedestrian vitality through the design of Center City streets by enhancing human scale and street level features.
- 6. Center City can be a “park once” location, especially if motorists find a pleasant, walkable environment between their parking deck and destinations.
- 7. Convert selected one-way streets to two-way streets.
- 14. Expand the On-Street Parking System managed by the City, by increasing the number of on-street spaces, expanding hours of operation, and offering payment options.
- 15. Develop an Off-Street Parking Policy framework for City participation in the parking component of mixed-use projects.

- 16. Continue to expand the Pedestrian Wayfinding System.
- 23. Adopt the Streetscape Standards.

CDOT CURRENTLY:

- Conducts field safety audits to examine speeds, sight distance, crossing treatments, lighting, and pedestrian exposure
- Regularly reviews existing signalized intersections for geometric improvement opportunities such as curb extensions, tighter turning radii, or high visibility crosswalk markings
- Implements traffic calming and safety approaches that may include: limiting or reducing the number of lanes, adding buffers to sidewalks, adding crossing islands at transit stops and/or mid-block crossings, and road "diets."

ADDITIONAL STEPS:

- Continue to ensure new development or redevelopment approvals include improved parking lot design to emphasize pedestrian routes from the street to store fronts that are out of the path of backing and faster-moving vehicles.
- Encourage pedestrian connectivity from internal site networks to external context network by working with private property owners and managers.
- Consider designs that place buildings near the street front with parking and driveway areas to the rear.

EDUCATION AND ENCOURAGEMENT

Transportation Action Plan

- 2.2.6. The City will take an active role in the education of motorists, pedestrians and bicyclists through annual transportation safety campaigns.

Currently CDOT conducts public awareness campaign to improve driver and pedestrian compliance with existing traffic laws utilizing Public Service Announcements that CDOT has produced to train city engineers, planners, decision-makers and the public about street design and improvements.

ADDITIONAL STEPS:

Conduct focus groups in higher crash areas with residents at the neighborhood level and transit riders could influence how to tailor safety messages for the community of outreach interest.

Produce safety messages in different languages, disseminating the information through local grassroots organizations, media and other public agencies can have a greater impact at the community level.

Utilize transit infrastructure could be used as a focal point for pedestrian safety education/awareness materials, since transit trips include a pedestrian component.

Develop driver education curriculum with Charlotte Mecklenburg Schools to include a component on pedestrian safety for the drivers' education program.

Work with local employers, business associations, and the Chamber of Commerce to provide incentives for programs that reduce vehicle demand through the promotion of Travel Demand Management, i.e. flex time, subsidized transit passes, carpooling match-up and telecommuting. Engage with community business owners, neighborhood residents, school children, seniors, transit riders and/or other populations based near high crash locations through walking audits to determine built environment issues while encouraging walkability from the user perspective.

ENFORCEMENT

CDOT currently partners with Charlotte Mecklenburg Police Department to encourage training and education of practitioners and law enforcement on pedestrian safety needs, benefits, and tools/best practices; as well as, enforcing speed and lower speed limits in "pedestrian crash corridors".

<u>ADDITIONAL STEPS:</u>

Work with law enforcement to conduct targeted yielding law operations to improve driver yielding to pedestrians in signalized intersections and no right turn on red.

Work with law enforcement to increase security and enforcement presence to reduce the crashes attributed to conflicts and disputes in private access areas.

Utilize mass media and traffic variable message boards to educate drivers and pedestrians about pedestrian safety.

EVALUATION

<u>Transportation Action Plan</u>

- 2.2.1. The City will monitor levels of service for motorists, bicyclists, and pedestrians at signalized intersections.
- 2.5.1. The City will identify and analyze roadways where speed-related collisions constitute a higher percentage of all crashes in order to prescribe engineering or enforcement countermeasures, consistent with the Urban Street Design Guidelines, to address excessive vehicle speeds.
- 2.5.2. The City will analyze locations with significantly higher crash rates to develop projects and programs, consistent with the Urban Street Design Guidelines, to reduce both the number of crashes and the overall crash rate.
- 2.5.3. The City will track and report the results of safety improvements programs and projects annually.

Evaluation is a key component of this process built into the engineering, education, encouragement, and enforcement efforts. The overall evaluation of efforts are updated every 5 years in the Transportation Action Plan, enabling CDOT to adjust efforts and best address pedestrian safety needs.

REFERENCES AND RESOURCES

Cunningham, C.M., J.E. Hummer, and J-P. Moon. (2008). Analysis of automated speed enforcement cameras in Charlotte, North Carolina. *Transportation Research Record* 2078: 127-134.

Garder, P.E. (2004). The impact of speed and other variables on pedestrian safety in Maine. Accident Analysis and Prevention 36: 533-542.

Effects of Driver Enforcement Programs on Yielding to Pedestrians: This report evaluates the effects of a driver enforcement program, aimed at improving safety for pedestrians (http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1284509/pdf/15529891.pdf)

Pedestrian Safety Enforcement Training and Resource Guide (NHTSA): This interactive training course provides law enforcement officials with a background on enforcing laws for improving pedestrian safety.

Pedestrian Safety Campaign (FHWA): The pedestrian safety campaign includes instructions for running a successful campaign and downloadable materials such as posters, brochures, and PSAs (http://safety.fhwa.dot.gov/local_rural/pedcampaign/guide.htm)

Pedestrian Road Safety Audit Guidelines and Prompt Lists (FHWA): This comprehensive guide allows engineers, planners, and other professionals to assess local conditions and identify pedestrian safety concerns (http://www.walkinginfo.org/library/details.cfm?id=3955).

Toolbox of Countermeasures and their Potential Effectiveness for Pedestrian Crashes (FHWA): This collection of crash reduction factors (CRFs) explains the expected reduction in crashes for a given treatment (http://www.walkinginfo.org/training/collateral/resources/pedToolboxofCountermeasures.pdf)

Crash Modifications Factors Clearinghouse (FHWA): This web site provides a searchable database of countermeasures and their potential effectiveness for reducing crashes (http://www.cmfclearinghouse.org/).

Countermeasures that Work (NHTSA): This report provides a comprehensive overview of effective traffic safety countermeasures, including pedestrian safety countermeasures (http://www.walkinginfo.org/library/details.cfm?id=4510).

Pedestrian Safety Guide for Transit Agencies (FHWA): This guide provides an overview of pedestrian safety issues related to transit stops and routes (http://www.walkinginfo.org/library/details.cfm?id=4231).

Toolkit for the Assessment of Bus Stop Accessibility and Safety (Easter Seals Project ACTION): This tool can be used to identify and address accessibility concerns around transit stops (http://projectaction.easterseals.com/site/PageServer?pagename=ESPA_BusStopToolkit).

Effects of Driver Enforcement Programs on Yielding to Pedestrians: This report evaluates the effects of a driver enforcement program, aimed at improving safety for pedestrians (http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1284509/pdf/15529891.pdf)

Complete Streets Resource Toolkit (SACOG): This CD ROM includes more than 150 resources related to developing and implementing Complete Streets policies (http://www.sacog.org/complete-streets/toolkit/files/order-cdrom.html)

APPENDIX A: Charlotte Task Force and Partners

Charlotte Task Force

A number of individuals representing a variety of agencies have been identified to serve as members of the project task force, who will help develop, update, and implement the action plan. These individuals will provide critical input at key stages of the project, and will assist the project team by identifying resources and strategies that may enhance project activities. Agencies represented include:

Charlotte Department of Transportation – The Department of Transportation will be the primary partner and champion within the City of Charlotte.

- Danny Pleasant – Director
- Norm Steinman – Planning Director
- Debbie Self – Traffic Safety, ITS, and Special Projects Manager
- Joe Mangum – Engineering Services Investigator (Data Analysis Division)
- Johanna Quinn – Traffic Calming Division
- Malisa Mccreedy – Pedestrian Program Manager

Charlotte/Mecklenburg Police – The Police Department has been very supportive of the project, and has provided a staff member to assist with project activities.

- Captain Andy Kornberg – Special Events Division, Accident Reconstruction Unit
- Sergeant David Sloan – Special Events Division, Accident Reconstruction Unit
- Officer Mark Jadlocki – Special Events Division, Accident Reconstruction Unit

Charlotte/Mecklenburg Health Department

- Dick Winters – Safe Routes to School Coordinator

Charlotte Community Partners

A number of individuals have been identified to serve as partners in action plan development, implementation, or evaluation. The partners will provide much needed on-the-ground support for the project team, as well as information about ongoing activities and potential collaborative efforts. As other partners are identified, this group may grow as the project moves forward. To date, Charlotte partners include the following groups and individuals:

Charlotte Public Works/NCDOT – Engineers at the City and State level will help identify locations with pedestrian safety concerns, and can lend their perspective on traffic management, speed, design, and other critical issues.

- M. Pate Butler – NCDOT Regional Traffic Engineer (Divison 10)
- Rick Mason – NCDOT Regional Traffic Safety Engineer (Divison 10)

Carolinas Center for Injury Prevention

- Janice Williams – Director

Charlotte/Mecklenburg District Attorney

- Peter Gilchrist – District Attorney
- Bruce Lillie – District Attorney, Misdemeanor Team (supervises the district court rooms and is prevention-oriented and would likely be a good partner)

City of Charlotte Mayor

- Anthony Foxx

Local Colleges – UNC Charlotte

- Srinivas Pulugurtha – Civil Engineering professor in the Center for Transportation Policy Studies

Charlotte Fire Department/Safe Kids

- Amy Krise – Charlotte Safe Kids Coordinator

Charlotte Department of Transportation

- Linda Durrett – Communications and Public Relations Manager

Charlotte Neighborhood and Business Services

- Jennifer Duru – Neighborhood Service Specialist

Appendix E: Law Enforcement Operations Plan

-MEMORANDUM-

TO: Click here to enter text.

FROM: Click here to enter text.

SUBJECT: Yielding Operations Plan

Date: Click here to enter text.

The purpose of this yielding operation is to determine compliance with the Motor Vehicle Code, specifically § 20 155 (c) on Right of Way, which states: "The driver of any vehicle upon a highway within a business or residence district shall yield the right of way to a pedestrian crossing such highway within any clearly marked crosswalk, or any regular pedestrian crossing included in the prolongation of the lateral boundary lines of the adjacent sidewalk at the end of a block, except at intersections where the movement of traffic is being regulated by traffic officers or traffic direction devices." The ultimate goal of this enforcement effort is to reduce crashes, injuries, and deaths to pedestrians and drivers contributed to drivers' failing to yield right of way. To this end, this operation is established. By participating, all agencies and officers agree to the purpose of this operation and to abide by this plan.

1. Briefing

All personnel will report to Click here to enter text. for roll call, briefing, and assignment:

Date: Click here to enter text.

Time: Click here to enter text. ☐AM ☐PM

2. Yielding Station

This systematic plan has been drawn up in advance and the following location(s) of the yielding operations was selected taking into account the likelihood of detecting non-yielding drivers, the traffic conditions (including lower speed roads, unsignalized intersections or midblock crossings, presence of marked crosswalks, and history of pedestrian crashes), the number of vehicles that would likely be stopped, and the convenience and safety of the officers and the general public.

Location of yielding operation: Click here to enter text.

3. Date & Time of Operation:

From: Click here to enter text. ☐AM ☐PM Click here to enter text. Day of Click here to enter text.

To: Click here to enter text. ☐AM ☐PM Click here to enter text. Day of Click here to enter text.

4. Equipment

a. ☐To advise the public that an authorized yielding operation is being conducted, signs will be posted in advance of the marked crosswalk to notify the motorists that a yielding operation is taking place. **[Subsection a applies only if checked]**

b. At a minimum, one law enforcement vehicle will be maintained during the operation and located downstream of the marked crosswalk where enforcement is taking place.

c. Officers conducting the pedestrian crossings in the yielding operation are to be plain-clothed officers, equipped with radio technology to communicate violators to other officers located downstream. Officers downstream of the marked crosswalk who will be making contact with drivers who have violated the yielding laws are to be uniformed officers.

d. Officers making contact with non-compliant drivers will have and distribute copies of an NCDOT brochure, *What You Need to Know About North Carolina Crosswalks*, provided by Click here to enter text..

e. Traffic cones will be provided by Click here to enter text..

f. Measuring wheels, to measure out the stopping zone, will be provided by Click here to enter text..

5. Yielding Operations Procedures

Officers involved in the yielding operation must be familiar and be able to give testimony concerning the yielding operation. The operation is to be conducted as detailed below:

a. When officers arrive at the marked crosswalk at the location above, they will use the measuring wheel and traffic cones (or any other visual marker) to define a motorist "stopping zone" in advance of the crosswalk in each direction, where applicable. Officers will measure the stopping zone from the outside edge of the crosswalk line closest to approaching traffic and then mark the end of the zone with a traffic cone. The stopping zone is the distance beyond which a motorist can safely stop for a pedestrian detected in a crosswalk. The formula used to calculate the stopping zone takes into account driver reaction time, safe deceleration rate, the posted speed, and the grade of the road. Officers will ensure that the traffic cone delineating the stopping zone is placed in a location that does not create an obstacle for pedestrians on the sidewalk and does not affect traffic patterns. Depending on the posted speed limit, the stopping zone will be measured at:

- 40 MPH Posted speed: 231 ft
- 35 MPH Posted speed: 183 ft
- 30 MPH Posted speed: 141 ft
- 25 MPH Posted speed: 104 ft
- 20 MPH Posted speed: 72 ft

If the speed is not posted, officers will use the stopping zone for a 35 MPH speed limit. No sites are posted at higher than 35 MPH. However, if traffic is traveling at significantly higher speeds than the posted speed limit, then officers should use caution and use the 40MPH stopping zone distance (231 ft). Officers should make note of the stopping zone distance used at every location. If the stopping zone is beyond the end of the block or adjacent intersection, then the intersection/block face will be used as the end of the stopping zone and no traffic cone will be needed. The officer in charge of delineating the stopping zone is Click here to enter text..

b. Plain-clothed officer(s) will be assigned to perform staged pedestrian crossings at the above location. The officer in charge of conducting pedestrian crossings is Click here to enter text.. This officer will consistently adhere to the following pedestrian crossing protocol in order to ensure a standard and safe crossing procedure at all marked, uncontrolled crosswalks. These protocols have been developed to provide a standard way of crossing that is compliant with the uniform vehicle code and to ensure the safety of the officer crossing the street. The following protocol will be employed at uncontrolled crosswalks (marked crosswalks that are not controlled by a traffic signals or stop sign). This protocol has been employed in other cities to measure and enforce motor vehicle-yielding and has not been associated with conflicts.

1. Officers will step with one foot into the marked crosswalk when an approaching vehicle is **just beyond** the marked stopping zone. Any motorist already inside the zone may not have sufficient distance to safely stop for a pedestrian in the crosswalk and therefore will not be considered non-compliant with the law. Anyone who has not yet passed the traffic cone is assumed to have sufficient distance to safely stop before the crosswalk.
2. Officers will make sure that they are standing in a location where they are visible to drivers; if there is on-street parking or a bicycle lane it will be necessary to walk to and stop at the lane line to view approaching traffic and so drivers of approaching vehicles can see.
3. Officers shall not cross into the travel lane until the driver significantly slows or stops his or her vehicle to allow the officer to safely cross. **For locations with multiple lanes, officers will always stop at the lane line for the second travel lane and make sure the next lane is clear before proceeding.** If the vehicle yields or there is a large gap in traffic, the officer will proceed to the median (if applicable) or finish crossing to the other side of the street to begin the operation for the other direction of traffic. The officer will avoid situations where they may become “trapped” in the centerline if there is no median—before starting the crossing, officers will feel confident that they will be able to cross the full street safely.
4. If any vehicle in any lane approaching the crosswalk makes no attempt to stop, or passes a stopped vehicle, the officer will call the violation(s) to the downstream unit for subsequent stopping.

c. The pattern for stopping vehicles is that every vehicle failing to comply with the Right-of-Way code (i.e., failing to yield to the plainclothes officer acting as the pedestrian in a marked crosswalk) is to be stopped. The officer performing the pedestrian crossings will radio the downstream officer(s) to identify and describe violators. If traffic conditions create a hazard or undue delay of motorists or pedestrians, the officer in charge may temporarily alter this pattern. No other officer may change the pattern nor may any officer deviate from the pattern or plan except when temporarily authorized by the officer in charge as provided above. The officer in charge of the yielding operation is: Click here to enter text..

d. The pattern for drivers that are stopped is to request that every driver produce his/her driver's license. While the vehicle is stopped, the officer stopping the vehicle shall (1) notify the driver that they were observed failing to yield to an officer serving as a pedestrian in the marked crosswalk, (2) explain the law requiring drivers to yield to pedestrians in marked crosswalks, and (3) provide a copy of the NCDOT brochure mentioned above.

e. Officers will use their judgment in determining whether to issue written warnings or citations to non-compliant drivers. Citations will be issued for all definite, clear-cut, and substantial violations of the law.

f. An officer, who determines there is a reasonable articulable suspicion that the driver or occupant of a vehicle has violated any other provisions of the Motor Vehicle Code, or any other law, may detain the person suspected of the violation for further investigation in accordance with the law.

g. The officer in charge shall terminate the yielding operation.

The ultimate goal of this operation is to make the highways safer, particularly for pedestrians, by reducing the incidence of drivers failing to yield to pedestrians in marked crosswalks. Your cooperation and assistance are appreciated.

Acknowledgement: This operations plan was adapted from the NCDOT Checkpoint Plan: *www.ncdot.gov/programs/**GHSP**/download/.../Checkpoint**plan**.doc.*

Appendix F: Law Enforcement Data Forms

POLICE DEPARTMENT DATA COLLECTION REQUEST

UNC Highway Safety Research Center is in the process of evaluating the effectiveness of the Watch for Me NC pedestrian safety education and enforcement program. We are also tasked with documenting all aspects of the campaign to provide a model for other communities. Following is information that we would like to have from your department related to **each enforcement activity conducted**:

Date of operation: ____________________Total Number of Officers Involved:_____________________
Officer in charge:____________________________Unit/District:________________________________
Site of enforcement (intersection or nearby crossroads):____
Time active enforcement began:______________ __ Time active enforcement ended:_______________

Number of "Failure to Yield to Pedestrian" **Oral Warnings** issued:________________________________
Number of "Failure to Yield to Pedestrian" **Written Warnings** issued:______________________________
Number of "Failure to Yield to Pedestrian" **Citations** issued:____________________________________

Number of "Speeding" **Oral Warnings** issued:____
Number of "Speeding" **Written Warnings** issued:____
Number of "Speeding" **Citations** issued:____

Warnings issued to pedestrians (please list type of violation and number given): ___________________
____
____
____

Citations issued to pedestrians (please list type of violation and number given): ___________________
____
____
____

Any other relevant warnings or citations given, including "Failure to Stop" "Aggressive/Reckless Driving" and "Alcohol-related Offenses" (please list type and number given): _______________
____
____
____
____
____

Please return completed forms to Laura Sandt at sandt@hsrc.unc.edu or contact her at 919-962-2358 to arrange collection by HSRC staff.

Appendix G: Law Enforcement Questionnaire

For Professional Participants ☐ Before Workshop ☐ After Workshop

Date ___________________

NOTE: The purpose of this form is to help evaluate this Training Course. No personal identifying information will be collected and all responses are considered **confidential** and for evaluation-use only.

For the following questions, please circle the correct response.

1. In an average year, approximately ___ pedestrians are killed in crashes with motor vehicles in North Carolina:
   - A. 35
   - B. 160
   - C. 500
   - D. 1000

2. A motorist approaching a person stepping off a curb at an uncontrolled intersection should:
   - A. Honk their horn to alert the pedestrian of their presence
   - B. Change lanes, if possible, to get around the pedestrian
   - C. Slow down or yield until the pedestrian crosses to the other side of the roadway
   - D. Alert the local police to safety issues posed by jaywalkers

3. Most pedestrian crashes occur at intersections.
   - A. True
   - B. False

4. Pedestrians cause most of their own problems in traffic.
   - A. True
   - B. False

5. There is no way to determine if a motorist could have yielded to a pedestrian in a crosswalk.
   - A. True
   - B. False

6. Would active pedestrians like to see the same, more, or less pedestrian traffic law enforcement?
   - A. More
   - B. Same
   - C. Less

7. When is it legal for a pedestrian to cross a street mid-block?
   - A. Never
   - B. When there is enough room for cars to slow down for them
   - C. When they do not impede traffic and are not violating the law

8. Sidewalks have been shown to reduce "walking along roadway" crashes by:
   - A. 23%
   - B. 48%
   - C. 60%
   - D. 88%

Using the scale below, please state your level of agreement or disagreement with each statement by circling one of the numbers on the right.

Disagree Completely	Disagree Moderately	Disagree Slightly	Agree Slightly	Agree Moderately	Agree Completely
1	2	3	4	5	6

1. I am familiar with the laws protecting pedestrian safety in North Carolina.	1	2	3	4	5	6
2. Motorists who do not follow traffic laws pose a serious threat to pedestrian safety.	1	2	3	4	5	6
3. Keeping pedestrians safe is an important part of my job.	1	2	3	4	5	6
4. Most pedestrian crashes are minor and do not result in serious injury.	1	2	3	4	5	6
5. Pedestrian laws are difficult to enforce.	1	2	3	4	5	6
6. I can help prevent crashes by enforcing pedestrian and motorist laws.	1	2	3	4	5	6
7. Within the next three months, I intend to work with others to improve pedestrian safety in my community.	1	2	3	4	5	6
8. On an average shift, I do not have time to enforce laws to protect pedestrians.	1	2	3	4	5	6
9. My colleagues and I have a great deal of resources to use toward making our community safer for pedestrians.	1	2	3	4	5	6
10. Over the next 3 months, I plan on using available resources toward making walking a safer way for people to get around in my community.	1	2	3	4	5	6
11. There is little information in pedestrian law enforcement that can help me do my job better.	1	2	3	4	5	6

Please describe any specific actions you plan to take as a result of this workshop (fill this out for the post-workshop survey only).

Appendix H: Protocol for Field Data Collection

Motorist Yielding Data Collection Procedures and Protocol

Adapted from original source material developed by Ron Van Houten[1]

When and Where to Collect Data

Data will only be collected on weekdays during dry conditions (i.e., no wet pavement) and clear visibility. Ideal data collection times are during peak travel times: 8:00-10:00AM, 11:30-1:30PM, and 3:00-5:00PM. A specific schedule of sites and times will be provided, as well as a range of dates in which data collection can occur.

Materials to Bring

When collecting data, data collectors will bring the following with them to each site:

- Measuring wheel
- 2 traffic cones for marking dilemma zones
- Protocols and data collection forms (Appendix A)
- Pens and pencils
- Clipboard (or something to write on)
- Watch
- Cell phone
- Photo identification
- Copy of study information sheet (Appendix B)
- Hat/Sunglasses or sunscreen if necessary
- Cash or coins for parking (if needed)
- Camera and/or video recording device (optional)
- Maps/GPS to navigate you to sites (optional)
- Lunch and plenty of water

Data collectors should wear normal, comfortable attire and comfortable shoes with closed toes and heel (i.e., no flip-flops). Neutral colored clothing is recommended. Some sort of "distraction" (i.e. a newspaper, book, cellphone) may be helpful for less busy or city crosswalks may be helpful in making staged pedestrian look more natural.

Calculation of the Dilemma Zone

Before collecting data, the research team will calculate the dilemma zone for each crosswalk site. Calculating the distance beyond which a motorist can safely stop for a pedestrian is essentially the same problem as calculating the distance in advance of a traffic signal that a motorist driving the speed limit can stop if the traffic signal changes to red. Traffic engineers use the signal-timing formula (Institute of Transportation Engineers, 1985), which takes into account driver reaction time, safe deceleration rate, the posted speed, and the grade of the road to calculate this interval for the amber indication. This formula will be used to measure the distance beyond which a driver could easily stop for a pedestrian by multiplying the time by the speed limit, and a landmark will be placed at this distance on each side of each crosswalk by placing a traffic cone near the curb or edge of the road. Be sure the cone does not create an obstacle for pedestrians on the sidewalk. Anyone inside the calculated distance may not have sufficient distance to safely stop for a pedestrian in the crosswalk and therefore is not scored as not yielding (though the can still be scored as yielding). Anyone who has not yet passed the traffic cone is assumed to have sufficient distance to safely stop before the crosswalk.

The formula for the calculating the dilemma zone is **Y = t + V/(2a+2Ag)** where:

Y= Yellow clearance interval in seconds
t= reaction time (use 1 second)
V= approach speed in ft/sec (use posted speed limit)
a= deceleration rate of a vehicle (use 10 ft/sec/sec)
A= Acceleration due to gravity (use 32.2 ft/sec/sec)
g= percent grade in decimal form (+for upgrade,- for downgrade; this is unknown but considered to be 0).

[1] *http://homepages.wmich.edu/~s9crowle/SCOPE%20OF%20WORK-2.pdf*

When the data collectors arrive at a site, they will measure the dilemma zone from the outside edge of the crosswalk line closest to approaching traffic and then mark the end of the zone with a traffic cone. Data collectors will check to make sure that the cone is visible to them from the marked crosswalk. Depending on the posted speed limit, the dilemma zone will be:

- 40 MPH Posted speed: 231 ft
- 35 MPH Posted speed: 183 ft
- 30 MPH Posted speed: 141 ft
- 25 MPH Posted speed: 104 ft
- 20 MPH Posted speed: 72 ft

If the speed is not posted, the data collectors will use the dilemma zone for a 35MPH speed limit. No sites are posted at higher than 35 MPH. However, if you feel that traffic is traveling at significantly higher speeds than the posted speed limit, then use caution and use the 40MPH dilemma zone distance (231 ft). Note the dilemma zone distance used on the data collection form at every visit.

Observer Positioning on Site

Two people will collect data at each site. One will serve as the person staging pedestrian crossings while the other will record all behavioral measures. The recorder will try to set up in a location with a clear view of traffic in both directions but far enough away from the crossing to not raise the attention of passing traffic or pedestrians. The person staging crossings will stand away from the crossing (so as to not display intent to cross) until the conditions are right to follow the staged crossing procedure below.

Staged Crossing Procedure for Uncontrolled Crosswalks

The pedestrian protocols used to collect motorist yielding data will be consistently followed to ensure a standard and safe crossing procedure at uncontrolled crosswalks. These protocols have been selected to provide a standard way of crossing that is compliant with the uniform vehicle code and to ensure the safety of the pedestrian crossing the street. The following protocol will be employed at uncontrolled crosswalks (marked crosswalks that are not controlled by a traffic signals or stop sign). This protocol has been employed in other studies to measured motor vehicle-pedestrian conflicts (a crash surrogate measure) and has not been associated with conflicts.

1. Step with one foot into the crosswalk when an approaching vehicle is **just beyond** the marked dilemma zone (the dilemma zone is the measured distance for the vehicle speed limit and road grade, which ensures a safe stopping distance for vehicles traveling at the posted speed). Make sure that all traffic coming from the opposite direction is beyond the traffic cone. Observer should make note of opposite side traffic location so as to score correctly. If there is on-street parking or a bicycle lane it will be necessary to walk to and stop at the lane line to view approaching traffic and so drivers of approaching vehicles can see the pedestrian. Pedestrians shall not cross into the travel lane until the driver significantly slows or stops his or her vehicle to allow the pedestrian to safely cross.
2. If the vehicle makes no attempt to stop, do not proceed to cross and score the vehicle as not yielding. Also, score subsequent vehicles that do not stop as not yielding.
3. On multilane roads, if the vehicle clearly begins to yield and the next lane is free, begin crossing. **Always stop at the lane line for the second travel lane and make sure the next lane is clear**

before proceeding. Score the vehicle that slowed or stopped as yielding. Do not score any vehicles traveling behind the yielding vehicle as they were forced to yield.

4. If a vehicle in the second lane makes no attempt to slow and stop, let it pass and score it as not yielding.
5. If the vehicle yields or there is a large gap in traffic, proceed to the median (if applicable) or finish crossing to the other side of the street to begin to measure yielding for the other direction of traffic. Do not create a situation where you will be trapped in the centerline if there is no median—be sure you will be able to cross the full street safely.
6. If a vehicle yields that is **inside** the marked dilemma zone, score the driver as yielding, but if they do not yield, do not score them at all**. All vehicles that have not yet entered the marked dilemma zone when you are halfway across the 2nd travel lane that do not slow or stop to allow you to cross should be scored as not yielding.**

These procedures will be carefully adhered to in order to gather enough data to calculate motorist yielding rates at each location. A minimum of 25 staged crossings will be performed at each site. If possible, data collectors will also gather data on any natural crossings observed during the 2-hour time period. When staged crossings are completed, the staged pedestrian can begin collecting data on natural crossings at the same time as the other recorder gathers data. The data collectors should note on the forms when they are both collecting data at the same time, and should avoid comparing decisions or talking about the data during this time—the data collection should be independent.

Measures

The following measures will be recorded using the data collection shown in Appendix A.

Driver yielding to pedestrians

Observers will score the percentage of motorists yielding and not yielding to pedestrians. A motorist will be scored as yielding if he or she stops or slows to allow the pedestrian to cross. A motorist will be scored as not yielding if he or she passes in front of the pedestrian but would have been able to stop when the pedestrian arrived at the crosswalk. We will use the formula used by traffic engineers to determine whether a driver could have safely stopped at a traffic signal that was presented under the calculation of dilemma zone to determine whether the driver could have stopped for a pedestrian. Motorists who have passed this landmark when a pedestrian enters the crosswalk can be scored as yielding to pedestrians but not as failing to yield, because they have passed a point in which there was sufficient time to yield. Motorists beyond the landmark when the pedestrian entered the crosswalk can be scored as yielding or not yielding because they have sufficient distance to safely stop. When the pedestrian first starts to cross, only drivers in the first half of the roadway will be scored for yielding. Once the pedestrian approaches within a half lane of the median, the yielding behaviors of motorists in the remaining lane(s) will be scored.

Conflicts between motorists and pedestrians

A conflict between a motorist and a pedestrian will be scored whenever a motorist suddenly stops or swerves to avoid striking a pedestrian or whenever a pedestrian jumps, runs, or suddenly steps or lunges backward to avoid being struck by a vehicle. Because pedestrians will be following the safe crossing protocol these types of incidents should be rare events. The may be more likely to occur when observing natural crossings.

Driver passed or attempted to pass stopped vehicle

A driver is recorded as passing a stopped vehicle if they passed a vehicle that was yielding to the pedestrian. A driver is recorded as attempting to pass a stopped vehicle if they did not yield until after they were alongside, or past, a yielding vehicle and hence then seeing the pedestrian, or if the driver behind a yielding vehicle changed lanes to go around but then yielded.

Car behind yielding car performs rapid deceleration (Hard Brake)

A car is recorded as performing rapid deceleration if they were behind a yielding car and the front-end of the car was observed taking a sudden movement to the ground.

Car braking closely to the crosswalk (Close Stop)

A car is recorded as braking closely to the crosswalk if they brake within 10 feet of the crosswalk. The data collection team should measure off the distance 10 feet from the edge of the crosswalk closest to approaching traffic and place a marker (tape, a rock, sidewalk chalk, etc) there to help them gauge if cars stopped or yielded closer than this distance.

Pedestrian trapped at median or centerline

A "trapped" situation may occur if a pedestrian makes it to the center of the road but vehicles coming from the other side do not yield, leaving the pedestrian stranded in the median or at the centerline. A centerline trapping should not occur with staged crossings, but could be observed in natural crossings. A median trapping situation will not be applicable unless a median is present.

Pedestrian outside the crosswalk

For natural observations, record any instances where a pedestrian walks more than 10 feet outside either edge of the crosswalk.

Entering Recorded Data

Once data has been collected, data will need to be transferred from the paper forms into raw and aggregate tables using Microsoft Excel. Upon returning to the office with completed data forms, follow these steps to ensure data is entered accurately and consistently.

1. Scan completed data forms into PDF format
2. Open the Raw Data Excel File and use a copy of the Template worksheet to enter each data form. Be sure to transfer all fields from the paper form into the template, including any relevant notes. Once complete, rename the worksheet using the following structure:

   First Letter of City-Major Road Name-Month Number-Day Number

3. Once all Raw Data has been entered, transfer the data from each new worksheet into the Aggregate Data Excel File. For each visit, there will be one row for Staged Crossings and one row for Natural Crossings. Transfer the number of vehicles yielding and not yielding, as well as the date, observer name, pedestrian name, and all other conflicts observed.
4. Once all data entry is complete, review both the Raw Data and Aggregate Data tables against the original forms to ensure consistency. When all fields have been checked, email scanned forms, Raw Data, and Aggregate Data tables to Dan Gelinne (gelinne@hsrc.unc.edu).

Inter-observer Agreement

A subset of the data collected will be used to calculate inter-observer agreement and procedural integrity. A measure of inter-observer agreement will be computed by dividing the number of times both observers agreed on the occurrence of each driver behavior by the number of times they agreed plus the number of times they disagreed on its occurrence. Inter-observer agreement will also be computed for the treatment integrity measure described below. A measure of inter-observer agreement will be computed at least once at each site, using the data collected by both recorders of natural crossings, after all staged crossings have been performed. For this reason, during the recordings of natural events, data collectors should not discuss the data they are collecting.

Description of Roadway Settings

Each crosswalk setting has already be described in terms of number of lanes, stop control, speed, intersection configuration, crossing type, and other surrounding factors such as significant landmarks, parked cars and bus stops. At the bottom of the tally sheet, data collectors will record any unusual circumstances that may have impacted data collection or the behaviors observed, including construction, congestion, events, obstructions, law enforcement or crossing guards present, etc.

General Safety

Data collectors will be standing near roadway intersections to collect data. Use caution traveling to the locations, including crossing roadways near the sites. Follow traffic laws at all times. Maintain a constant awareness of your surroundings, including traffic conditions and social situations, and ensure that data collection does not interfere with your attention to safety. If you feel unsafe, uncomfortable, or threatened at any time, stop data collection and move to a safer location.

Appendix I: Field Data Collection Form

Intersection or midblock crossing name:____

Weather: _____________Date: ______________ Observer name: _________________________

Data collection start time: ____________end time: _________________DZ measure:_________

Event	Yield	NO Yield	Conflict	Attempted to Pass	Hard Brake	Close Stop	Trapped Ped	No X-walk use	Notes (number of vehicles, distraction, etc.)
1									
2									
3									
4									
5									
6									
7									
8									
9									
10									
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									
21									
22									
23									
24									
25									
Natural Pedestrian Crossings									
1									
2									
3									
4									
5									
6									
7									
8									
9									
10									
11									
12									
13									
14									
15									

Study Information Sheet

July 3, 2012

Data collectors, working on behalf of the UNC-Chapel Hill Highway Safety Research Center, are conducting studies of driver and pedestrian behavior at marked crosswalk throughout the Triangle area as a part of a project to evaluate a campaign (funded by the National Highway Traffic Safety Administration and the North Carolina Department of Transportation) to improve pedestrian safety. No personal or vehicle identifying information is being collected. Data collection will occur on weekdays throughout the months of July 2012 through February 2013. Locations for data collection include:

- In Durham:
  - University @ Chapel
  - Gregson Near Main (at Brightleaf)
  - Anderson @ Yearby
  - Lamond @ Gregson
  - Fayetteville @ Peekoe
  - Tobacco Trail Near Riddle
- In Raleigh:
  - Wilmington between Hargett and Martin
  - Wilmington near New Bern (by Capitol)
  - Blount Street between Martin and Hargett
  - Martin @ State
  - Martin @ Bloodworth
  - South near Fayetteville (between Wilmington and Salsbury)

If you have any questions about the data collection procedures or how the data will be used, please contact the project's Principle Investigator: Laura Sandt at sandt@hsrc.unc.edu or 919-962-2358.

Appendix J: Transferability Model

This transferability model is intended to provide answers to key questions that agencies and organizations may have when developing similar programs. The full report and other appendices may provide additional information.

What was the goal of the campaign?

The Watch for Me NC campaign aimed at reducing the number of pedestrians hit and injured in crashes with vehicles through a comprehensive program of public outreach and law enforcement.

How did the campaign relate to the overall pedestrian safety program?

The campaign was informed by existing pedestrian safety plans and aimed to complement ongoing infrastructure improvements occurring during the same time period. Campaign participants included local pedestrian coordinators, planners, law enforcement officers, engineering staff, and others who coordinated closely. However, the campaign was managed externally by NCDOT and not housed within any local pedestrian safety program. Thus, for some agencies, participation in the program was seen as a supplemental effort in relation to their overall pedestrian program and was not as heavily integrated as would have been ideal for program sustainability.

Who were the key campaign leaders and how was it organized/managed?

As NCDOT was the primary funder of the campaign materials, NCDOT staff led the decision-making and purchasing regarding communication strategies and material development such as radio ads, transit ad placement, and other print materials. Their decisions were guided with input from a steering committee made up of UNC-HSRC research staff and local and regional pedestrian planners and engineers. UNC-HSRC staff, with funding from NHTSA, led the evaluation effort and coordinated closely with the law enforcement, who led decisions regarding what operations were conducted during the study period. The local partners that committed to the campaign were responsible for leading community engagement activities and disseminating the materials and campaign messages in their respective communities or campuses. The steering committee met in person about once per month for roughly more than a year from the time campaign planning began until after it was launched. As noted in the lessons learned section of the final report, having a stable, long-term community champion (or group of partners) is essential. These champions need to have an interest in pedestrian safety, knowledge of effective practices, support from their organization(s), and dedicated time (and related funding) to perform the duties required by the campaign.

What was the timeframe for the campaign?

Planning for the campaign with the Triangle partners began in October 2011. The campaign launched in in August 2012 and ran through November 2012. Planning for the second year began in January 2013 and a second campaign, with additional partners, was launched in August 2013. Several months were spent on performing a crash analysis that helped inform the direction of the campaign. Significant time (from January to June 2012) was also dedicated to communication material development, including conceiving ideas and researching other examples, writing copy, designing ads, testing materials, and working with vendors to produce materials. It is recommended that future programs consider the time needed to gather an information base and develop new materials if none exist, in addition to considering the time needed for training, partnership building, and program implementation.

How was the campaign funded?

The Watch for Me NC campaign was funded with a combination of state (NCDOT) and federal funds (NHTSA cooperative agreement). No funds were used for officer over-time pay; they voluntarily committed their time to perform pedestrian safety operations.

Who are important stakeholders and partners?

The Watch for Me NC campaign involved the participation of hundreds of partners from a variety of organizations. Each partner brought a different set of assets to the project that contributed to the successful development, implementation, and evaluation of the Watch for Me NC intervention. Partners considered key include:

Key Partners	Common Partner Assets
City/ Regional Planners	• Access to meeting space • Knowledge of community calendar • Access to key city officials and city council agendas • Expertise in transportation issues • Access to communication/public affairs staff • Possible source of funding
Advocacy groups or walk/bike clubs	• Knowledge of community leaders • Perspective on key pedestrian issues and danger areas • Access to community listservs and grassroots outreach channels • Source of volunteer support for events and outreach
Public Health Professionals	• Knowledge of best practices in health education and injury prevention • Access to meeting space • Knowledge of community calendar • Access to communication/public affairs staff • Possible source of funding
Law Enforcement Staff	• Ability to perform targeted traffic safety operations • Knowledge of road safety concerns and danger areas • Ability to assist with community education and outreach • Knowledge of community and business leaders
Research or University Staff	• Ability to collect and analyze data • Knowledge of best practices • Connections with students or volunteer support
Local Businesses	• Source of funding for events or campaign activities

In addition to having a diverse set of partners, formal commitments by partner groups helped ensure longevity and a "committee steering committee" helped provide structure and continuity to program activities. While the Watch for Me NC effort did not involve school-based education or outreach, school representatives who have an interest in pedestrian safety may also be an important partner in other programs.

How were stakeholders engaged?

Partners and stakeholders were engaged in different ways. Local planning staff served as the liaisons to the local advocacy groups, elected officials, and business leaders in their respective communities. The planners also coordinated with the law enforcement but the UNC-HSRC research team was the primary contact for law officers, who participated in trainings, safety operations, and contributed information to support the program evaluation. Several approaches were used to engage law enforcement and solicit their support (particularly in the absence of over-time pay). First, UNC-HSRC provided crash data showing the magnitude of the problem and mapping high-crash locations, as well as data showing how low baseline yielding rates were at specific sites. Officers appreciated having data to help justify their actions and plan enforcement sites, as well as compare crash data to other issues such as crime. By working at the regional scale, the campaign leveraged the natural competition among nearby agencies to participate. Once one police chief had signed on, others quickly followed. Finally, the UNC-HSRC team provided law enforcement with support tools to make their jobs easier, such as brochures and materials to hand out to the public, sample operations protocols, training to build officer capacity, etc. The Watch for Me NC steering committee also coordinated with the district court judges and attorneys so that they would be aware of the program and would not quickly dismiss any citations generated as a result of the campaign.

How was the campaign developed?

The campaign development was informed by a review of previous literature and theories, a comprehensive pedestrian crash analysis, input from stakeholders on key issues and opportunities, site visits to observe conditions and collect baseline data, and local plans that identified priority issues and locations for education and enforcement. As with every project, the campaign was limited by the resources available (including funding and partner availability) during the timeframe.

What were the key elements of the campaign?

The campaign consisted of safety messages directed toward drivers and pedestrians, as well as active enforcement by area police to crack down on some of the violations of pedestrian safety laws. The campaign was intended to be comprehensive (i.e., targeting all road users in the general population). It took a phased approach, rolling out the education and public awareness elements before launching targeted enforcement operations. See the Final Report for a comprehensive summary of the program development and communication products developed. To help them prepare for operations, a one-day training course was provided at no cost to participating police agencies. Ideally, a pedestrian safety program would have more systematic and required training for law enforcement to reach all officers. For the enforcement effort, some agencies used a progressive ticketing system, conducting informational checkpoints first, then stopping drivers and giving verbal or written warnings. Citations were used in egregious cases, primarily involving drivers failing to yield, while most pedestrians received information or warnings. As discussed in the Final Report, enforcement was limited overall to typically one or two visits to a few sites over the four month period of the campaign, limiting the reach and effectiveness of the program, with the exception of the sustained enforcement that occurred in Carrboro, NC. More intensive efforts have been documented in other cities, including Gainesville, FL and Chicago, IL, and future programs are encouraged to consider routine (i.e., every month), high visibility operations throughout the high-crash season.

What communication materials were developed, and how?

Communication materials included radio PSAs, posters, bumper stickers, banners, transit ads (internal and external to the bus), a brochure of laws, gas tank toppers, and a project website. Some materials were available in English and in Spanish. Press releases, talking points, and a communications plan were also generated to help earn media. Presentations about the campaign were also developed for use in community meetings and briefings with elected officials. All are available on the project website: www.WatchForMeNC,org. Material designs and content were conceived based on several principles: 1) Materials were designed to be health-risk based, or to provide information and statistics to communicate the risk of a pedestrian crash and raise awareness of the issue; 2) Materials were intended to address a specific set of behaviors (driver and pedestrian) identified based on the crash analysis and communicate model safe behaviors (through images and related text); and 3) Materials aimed to avoid fear-based or graphic imagery, due to potentially unintended consequences of turning off viewers. This principle was based upon research regarding the effectiveness of fear-based appeals in traffic safety behavior change (http://www.swov.nl/rapport/Factsheets/UK/FS_Fear_appeals.pdf). NCDOT communications led the design work, with input from stakeholders and the steering committee. There was limited opportunity to do focus-group testing or other systematic evaluation of the materials before roll-out, but other programs with the available resources would be strongly encouraged to test such messages before distribution.

What are realistic campaign performance measures?

The UNC-HSRC project team utilized multiple measures to evaluate the campaign and monitor its performance, including program implementation records, self-reported measures of law enforcement knowledge, attitudes, and capacity, and measures of driver yielding behaviors. For this effort, due to the lag in crash data reporting and short time period for follow up, crash-based measures were not feasible. Other projects have performed community surveys as an additional method to evaluate measures of communication reach and recall or awareness of the campaign. Each program evaluation plan will need to be tailored to the program based on available funding and staff resources and expertise, as well as consideration of what program elements are available to be evaluated, what data exists or could be collected, and how the information will be used. NHTSA's Art of Appropriate Evaluation may be a useful resource for determining realistic campaign performance and evaluation methods: http://www.nhtsa.gov/people/injury/research/ArtofAppEvWeb/.

What additional resources were useful in providing guidance to the campaign?

The following links to resources were repeatedly used by Watch for Me NC partners and may be useful for other programs:

- Communication for Pedestrian Safety: Risk, Response, and Change—A toolkit developed by the California Department of Public Health to assist communities in promoting education and change through effective communication and outreach
- NHTSA Pedestrian Safety Training for Law Enforcement (link to order CD-ROM)—A guide for how officers can enhance enforcement efforts to protect pedestrians
- NHTSA Child Pedestrian Safety Curriculum—A five-part lesson series for children in grades K-5 that includes instructor lesson plans, skills practice, and take-home materials for caregivers
- Pedestrian and Bicycle Information Center—A comprehensive collection of pedestrian and bicycle safety resources and research for practitioners, advocates, and the general public
- Pink Book - Making Health Communication Programs Work— A helpful resource on health communication strategies by the National Cancer Institute
- Public Information about Road Safety— A summary of research and best practices on conducting public information campaigns to improve road safety

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