Final Problem Identification, Countermeasure Selection, and Outreach & Awareness Report

Pedestrian Safety Engineering and Intelligent Transportation System-Based Countermeasures Program for Reduced Pedestrian Fatalities, Injuries, Conflicts and Other Surrogate Measures

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EXECUTIVE SUMMARY

The University of Florida Transportation Research Center (TRC) has assembled a project team that includes traditional and nontraditional stakeholder to reduce the number of pedestrian crashes in Miami Dade County. The primary goal of the project is to install and evaluate a number of traditional and new ITS based treatments along the top 12 high crash corridors in Miami Dade County. These treatments have been matched to specific sites using GIS crash data, categorizing all crashes within each corridor using GIS crash mapping, the Pedestrian Bicycle Crash Analysis Tool (PBCAT), site visits, demographic data, and surrogate data collected at high crash sites. The primary objectives are: 1. To determine whether crash analysis methodology can match specific and appropriate treatments to crash sites along each corridor. 2. To determine whether these treatments are effective in reducing crashes and surrogate data at the treated sites. 3. Determine the effects of the treatment on pedestrian and vehicle mobility along the corridor. 4. To determine whether the effects of the treatments will result in a positive area wide impact on safety and mobility.

Problem Identification

Miami Dade County has a population of 2,253,367, which is about 14% of the state's population. The county forms a metropolitan area that contains 26 jurisdictions. While each city has its own government, Miami-Dade County is the government responsible for all transportation improvements in the county. The area has a diverse population: it has a significant retirement population and is home to large minority populations. Within the state of Florida, Miami-Dade County has consistently led the state in pedestrian deaths and injuries per 100,000 population.

In order to identify high crash corridors the following procedures were followed. First, all pedestrian crashes between 1996-2000 were extracted from the Florida Department of Highway Safety and Motor Vehicles records and mapped using ESRI's ArcInfo and Arc View, from the written crash reports. The spatial analysis tools allowed us to analyze crash concentrations by developing a set of contours showing crash density. This analysis identified 27 high crash corridors. Each corridor was then ranked by multiplying the number of crashes per mile within it by the number of fatal and incapacitating crashes per mile and dividing this product by 100 yielding a crash index weighted for severity of crashes. Corridors with a crash index of 6 or more were selected for treatment. This analysis identified 9 corridors. Two additional corridors were selected because they were surrounded by high crash corridors and had a crash index in the borderline range and one corridor with a relatively low index was selected because almost all crashes occurred at night. The 12 corridors selected for treatment accounted for 12% of all crashes and 14% of fatal crashes in Miami Dade County. The crash frequency per mile for the top 10 corridors ranged from 42.2 to 72.5 per mile as compared with the average rate of 1.35 crashes per mile for all of Miami-Dade County.

Matching Treatments to Corridors

Once the corridors were selected all crashes in each corridor were analyzed using PBCAT. These data were then merged back into the GIS crash spreadsheet along with demographic information associated with each crash. Once this task was completed a guide was prepared which listed all crashes by location within each corridor. This guide also contained information on the location, time, lighting conditions, severity of pedestrian injury, pedestrian age, offset from intersection, direction of vehicle, the year, whether classified as intersection or non-intersection location, and the PBCAT category for each crash. Summary data for each corridor are also provided along with a GIS map of crashes in the corridor. These data were also desegregated for populations, and subpopulations, specific action of the pedestrian, and specific aspect of the crash itself. These crash data were then analyzed for lighting condition; intersection vs. non-intersection location, all turning vehicles, left turning vehicles, pedestrian violations, and motorist violations, which revealed interesting differences in the crash pattern across corridors. These data were then used to assist the team in matching treatments to zones. This analysis identified several corridors with a high percentage of senior pedestrians struck, and one corridor with a high percentage of child pedestrians struck. It also identified corridors with significantly more crashes at intersection locations, corridors with significantly more crashes at non-intersection locations, and corridors with significantly more crashes that involved turning vehicles and left turning vehicles.

Surrogate data collection was informed by the above analysis. Several pedestrian behaviors were recorded at a number of sites. These included the percentage of percentage of pedestrians crossing during the WALK, clearance, and DON'T WALK indications; and the percentage of pedestrians pressing the call button. These data showed that the level of compliance with pedestrian signals was very low and that the pattern of behavior varied across corridors. For example most pedestrians crossed against the pedestrian signal at Collins and Washington sites while more initiated crossing during the pedestrian clearance phase on Alton Rd. The percentage of pedestrians pressing the call button varied across site between 7% and 35%.

Surrogate data were also recorded along one corridor, which had a high percentage of pedestrians using transit. At these locations many crashes occurred mid-block and the surrogate data indicated that bus users comprised 27% of pedestrians crossing at these locations. These data also showed that bus patrons were twice as likely to cross mid-block.

Data collected on driver behavior indicated that on average less than half of drivers turning at intersections yielded to pedestrians in crosswalks controlled by traffic signals. The percentage yielding at uncontrolled locations only averaged 24%. These data validated the PBCAT data, which indicated a high percentage of crashes involved turning vehicles. Surrogate data was also collected on the percentage of drivers who came to a complete stop when turning right on red at locations with high numbers of crashes of this type. These data indicated that only half of the vehicles came to a complete stop and only 14% to 17% of drivers slowed minimally at these locations. Only 23% of motorists turning right from Collin onto 5th St looked right for pedestrians before initiating their turn and 30% of drivers turning right from Washington Ave. onto 5th St. looked for pedestrians.

Although the PBCAT was helpful in matching countermeasures to corridors, the team did identify a number of limitations, which could be improved in the next version of the software. Specifically we recommend that each crash be coded for more than one potential cause. Much important data is lost when a crash is only coded for one crash type. This would allow practitioners to extract more information when examining the role of specific factors responsible for crashes.

Countermeasures were selected by using the methodology described above. The "Pedestrian Facilities Users Guide: Providing Safety and Mobility" was one tool used to match treatments to corridors. We also referred to other documents and in the case of novel ITS countermeasures contact with other professionals. Countermeasures recommended in this report include the following: 1. Advance Yield Markings for crosswalks with an uncontrolled approach; 2. Offset Stop Bars at intersections; 3. Leading Pedestrian Signal Phase; 4. TURNING VEHICLES YIELD TO PEDESTRIANS symbol signs for drivers; 5. Eliminating Permissive Left Turns; 6. Roadway lighting Improvements; 7.In roadway knockdown YIELD TO PEDESTRIANS signs for crosswalks at controlled and uncontrolled locations; Pedestrian Zone Warning Signs for locations; 8. Crossing Islands where crashes occur mid-block and at uncontrolled locations; 9. Curb radius reduction for location where right turning vehicles are over represented in crashes; 10. ITS Pedestrian Detection for locations where pedestrians do not press call buttons; 11. ITS Push Buttons that acknowledge the call; 12. ITS Sign that shows the driver the direction a pedestrian is crossing for uncontrolled crosswalks; 13. ITS Smart lighting that increase in brightness when pedestrians are crossing; 14. ITS NRTOR signs for sites where drivers do not yield to pedestrians when turning right on red; 15. ITS Pedestrian Signals that warn pedestrians to look for turning vehicles during the WALK phase and provide the time left to cross during the clearance phase; 16. ITS Speed Warning Signs that flash SPEEDING SLOW DOWN when vehicle are exceeding the speed limit; 17. LED Transponders to assist the blind crossing the street.

The next section of the report matches treatments to each crash zone. Because a multifaceted approach to safety that includes treatments designed to influence drivers as well as treatments designed to influence pedestrians is most likely to produce a detectable reduction in pedestrian crashes, multiple treatments have been matched to each corridor. This section provides the following information for each corridor: 1. A summary description of the crash characteristics within the corridor. 2. A description of the corridor that includes speed limit and ADT. 3. The PBCAT crash profile for the corridor. 4. A report on observations made during a site visit to the corridor. 5. Surrogate behavioral data collected within the corridor. 6. Specific recommendations for treatments that are informed by the above mentioned data. 7. A spreadsheet showing the placement of each recommended countermeasure.

Data Collection and Experimental Design

It selection of measures of effectiveness (MOEs) is critically important in documenting the success of a demonstration project of this type. The project team in consultation with FHWA has determined a wide array of MOEs for each treatment undergoing evaluation. These measures include crash frequency and severity, demographic information on road users; mobility measures, and a variety of surrogate safety measures. Because of the number of behaviors to be scored would make it difficult for observers to score behavior in real time we have decided to videotape pedestrians and motorist behavior using cameras mounted on telescoping poles over the area of interest. Data can then be scored from videotape. All tapes will be saved so that other researcher can reanalyze these tapes for other purposes.

Because it is not possible to employ a large-scale group design that includes random assignment to conditions, within comparisons have been selected. One frequently employed alternative is the use of before and after studies. First baseline data is collected before the treatment in introduced, followed by the introduction of the treatment and the collection of after treatment data. This design has one major drawback: it does not control for possible confounding variables that might be correlated with the introduction of the treatment. The list of potential confounding variable is legion: weather changes; changes in traffic patterns or road user population; change in the level of enforcement or perceived enforcement; etc. Many of these changes can easily lead to significant differences that are not caused by the treatment under study.

One alternative to simple before and after studies is the use of designs based on replication logic. One such design variant is termed a multiple baseline design. Before data are collected at several sites with each site receiving the treatment at a different point in time. Each time a site receives the treatment another before measure is obtained at the untreated locations. The untreated sites serve as a control for possible confounding variables since significant changes should only be detected following the introduction of the treatment at each site. The multiple baselines design is illustrated below.

	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5
Site 1	Baseline	Treatment	Treatment	Treatment	Treatment
Site 2	Baseline	Baseline	Treatment	Treatment	Treatment
Site 3	Baseline	Baseline	Baseline	Treatment	Treatment
Site 4	Baseline	Baseline	Baseline	Baseline	Treatment

The design plan involves evaluating each of the treatments at several sites using the multiple baseline design. A plan presented in this report would see all of the data collected within a two-year period.

Outreach and Awareness

The final section of the report describes how outreach and awareness campaigns will be implemented as part of this project. There are four basic strategies that can be used to target pedestrians and drivers using outreach and awareness campaigns. These strategies can be employed in isolation or combination to address a particular problem. First, one can blanket the entire community with information using flyer sent out with phone or power bills, frequent public service announcements on broadcast on cable television, or radio stations, and newspaper articles and advertisements. This strategy is fairly costly but can be effective provided the messages are repeated often. Second, one can target a particular segment of the population by handing out educational materials to children, seniors, or other groups identified as particularly at risk. This strategy can be effective but requires repetition and can be somewhat costly. Third, one can target a particular zone, by distributing flyers, posters or other educational materials to individuals that live in the area where the problem occurs. This strategy is most effective when the pedestrians or drivers involved in crashes live in the immediate vicinity or the area where the problem occurs. It becomes less effective as the percentage of persons involved in crashes that live outside the area where the crashes take place increases. Fourth, educational materials can be placed in close proximity to the devices. This strategy is very effective at targeting the population who use the device regardless where they live, and is even effective in educating visitors to the area. Typically signs, and posters are placed either at locations where the countermeasures are installed or in locations where people using the corridor will see them (i.e., in bus shelters or on buses, or in local schools).

Outreach and awareness strategies will be designed to educate pedestrians in the appropriate use of each of the installed technologies. The most cost effective way to educate drivers and pedestrians about traffic engineering countermeasures placed in there area is to place them in close proximity to the devices themselves. Therefore, this strategy will be used as often as possible. The second planned approach is to disseminate materials within corridors where most of the persons struck live close to the corridor. This could be achieved by placing educational materials in community centers and recreational areas, in local schools, and in local businesses that serve the public such as bars and restaurants. From a psychological perspective it is also important that education and outreach material be focused and specific in nature, because specific reminders have been repeatedly shown to be superior to general reminders in inducing behavior change. With these points in mind, the outreach and awareness strategies were matched to each of the 12 corridors identified to receive treatment.

Each technology requires a somewhat different outreach and awareness solution. Some devices will require a good deal of educational activity while drivers and pedestrians more intuitively understand others. In some cases it may be undesirable to provide outreach and awareness because it may be more desirable not to inform pedestrians that the technology is being introduced so they not become overly dependent upon it. This is typically the case with tactics that focus on the driver but may also relate to automatic detection implemented to back up push button calls. If pedestrians are aware of automatic detection they may stop using the pedestrian call button even in areas where automatic detection is not provided. The specific strategy proposed for each intervention is outlined in the report.

The best way to assess the efficacy of the outreach and awareness efforts would be to compare a large number of treated corridors, some of which receive outreach and awareness efforts and some that do not. Unfortunately, this approach is beyond the scope of this study. An alternative tactic would involve surveying pedestrians to determine how well they understand the devices and whether they have seen outreach material about the device. Unfortunately such surveys can also be deceptive. For example, most drivers respond to a wide array of traffic engineering devices but when surveyed do not provide clear evidenced that the devices are understood in an intellectual sense. One reason for this discrepancy may be that the devices are understood at an intuitive level, and that non-engineers do not have the vocabulary to clearly indicate their understanding of the device. For example, studies show that members of the general public do not understand the meaning of the flashing hand. Yet most people have crossed many times and have never noted having to dodge through vehicles during this condition. How can it be that the average person is so insensitive to correlations in their environment? The most likely answer is that most are not insensitive. They know that vehicles have not been released but they also know that they will be at some time in the future. Hence most pedestrians hurry during the clearance phase. There behavior indicates they do have a certain intuitive understanding, however when you survey them they say they don’t understand what the flashing hand means. With this caveat in mind, a number of human factors studies and surveys are proposed to assess the effectiveness of the outreach and awareness activities.

FINAL PHASE 1 REPORT

The University of Florida Transportation Research Center (TRC) is pleased to submit this Final Report under the Cooperative Agreement (CA) "Pedestrian Safety Engineering and Intelligent Transportation System-Based Countermeasures Program for Reduced Pedestrian Fatalities, Injuries, Conflicts and Other Surrogate Measures" (CA DTFH61-01-X-00018) to investigate and produce timely and comprehensive solutions for pedestrian encounters with road vehicles that result in death or injury to pedestrians.

The TRC joined forces with the Department of Urban and Regional Planning (DURP) at the University of Florida, the Florida Department of Transportation, Department of Psychiatry and Behavioral Sciences (DPBS) at the University of Miami, Miami-Dade County Public Works Department, Mr. Charles Zegeer [an employee of the University of North Carolina Highway Safety Research Center (HSRC), but in this instance working as a private consultant to the TRC], Dunlap and Associates, Inc., and Miami-Dade Metropolitan Transportation Planning Organization (MPO) to carry out phase 2 if the proposal is approved.

Miami-Dade County, Florida, the Florida Department of Transportation (FDOT) District 6 office, and the FDOT Research Office have graciously joined with us as a partner by providing the matching funds for Phase 2. This report covers problem identification, countermeasure selection, research methodology, and the outreach and awareness strategies planned to educated the public about the countermeasures to be implemented in phase 2.

Project Team

The University of Florida TRC has assembled a team of experts and stakeholders that possess the technical and management skills required to competently carry out this project in Miami Dade County. This team is dedicated to reducing crashes through traditional traffic engineering practices and the application and development of ITS countermeasures and includes stakeholders at the local level. The team includes members with extensive experience in pedestrian issues in Miami-Dade County and consists of traditional and non-traditional partners including: safety researchers; traffic engineers; planners; evaluation specialists; health specialists; and local community group members concerned with pedestrian safety and education.

To ensure that the technical task were successfully completed the team includes individuals with expertise in the following areas: (1) GIS pedestrian crash mapping in Miami-Dade County; (2) use of *Pedestrian and Bicycle Crash Analysis Tool* (PBCAT) software; (3) use of a zone approach to select appropriate engineering countermeasures to reduce pedestrian crashes; and (4) the deployment of traditional and ITS pedestrian countermeasures. To ensure a strong community base, the team included local community groups, local government, and the local FDOT district office (District 6). The task of assembling a local team was facilitated by the ongoing work of Charlie Zegeer under the a National Highway Traffic Safety Administration (NHTSA) grant entitled, *Large City/Jurisdiction Demonstration and Evaluation Program for Pedestrian Safety*, which is working on educational and enforcement initiatives to increase pedestrian safety in Miami-Dade County. Several members of the project team are involved in various aspects of this NHTSA grant. Finally, the project team received a matching grant from FDOT Research Office, for Phase 1 and matching funds from the Miami-Dade County Public Works Department, and FDOT District 6 for Phase 2.

Traditional Team Members

Dr. Ralph Ellis. Dr. Ellis is currently Associate Professor of Civil Engineering at the University of Florida where he teachers Construction Engineering and Engineering Management. Dr. Ellis has over 15 years experience as a construction and engineering manager and has been Principal Investigator in on 32 sponsored research projects. Dr. Ellis will take responsibility for project management.

Dr. Ron Van Houten. Dr. Van Houten will serve take responsibility for the overall technical direction of the project. He has over 20 years of experience in the development and analysis of countermeasures including the deployment of ITS technology and has conducted studies on a wide variety of pedestrian safety countermeasures. Dr. Van Houten also chairs the papers committee for the TRB pedestrian committee and is a member of the National Committee for Uniform Traffic Control Devices. He will also be responsible for preparing technical reports.

Kenneth Courage. Professor Courage will be responsible for the development and application of the data collection and analysis technology fro this project. He has directed several research projects, many of which have involved application of advanced technology to traffic data collection. He is the principal developer of several computer based data collection and visualization techniques such as the Moving Vehicle Run Analysis Package, The Platoon progression Diagram, and Signal Network Animated Graphics.

Dr. Scott Washburn. Dr. Washburn will be responsible for the data reduction and analysis of data collected by field deployed video technologies. Dr. Washburn has considerable experience in the development of software tools for data processing, and statistical computing and analysis.

Charlie Zegeer. University of North Carolina, Highway Safety Research Center. Mr. Zegeer is currently Associate Director of the Highway Safety Research Center. He is the Project Manager for the NHTSA Miami-Dade Pedestrian Demonstration study, which is focusing on educational and enforcement interventions. Mr. Zegeer has over 20 years experience in evaluating pedestrian engineering interventions.

Dr. Ruth Steiner. Assistant Professor, Department of Urban and Regional Planning. Dr. Steiner has considerable experience with GIS crash mapping and can consult with the team on land use issues.

Richard Blomberg. Richard is Senior Engineer with Dunlap and Associates. He participated in the beta test for the Pedestrian Bicycle Crash Assessment Tool and will be responsible along with Arlene Cleven for categorizing all crashes in the corridors under study in the research project.

Dr. Louis Malenfant. Dr. Malenfant is the President of the Center for Education and Research in Safety. He has considerable experience designing outreach and awareness materials that target pedestrians and drivers. Dr. Malenfant will work with Jose Guerrier to develop materials to educate driver and pedestrians on the appropriate way to respond to the engineering devices selected for evaluation in this project.

Dr. Jose Guerrier. Department of Psychiatry, University of Miami. Dr. Guerrier is a communication specialist with a good deal of experience providing outreach on traffic engineering measures to the Spanish and Haitian-Creole speaking populations from Miam-Dade County.

David Henderson. Bicycle-Pedestrian Coordinator for the Miami Urbanized Area Metropolitan Planning Organization. Mr. Henderson and his staff are very knowledgeable on pedestrian safety issues in Miami Dade County. He began his career in transportation as a project manager with the Florida Department of Transportation's District Six rising to the position of assistant planning manager. He was responsible for managing several FDOT programs including bicycle/pedestrian coordination.

Muhammed Hasan. Division Chief of Traffic Engineering for Miami-Dade County Public Works. Mr. Hasan has a strong commitment to improving pedestrian safety in Miami-Dade County and is an important partner in the this project.

Rory Santana.

Elio Espino. Florida Department of Transportation, District Six Safety Engineer. Mr. Espino has worked on a number of safety projects in Miami-Dade and is presenting a paper on a systematic approach for the identification of pedestrian high crash corridors at TRB this year. His close cooperation with the project helps to ensure that successful components will be maintained after the project is completed.

Non-Traditional Team Members

Dade County Public Schools: The Dade County Public Schools (DCPS) has consistently collaborated with team members in the implementation of pedestrian safety education workshops for elementary school children. The DCPS can assist us in disseminating information to parents and children on the proper use of the countermeasures implemented. Various schools in the DCPS also organize activities for adults in the community. Among these are health fairs and adult education programs. The latter especially can be used as another vehicle for data collection and education.

Miami-Dade Police Department Community Affairs, Pedestrian Safety Section: Mr. Henri Oliver, the Director of the Pedestrian Safety Section at the Miami-Dade Police Department (MDPD)/Community Affairs, has been a very supportive partner in our pedestrian education workshops with elementary schools in Miami-Dade. The Pedestrian Safety section of the MDPD works extensively on pedestrian safety education with Miami-Dade County public and private schools as well as with seniors and other public or private groups (e.g., girl/boy scouts) in unincorporated Miami-Dade County. As such, it is a readily recognizable and respected entity in the county and would serve as a strong partner in helping us to identify and establish contacts across diverse communities as appropriate. This will help us to identify additional partners that will facilitate the implementation of this project.

Little Haiti/Edison/Little River NET Service Center: The role of the Neighborhood Enhancement Team (NET) is to make each neighborhood in the city cleaner and safer. The NET serves as a liaison between the police department and the community. It receives complaints from the community residents about a variety of community related issues and also serves as an agency for disseminating information on various issues ranging from health to transportation. Thirteen NET service centers in Miami represent many of the communities in Miami-Dade County. These centers will be an important instrument in reinforcing information dissemination efforts of our team and can assist in providing venues for collecting qualitative data before and after the implementation of countermeasures.

Alliance for Aging in Miami-Dade: Florida has the highest proportion of elderly persons in the nation. Furthermore, older pedestrians are more likely to die in pedestrian crashes than their younger counterparts. Consequently, it will be important to identify areas with high elderly pedestrian injuries and fatalities for the implementation of countermeasures, and it will be especially important to educate the elderly pedestrians about these applications. The Alliance for Aging of Miami-Dade will be especially helpful in that endeavor.

Format of the Report

This report is broken into three sections. The first section describes the problem identification methodology, the second section describes how countermeasures were selected, and the final section describes the development of outreach and awareness strategies. These three sections will describe a strategy for reducing pedestrian fatalities, injuries and surrogate measures in order to increase pedestrian safety and walkability.

Project Goals and Objectives

This primary goal of this project is to install and evaluate a number of traditional and new ITS based treatments along the top 12 high crash corridors in Miami Dade County. These treatments will be matched to specific sites using GIS crash data, categorizing all crashes with each corridor using GIS crash mapping, the Pedestrian Bicycle Crash Analysis Tool (PBCAT), sites visits, demographic data, and surrogate data collected at high crash sites. The primary objectives are: 1. To determine the crash analysis methodology can match specific and appropriate treatments to crash sites along each corridor. 2. To determine whether these treatments are effective in reducing crashes and surrogate data at the treated sites. 3. Determine the effects of the treatment on pedestrian and vehicle mobility along the corridor. 4. To determine whether the effects of the treatments will result in an area wide impact on safety and mobility.

Section 1: Problem Identification

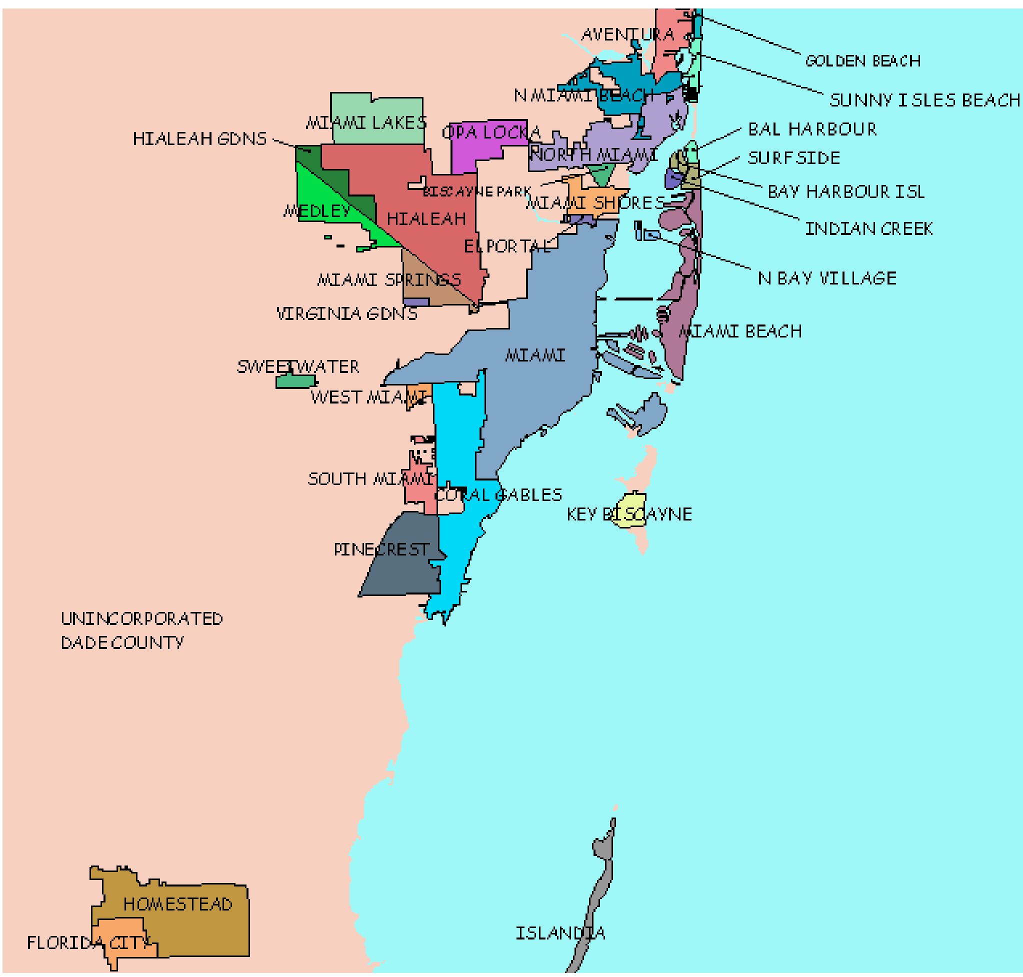
1.1.1 Comprehensive Data Collected in Miami-Dade

Miami-Dade County in located in southernmost Florida and has a population of 2,253,362 (Census), which about is about 14.1% of the state's total population of 15,982,378. The county encompasses almost 2,000 square miles (larger than the states of Rhode Island and Delaware). One-third of the county is located in Everglades National Park.

The county forms a metropolitan area that contains 26 jurisdictions (see Map below). The City of Miami covers 34 square miles and is the eighth largest U.S. metropolitan area. The City of Miami is the largest one in the county with a population of 362,470 (US Census). Other major cities in the county include Hialeah (226,419), Miami Beach (87,933), North Miami (54,880), Coral Gables (42,249), and North Miami Beach (40,786).

While each city has its own government, Miami-Dade County is the government responsible for all transportation improvements in the county. The county changed its name from Dade County in 1997. Miami-Dade Mayor Alex Penelas is considered a strong and popular mayor who has spearheaded a push for improvements to the pedestrian environment.

Map of Miami-Dade County Municipalities



The area has a diverse population: it has a significant retirement population; it is a main tourist attraction and a home to large minority populations, the most predominant being Hispanic. The characteristics of the population are discussed in greater detail in Sections 1.1.2. and 1.1.3.

Major employers include American Airlines, University of Miami, BellSouth, Winn-Dixie, Florida Power and Light, Burdines Department Store, K-Mart, Publix Grocery, Mt. Sinai Medical and Baptist Health Systems. Tourism is big business and pumps over $5.5 billion into the Greater Miami's economy each year. The seaport makes the area the U.S.'s cruise capital and the Miami airport ranks first in nation in number of international flights.

Miami-Dade County's Overall Traffic Safety Problem. Miami-Dade County has the largest population in the state and leads all other counties in terms of number of crashes and number of deaths and injuries. In 2000, 302 persons were killed and 40,714 were injured in motor vehicle crashes in Miami-Dade County. Over the last five years, traffic-related fatalities in Miami-Dade County peaked in 1996 and were lowest, with 300 fatalities, in 1998. The number of crashes has steadily increased from 43,233 in 1995 to 51,132 in 2000 with a slight dip in 1997.

Fatality Trends					
	1996	1997	1998	1990	2000
Miami-Dade County	326	309	300	316	302
All of Florida	2,806	2,811	2,889	2,920	2,999

Crash Trends					
	1996	1997	1998	1999	2000
Miami-Dade County	48,634	47,794	49,421	49,804	51,132
All of Florida	241,377	240,639	245,440	243,409	246,541

2000 Crash Facts

	Miami-Dade County	State of Florida
Total Crashes	51,132	246,541
Alcohol-related crashes	2,007	23,578
Fatalities	302	2,999
Alcohol-related fatalities	51	979
Injuries	40,714	231,588
Alcohol-related injuries	1,709	19,775
Pedestrian fatalities	81	506
Pedestrian injuries	1,643	7,782
Bicyclist fatalities	6	83
Bicyclist injuries	582	4,618

Miami-Dade County's Pedestrian Crash Problem. To better understand the pedestrian crash problem in Miami-Dade County and put it in proper perspective, it is useful to take a glimpse of the State and County pedestrian crash problem versus the nationwide trends. In 2000, the state ranked second (behind California) in the number of pedestrian fatalities, with 492 fatalities. The population of the state ranks fourth behind California, Texas and New York. When the numbers of pedestrian crashes are adjusted to account for differences in population, Florida ranked second (behind Washington, DC) with a rate of 3.2 pedestrian fatalities per 100,000 in population. This compares with the national rate of 1.7 pedestrian fatalities per 100,000 in population.

Within the state of Florida, Miami-Dade County has consistently led the state in pedestrian deaths and injuries. In 2000, Miami-Dade had the following statistics for pedestrian crashes:

- 81 pedestrian fatalities (Hillsborough County was second with 50 and Broward third with 49).
- A pedestrian fatality rate of 3.59 fatalities per 100,000 in population (compared to the state rate of 3.17.
- 1,643 pedestrian injuries (Broward County was second with 969 and Palm Beach County third with 609).
- Pedestrian injury rate at 72.64 injuries per 100,000 in population (behind Monroe County (with a population of 79,589) at 76.64).

Pedestrian injuries and deaths by age and gender for the state of Florida are shown below.

Pedestrians Involved in Crashes by Age and Gender in 1999						
Age Groups	Pedestrians Killed			Pedestrians Injured		
	Total	Male	Female	Total	Male	Female
0-4	8	6	2	264	164	100
5-9	19	14	5	605	400	205
10-14	15	10	5	759	464	295
15	6	5	1	173	107	66
16	8	8	0	154	92	62
17	2	2	0	126	70	56
18	6	3	3	128	76	52
19	1	1	0	110	73	37
20	6	4	2	134	94	40
21-24	20	16	4	409	252	156
25-34	56	42	14	993	630	363
35-44	94	73	20	1,139	745	394
45-54	88	69	19	786	499	285
55-64	56	40	16	513	291	220
65-74	43	31	12	446	242	204
75+	55	29	26	497	221	276
Not Stated	18	11	7	300	201	96
Total	501	364	136	7,536	4,621	2,907

While there certainly is a pedestrian crash problem with older pedestrians as expected, the problem covers other age groups as well. Of course, population data by age is important in making such comparisons (and pedestrian walking exposure would certainly be desirable in such comparisons if such data existed).

Statewide, 4,621 male pedestrians were injured in 1999 compared to 2,907 females. In Miami-Dade County in that same year, 870 male pedestrians were injured or killed compared to 657 females. For most age categories, males represented about two-thirds of all pedestrian injuries compared one-third for females. Above age 65 male and female pedestrian injuries were about equal. Such trends show up in other studies for a variety of reasons (e.g., there are more females than males in the 65 and above population).

Overall summaries of pedestrian injury and fatal crashes for 1996-2000 in Miami-Dade County are discussed briefly below for various features of interest. This is not intended to be a comprehensive discussion, but provides some insights into the nature of pedestrian crashes in Miami-Dade County. The characteristics for specific groups in the population are discussed, in Sections 1.1.2 and 1.1.3, below.

<u>Vehicle Type</u>

- As expected, drivers of cars (5451), pickup/light trucks (1029), and passenger vans (701) struck pedestrians most often in Miami-Dade County in 1996-2000. Buses struck 127 pedestrians, while drivers of medium and heavy trucks struck 108 pedestrians. Such values could be normalized by exposure by vehicle type to be more meaningful.

Pedestrian Action

- Just over half of the pedestrian fatalities occur while crossing not at an intersection in Miami-Dade County.

<u>Roadway Functional Type</u>

- The great majority of pedestrian crashes occurred on local streets (3,437), county roads (2,105) and state roads (1,479), with many fewer on US routes (178) and Interstate routes (152)

- Pedestrian deaths occurred more often on local streets (121) and state roads (122) than on county routes (98) or US routes (27).

<u>Number of Lanes</u>

- Pedestrian fatalities in Miami-Dade County occur with about equal frequencies on two-lane (105), four-lane (128) and six-lane roads (86).

Light Conditions

- Over half of all pedestrian fatalities (233 out of 437) occur after dark in Miami-Dade County.

1.1.2 Description of sub-populations

The area has a diverse population: it has a significant retirement population; it is a main tourist attraction and a home to large minority populations, the most predominant being Hispanic. The following is a breakout of the percentage of the Miami-Dade County's population by age group:

Age	% of Population
0-14 years	20.6%
15-44 years	44.3%
45-64 years	21.7%
65+ years	13.3%

Among the 82 pedestrian deaths in Miami-Dade County in 2000:

- Nearly half (34) involved pedestrians 55 or older,
- 16 pedestrian deaths were to pedestrians older than 75, and
- 9 pedestrian deaths involved pedestrians under age 20.

(This Data needs to be updated or deleted.) **Of the 1,643 pedestrian injuries in Dade County in 2000, pedestrian age was known in 1, collisions. Of those:**

- **138 (9.3%) involved pedestrians aged 9 or younger**
- **399 (26.7%) involved pedestrians aged 10 to 24**
- **614 (41.2%) involved pedestrians aged 25-54**
- **338 (22.6%) involved pedestrians aged 55 and above (with 106 of those involving ages above 75).**

Overall summaries of pedestrian injury and fatal crashes for 1996-2000 in Miami-Dade County are discussed briefly below for various features of interest. The characteristics for specific groups in the population, by age and race/ethnicity are discussed below.

Injury Severity Level

- Total injuries are greatest in numbers for ages 25 through 54. However, more pedestrians are killed for ages 55 and above with almost half pf the fatalities among persons ages 55 and above.

Pedestrian Action

- "Crossing not at intersection," was a major pedestrian action for all pedestrian ages, but represented a particularly high percentage (compared to intersection collisions) for pedestrians 17 and under (44.8%).

- Young adults aged 18 to 24 had a higher percentage of crashes while walking with traffic than any other age group.

Alcohol/Drug Use by the Pedestrian

- This summary shows only 496 cases of alcohol and/or drug use by the pedestrians out of all crashes, or only about 5.7 percent.

- Of 437 pedestrian deaths, only 14.4% were indicated by the police officer as related to alcohol or drug use by the pedestrian. This compares with approximately one third of pedestrian deaths statewide where the pedestrian was drinking. This suggests a likelihood of considerable underreporting of alcohol use by pedestrians by the reporting police officer.

Roadway Functional Type

- Children age 17 and below are struck slightly more often on local streets (762) than on county roads (732) in Miami-Dade County.

- Pedestrians ages 55 and over are struck most often on local streets and state roads.

Number of Lanes

- As expected, pedestrians age 0 to 17 are struck much more often on two-lane roads (compared to wider roads).

- Pedestrians ages 18 and above are much more likely to be struck on roads with three or more lanes. Pedestrians age 55 and above are three times more likely than 18 to 24 on three-lane roads.

Light Conditions

- As expected, children (age 0-17) and elderly (55+), are much more likely to be struck in daylight than older pedestrians (based certainly on their reduced walking exposure at night).

- Pedestrians 18-24, in particular, are having the highest incidence of nighttime collisions.

1.1.3 Jurisdiction Specific Information

Miami-Dade County is much more racially diverse than the state of Florida as a whole. Over half of the population of Miami-Dade County identifies itself as Hispanic or Latino of any race. Just over 20% of the population of Miami-Dade County is black or African-American compared to approximately 15% statewide.

Race and Ethnicity of Miami-Dade County and the State of Florida (% of Population)		
Race or Ethnicity	State of Florida	Miami-Dade County
White	78.0%	69.7%
Black/African American	14.6%	20.3%
Asian	1.7%	1.4%
Other Races	3.3%	4.8%
Total One Race	97.6%	96.2%
Total Two or More Races	2.4%	3.8%
TOTAL	100.0%	100.0%
Hispanic or Latino (Any Race)	16.8%	57.3%

The race and ethnicity of the population is dramatically different depending upon the location with Miami-Dade County. The following table shows the composition of the population of for the cities in Miami-Dade County. Coral Gables, Hialeah and Miami Beach have the highest percentage of White population, but over 90% of the population of Hialeah is Hispanic or Latino compared to about half in the other two cities. Over half of the population of North Miami and 39% of North Miami Beach's population is Black or African American. The City of Miami most closely resembles the constitution of Miami-Dade County as a whole.

Racial and Hispanic or Latino Composition of Most Populous Cities in Miami-Dade County (2000 Census)

	Miami	Hialeah	Miami Beach	North Miami	Coral Gables	North Miami Beach
Population	362,470	226,419	87,933	59,880	42,249	40,786
Race or Ethnicity						
White	66.6%	88.0%	86.7%	34.8%	91.8%	46.7%
Black/African American	22.3%	2.4%	4.0%	54.9%	3.3%	39.0%
Asian	0.7%	0.4%	1.4%	1.9%	1.7%	4.0%
Other Races	5.7%	5.6%	4.4%	3.5%	1.7%	5.0%
Total One Race	95.3%	96.4%	96.5%	95.1%	98.5%	94.7%
Total Two or More Races	4.7%	3.6%	3.5%	4.9%	1.5%	5.3%
TOTAL	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Hispanic or Latino (Any Race)	65.8%	90.3%	53.4%	23.2%	46.6%	30.0%

An analysis of the pedestrian crashes for the years 1996 to 2000 show the following trends based upon race and ethnicity of the population:

- Pedestrians most often injured between 1996 and 2000 were white (2,618 or 41.9%), black (1980 or 31.7%), and Hispanic (1591, or 25.5%) for all ages combined. Thus, blacks are over represented among the population injured as a pedestrian. Hispanics and

Hispanics may be underrepresented or underreported because the traffic crash report offers 4 options for race: white (1); black (2); Hispanic (3) and Other (4).

- For whites, ages 25 to 54 have the highest number of crashes.
- Black had high number of pedestrian crashes in the 25- to 54 age-category, but especially for children and young adults.
- Hispanics has their highest pedestrian crash numbers for ages 55 and above.

1.1.4 Zone Analysis

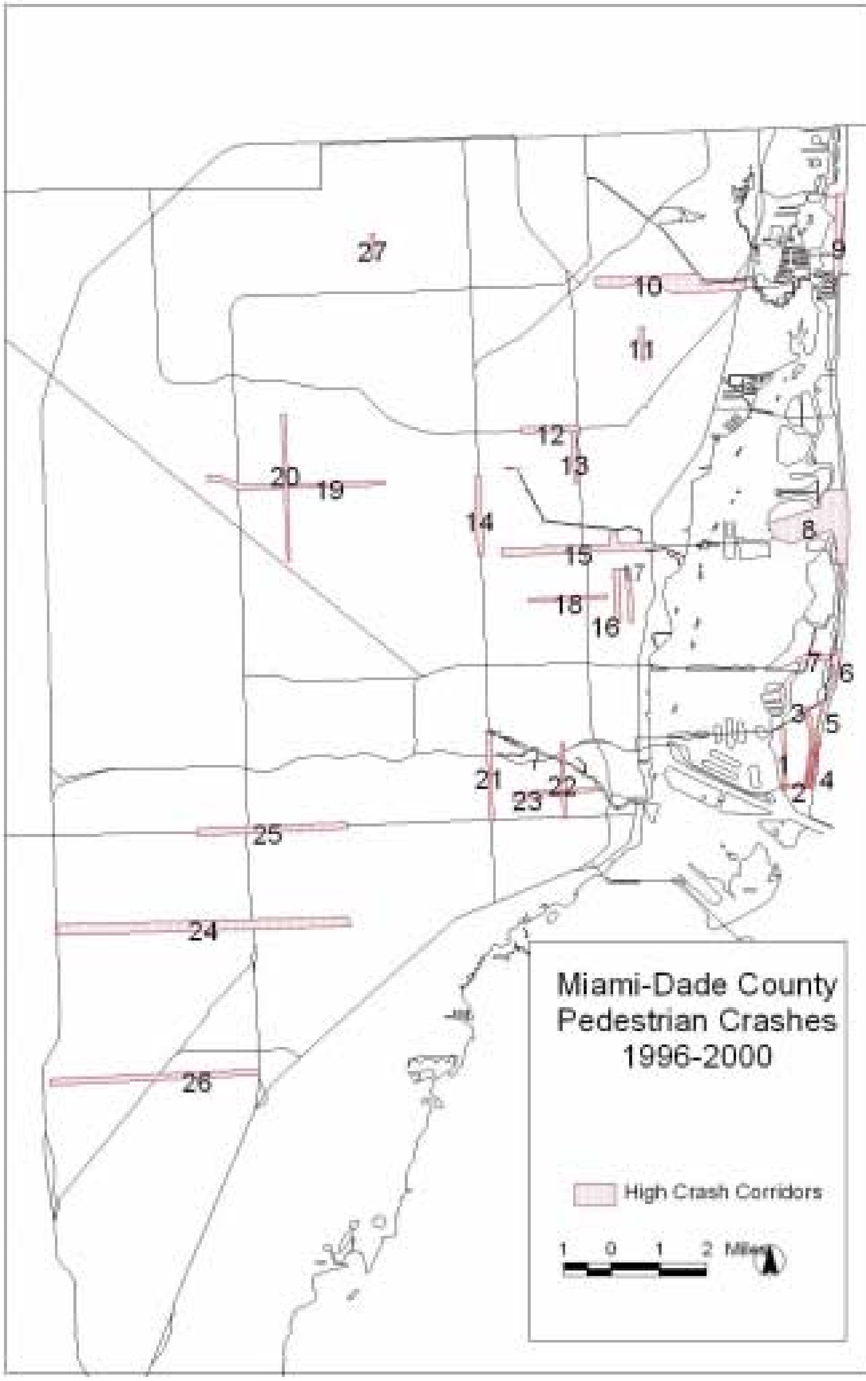
GIS Analysis: Data on all pedestrian crashes for the five years between 1996-2000 were extracted from the Florida Department of Highway Safety and Motor Vehicles records and mapped using ESRI's ArcInfo and ArcView, from the written crash reports.

Zone Analysis: The analysis of zones of high concentrations of crashes was conducted David Henderson of the Miami-Dade Metropolitan Transportation Planning Organization. The spatial analysis tools allowed us to analyze crash concentrations by developing a set of contours that showed the density of crashes (from highest to lowest) within a specified distance from each location on that map. The contours were developed at several different scales by changing the search distance over which the analysis was completed (we used a search radius of 1000- and 5000-foot to identify our zones). In this way, neighborhoods with high concentrations were identified along with corridors with a high crash density within each zone. The maps shown below illustrate how this tool was used to identify corridors. The map on the left shows the crash locations with a red dot. More than one crash could occur at each of these locations, as often was the case. The map on the right shows crash density in the corridor using the special analysis tools.

Identification of Zones with High Efficiency Ratios: The Zone Guide for Pedestrian Safety prepared by Dunlap and Associates was applied to the data in order to identify corridors with high efficiency ratios. This process was refined through several iterations until problems zones with high efficiency ratios were identified. In order to assure that target zones had high efficiency ratios, it was necessary to examine various combinations of target groups because specific crash determinants may influence more than one target group. We also weighted the measure to reflect serious crashes (fatal or incapacitating crashes) in order to concentrate our efforts where they could have the largest effect on serious rather than nuisance crashes.

This analysis identified 27 high crash corridors presented below. Each of the corridors was then ranked by multiplying the number of crashes per mile within each corridor by the number of fatal and incapacitating crashes per mile for that corridor. The resulting product was then divided by 100 to yield a crash index, which is weighted for severity. The index varied from 0.5 for the lowest weighted corridor to 16.8 for the highest weighted corridor. We selected corridors with an index of 6 or more. This analysis identified 9 corridors. Two additional corridors were added because they were surrounded by other high crash corridors and had an index that was in the borderline range for selection (indexes of 5.1 and 5.3). We also selected one corridor with a low index of 3.4 because most of the crashes occurred in the same location with 100% of these crashes occurring night. This area could be easily treated with lighting and warning signs. The table below shows the index for each of the sites and the map below it shows the crash corridors identified by the analysis.

Corridor	Crashes/mi	Fatal and Incapacitating/m	product	div by 100	Rank
1. Alton Road: 5 St to 17 St	60	21.7	1302.0	13.0	3
2. 5 St: Alton Rroad to Ocean Dr	70	24	1680.0	16.8	1
3. Washington Ave: 5 St to Dade Blvd	72.5	17.5	1268.8	12.7	4
4. Ocean Dr: 5 St to 15 St	44.4	6.7	297.5	3.0	20
5. Collins Ave: 5 St to 24 St	52.8	10	528.0	5.3	13
6. Collins Ave: Indian Creek 28 St to 43 St	43.3	23.3	1008.9	10.1	7
7. 41 St: Alton Rd to Pine Tree Dr	42.2	12.2	514.8	5.1	14
8. North Beach/Normandy Isle	43.7	24.1	1053.2	10.5	6
9. Collins Ave: Sunny Isles Cway to Lehman Cway	58.1	20	1162.0	11.6	5
10. NE 163 St: NW 2 Ave to Biscayne Blvd	53.1	15	796.5	8.0	9
11. NE 6 Ave: NE 141 St to NE 151 St	61.7	23.3	1437.6	14.4	2
12. NW 119 St: NW 17 Ave to NW 7 Ave	30	13	390.0	3.9	16
13. NW 7 Ave: NW 101 St to NW 113 St	28.8	16.3	469.4	4.7	15
14. NW 27 Ave: NW 79 St to NW 103 St	43.3	12.7	549.9	5.5	12
15. NW 79 St: NW 22 Ave to Biscayne Blvd	53.6	16.8	900.5	9.0	8
16. Miami Ave: NW 54 St to NW 71 St	32	6	192.0	1.9	24
17. NE 2 Ave: NE 54 St to NE 71 St	43	6	258.0	2.6	23
18. NW 62 St: NW 17 Ave to NW 2 Ave	34	10	340.0	3.4	19
19. W 49 St: W 24 Ave to E 4 Ave	34.3	10.4	356.7	3.6	17
20. W 12 Ave: W 25 St to W 72 St	27.7	9.7	268.7	2.7	22
21. NW 27 Ave: SW 8 St to NW 16 Ave	42.7	14	597.8	6.0	11
22. NW 12 Ave: SW 8 St to NW 14 St	48.5	14.6	708.1	7.1	10
23. Flagler St: NW 22 Ave to S River Dr	34.8	7.8	271.4	2.7	21
24. SW 40 St: SW 117 Ave to SW 57 Ave	13.3	4	53.2	0.5	27
25. SW 8 St: SW 87 Ave to SW 57 Ave	17.3	7	121.1	1.2	25
26. SW 88 St: SW 117 Ave to SW 77 Ave	16.8	6	100.8	1.0	26
27. NW 47 Ave: NW 178 St to NW 187 St	24	14	336.0	3.4	18



Miami-Date showing the 27 high crash corridors identified.

The left frame of the bar graph on the next page shows the number of all in roadway crashes in all of Miami-Dade, in the 27 selected corridors initially selected, and 12 corridors identified to receive countermeasures. The right frame of the bar graph shows the number of fatal and incapacitating crashes in all of Miami-Dade, the 27 corridors identified and the 12 highest ranked corridors. All 27 corridors identified account for 21% of all crashes, while the 12 sites selected account for 12% of all crashes. The 27 corridors selected account for 25% of fatal or incapacitating crashes while the 12 corridors selected to receive treatment accounted for 14% of these crashes. The crash frequency per mile for the top 10 corridors ranged from 42.2 to 72.5 per mile as compared with the average rate of 1.35 crashes per mile for all of Miami-Dade County.

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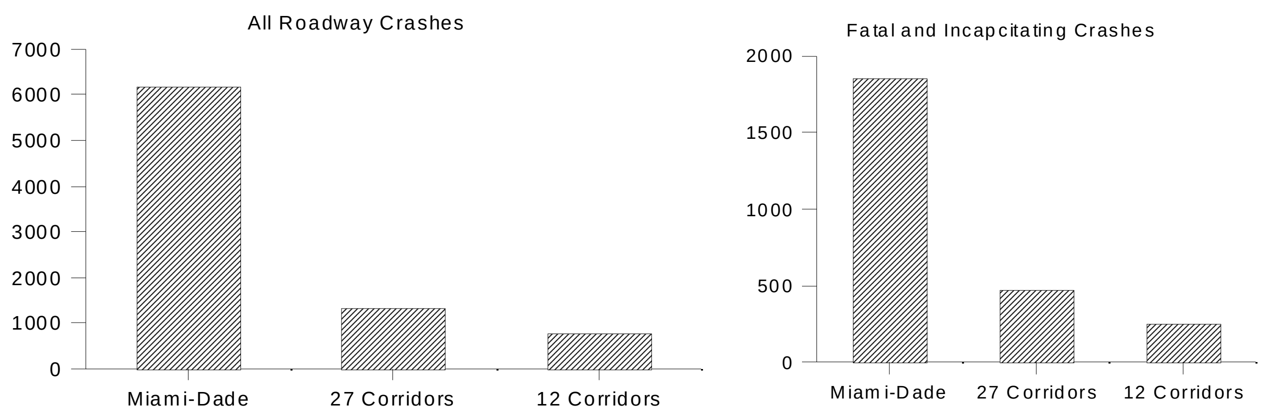
Miami-Dade Crashes During Last 5-Years



1.1.5 PBCAT Analysis

PBCAT Analysis. The development of effective countermeasures to help prevent bicyclist and pedestrian crashes is hindered by the lack of detailed information in the GIS crash files, which is taken from DHSMV records. Analysis of these data will provide information on where pedestrian crashes occur (city, street, intersection, two-lane road, etc.), when they occur (time of day, day of week, etc.), and characteristics of the victims involved (age, gender, injury severity, etc.). However, these data do not provide a sufficient level of detail regarding the sequence of events leading to the crash. Thus, additional analysis was conducted using PBCAT. Once the zones with high concentrations of crashes had been identified and analyzed using GIS, all of the pedestrian crashes were extracted from the records and sent to Dunlap and Associates for further analysis using PBCAT. These data were then merged back into the GIS crash spreadsheet. In order to obtain high efficiency measures it was necessary to pool crash types with overlapping countermeasures, such as, pedestrian fails to yield and dart out at intersection locations because they all involve violation of motorists right of way. Police scores crashes as intersection crashes if they occur in an area that is part of two or more crossing roadways. Police also can also exercise a certain degree of discretion to code crashes within 2 or 3 meters of the intersection as occurring at intersection.

1.1.6 Analysis of High Crash Locations

Desegregation of Data for Relevant Populations and Subpopulations: Each crash is available in a spreadsheet and contains all relevant demographic data. This made it relatively easy to examine the crash data in respect to specific populations and sub populations. The data was then analyzed for specific targeted populations (e.g., Hispanic, Seniors, and alcohol-impaired pedestrians), specific action of the pedestrian (e.g., crossing at intersection vs. not at intersection) and specific aspect of the crash itself (e.g., time of day, day of week). We also examined whether pedestrians failed to yield, whether drivers failed to yield, and the percentage of intersection crashes that involved turning vehicles. These data were then ranked for each corridor to help identify treatments that were specific to particular populations and crash characteristics observed in each corridor. We also examined crashes over years for each site to attempt to identify sites with increasing or decreasing crash trends.

The percentage of pedestrians struck in each corridor who were over 65 years old varied across corridors. An analysis of these data show that the proportion of pedestrians struck on Collins Ave between 28th St. and 43rd St., on 41st St between Alton Rd and Pine Tree Drive, and on North Beach/Normandy Isle who were over 65 was significantly greater than the proportion for all of the corridors. These data also show that the proportion of persons struck who were over 65 years of age was less than expected on NW 79th St. between NW 22nd Ave and Biscayne Blvd. It is important that treatments and outreach and awareness efforts on Collins Ave between 28th and 43rd St., on 41st St and in North Beach/Normandy Isle address the needs of older pedestrians and that outreach and awareness efforts focus more heavily on this group.

The demographic breakdown of pedestrians struck in each of the corridors show most pedestrians struck in the 7 corridors selected in Miami Beach were White with the percentage varying between 66% and 89%. Hispanic pedestrians comprised between 9% and 21% of pedestrians struck in these corridors and Black pedestrians averaged 3% to 18% in these corridors. Pedestrians struck along the NE 163rd St. corridor averaged 53% White, 41% Black and 5% Hispanic. The majority of pedestrians struck along the NE 6th Ave corridor were Black (73%) with 19% White and 8% Hispanic. The NW 79th Corridor in Liberty City also had a majority of black pedestrians struck in crosswalks with 63% Black, 28% White, and 8% Hispanic. The NW 12th Ave. Corridor is located in Little Havana, had the highest percentage of Hispanic pedestrians struck (44%). The percentage of White pedestrians struck in this corridor was 45%, and the percentage of Black pedestrians was10%. Finally, pedestrians struck in the NW 47th Corridor were 55% Black, 36% White, and 9% Hispanic. Many Black pedestrians are Haitian and speak Creole. These data suggest that outreach and awareness materials used in some corridors need to be in Spanish and English. Others also may need to be prepared in Creole.

The proportion of pedestrians in each corridor who were under 13 and between 13 and 17 years of age are also presented in table form. These data show that children under 13 were significantly over represented in crashes along the NE 6th Ave. corridor and youth aged 13 to 17 were over represented along NE 163rd St and NW 79th St. Outreach in the NE 6th corridor should focus on elementary and middle school aged children while outreach efforts along the NE 163rd and NW 79th corridors should focus on middle and high school aged children and youth.

The percentage of pedestrians struck in each corridor that was over 65.

Percent of Pedestrians Hit Who Were Over 65 P1

Corridor	Over 65	Total Known	% > 65	
1. Alton Road: 5 St to 17 St	20	69	0.29	
2. 5 St: Alton Rroad to Ocean Dr	10	32	0.31	
3. Washington Ave: 5 St to Dade Blvd	21	113	0.19	
4. Ocean Dr: 5 St to 15 St	3	39	0.08	
5. Collins Ave: 5 St to 24 St	12	92	0.13	
6. Collins Ave: Indian Creek 28 St to 43 St	**19**	**36**	**0.53**	*
7. 41 St: Alton Rd to Pine Tree Dr	**17**	**35**	**0.49**	*
8. North Beach/Normandy Isle	**49**	**165**	**0.30**	*
9. Collins Ave: Sunny Isles Cway to Lehman Cway	32	88	0.36	
10. NE 163 St: NW 2 Ave to Biscayne Blvd	28	134	0.21	
11. NE 6 Ave: NE 141 St to NE 151 St	3	35	0.09	
12. NW 119 St: NW 17 Ave to NW 7 Ave	3	28	0.11	
13. NW 7 Ave: NW 101 St to NW 113 St	3	22	0.14	
14. NW 27 Ave: NW 79 St to NW 103 St	3	55	0.05	
15. NW 79 St: NW 22 Ave to Biscayne Blvd	**14**	**143**	**0.10**	*
16. Miami Ave: NW 54 St to NW 71 St	2	29	0.07	
17. NE 2 Ave: NE 54 St to NE 71 St	2	40	0.05	
18. NW 62 St: NW 17 Ave to NW 2 Ave	4	43	0.09	
19. W 49 St: W 24 Ave to E 4 Ave	24	94	0.26	
20. W 12 Ave: W 25 St to W 72 St	21	77	0.27	
21. NW 27 Ave: SW 8 St to NW 16 Ave	12	56	0.21	
22. NW 12 Ave: SW 8 St to NW 14 St	17	61	0.28	
23. Flagler St: NW 22 Ave to S River Dr	17	72	0.24	
24. SW 40 St: SW 117 Ave to SW 57 Ave	30	91	0.33	
25. SW 8 St: SW 87 Ave to SW 57 Ave	12	49	0.24	
26. SW 88 St: SW 117 Ave to SW 77 Ave	11	65	0.17	
27. NW 47 Ave: NW 178 St to NW 187 St	3	11	0.27	
Grand Total	392	1774	0.22	

Z test for pooled proportions. * significant at .01, two tailed

Racial breakdown of pedestrians struck in each of the 27 corridors.

Demographic Breakdown

Corridor	White	Black	Hispanic
1. Alton Road: 5 St to 17 St	87%	3%	9%
2. 5 St: Alton Rroad to Ocean Dr	69%	11%	20%
3. Washington Ave: 5 St to Dade Blvd	72%	6%	21%
4. Ocean Dr: 5 St to 15 St	60%	13%	25%
5. Collins Ave: 5 St to 24 St	70%	18%	12%
6. Collins Ave: Indian Creek 28 St to 43 St	89%	5%	5%
7. 41 St: Alton Rd to Pine Tree Dr	83%	9%	9%
8. North Beach/Normandy Isle	66%	12%	21%
9. Collins Ave: Sunny Isles Cway to Lehman Cway	85%	4%	11%
10. NE 163 St: NW 2 Ave to Biscayne Blvd	**53%**	**41%**	**5%**
11. NE 6 Ave: NE 141 St to NE 151 St	**19%**	**73%**	**8%**
12. NW 119 St: NW 17 Ave to NW 7 Ave	34%	48%	17%
13. NW 7 Ave: NW 101 St to NW 113 St	26%	52%	22%
14. NW 27 Ave: NW 79 St to NW 103 St	28%	55%	17%
15. NW 79 St: NW 22 Ave to Biscayne Blvd	28%	63%	8%
16. Miami Ave: NW 54 St to NW 71 St	6%	84%	6%
17. NE 2 Ave: NE 54 St to NE 71 St	37%	55%	8%
18. NW 62 St: NW 17 Ave to NW 2 Ave	11%	84%	5%
19. W 49 St: W 24 Ave to E 4 Ave	43%	14%	42%
20. W 12 Ave: W 25 St to W 72 St	45%	1%	53%
21. NW 27 Ave: SW 8 St to NW 16 Ave	44%	7%	48%
22. NW 12 Ave: SW 8 St to NW 14 St	45%	10%	44%
23. Flagler St: NW 22 Ave to S River Dr	51%	5%	42%
24. SW 40 St: SW 117 Ave to SW 57 Ave	42%	2%	56%
25. SW 8 St: SW 87 Ave to SW 57 Ave	54%	0%	46%
26. SW 88 St: SW 117 Ave to SW 77 Ave	46%	11%	38%
27. NW 47 Ave: NW 178 St to NW 187 St	36%	55%	9%
Grand Total	52%	23%	23%

The percentage of children and youth struck in each of the 27 corridors.

Percent of Pedestrians hit who are Children or Youth					
Corridor	**<13 years**	**13-17 years**	**adult**	**Grand Total**	
1. Alton Road: 5 St to 17 St	4%	0%	96%	100%	
2. 5 St: Alton Rroad to Ocean Dr	3%	6%	91%	100%	
3. Washington Ave: 5 St to Dade Blvd	**0%**	3%	97%	100%	
4. Ocean Dr: 5 St to 15 St	3%	3%	95%	100%	
5. Collins Ave: 5 St to 24 St	**1%**	3%	96%	100%	
6. Collins Ave: Indian Creek 28 St to 43 St	6%	0%	94%	100%	
7. 41 St: Alton Rd to Pine Tree Dr	0%	3%	97%	100%	
8. North Beach/Normandy Isle	11%	6%	83%	100%	
9. Collins Ave: Sunny Isles Cway to Lehman Cway	6%	5%	90%	100%	
10. NE 163 St: NW 2 Ave to Biscayne Blvd	6%	**12%**	82%	100%	*** adol**
11. NE 6 Ave: NE 141 St to NE 151 St	**34%**	6%	60%	100%	*** child**
12. NW 119 St: NW 17 Ave to NW 7 Ave	11%	4%	85%	100%	
13. NW 7 Ave: NW 101 St to NW 113 St	14%	0%	86%	100%	
14. NW 27 Ave: NW 79 St to NW 103 St	13%	10%	77%	100%	
15. NW 79 St: NW 22 Ave to Biscayne Blvd	7%	**11%**	82%	100%	**** adol**
16. Miami Ave: NW 54 St to NW 71 St	43%	21%	36%	100%	
17. NE 2 Ave: NE 54 St to NE 71 St	33%	8%	60%	100%	
18. NW 62 St: NW 17 Ave to NW 2 Ave	12%	12%	76%	100%	
19. W 49 St: W 24 Ave to E 4 Ave	9%	4%	87%	100%	
20. W 12 Ave: W 25 St to W 72 St	4%	8%	88%	100%	
21. NW 27 Ave: SW 8 St to NW 16 Ave	6%	4%	91%	100%	
22. NW 12 Ave: SW 8 St to NW 14 St	7%	3%	90%	100%	
23. Flagler St: NW 22 Ave to S River Dr	4%	6%	90%	100%	
24. SW 40 St: SW 117 Ave to SW 57 Ave	10%	4%	86%	100%	
25. SW 8 St: SW 87 Ave to SW 57 Ave	4%	4%	92%	100%	
26. SW 88 St: SW 117 Ave to SW 77 Ave	6%	11%	83%	100%	
27. NW 47 Ave: NW 178 St to NW 187 St	0%	0%	100%	100%	
Grand Total	8%	6%	86%	100%	

Z test for pooled proportions. * significant at .01, two tailed ** significant .05, two tailed.

The next table shows the percentage of crashes by lighting condition. These data show that most crashes occurred during daylight hours. Some trends are apparent from this data. First, in South Beach areas not located close to the entertainment district such as the Alton Rd. corridor, the 41st St. corridor, and Collins Ave between 28th St and 43rd St. most crashes occurred during daylight hours with percentages of daylight crashes varying between 72% and 81%. Areas closer to the Entertainment area such as Collins Ave between 5th and 24th St., Washington Ave., and 5th St. had few crashes occurring during daylight hours with daytime crashes averaging between 46% and 54%. These areas have higher levels of exposure at night than the rest of Miami Beach. Examination of data on the percentage of intoxicated pedestrians showed very low percentages in all corridors. It is likely that drinking is significantly under reported in Miami-Dade. Of the remaining corridors selected for intervention, the Liberty City corridor along NW 79th Ave. Had 56% of crashes during daylight hours and the small corridor along NW 47th experienced 80% of pedestrian crashes at night. Countermeasures for this small corridor should examine possible increases in illumination.

Percentage of pedestrians struck in each corridor by lighting condition.

Miami-Dade County High Pedestrian Crash Corridors (1996-2000): Lighting Conditions							
Corridor	Daylight	Dusk	Dawn	Dark, Streetlight	Dark, No Streetlight	Missing	TOTAL
1. Alton Road: 5 St to 17 St	74%	3%	1%	21%	0%	0%	100%
2. 5 St: Alton Rroad to Ocean Dr	46%	9%	0%	46%	0%	0%	100%
3. Washington Ave: 5 St to Dade Blvd	54%	4%	0%	41%	1%	0%	100%
4. Ocean Dr: 5 St to 15 St	45%	0%	0%	50%	5%	0%	100%
5. Collins Ave: 5 St to 24 St	49%	1%	2%	46%	1%	0%	100%
6. Collins Ave: Indian Creek 28 St to 43 St	72%	3%	0%	26%	0%	0%	100%
7. 41 St: Alton Rd to Pine Tree Dr	81%	6%	3%	8%	0%	3%	100%
8. North Beach/Normandy Isle	67%	4%	0%	26%	2%	1%	100%
9. Collins Ave: Sunny Isles Cway to Lehman Cway	63%	4%	0%	31%	1%	0%	100%
10. NE 163 St: NW 2 Ave to Biscayne Blvd	80%	4%	1%	16%	0%	0%	100%
11. NE 6 Ave: NE 141 St to NE 151 St	70%	3%	5%	22%	0%	0%	100%
12. NW 119 St: NW 17 Ave to NW 7 Ave	70%	7%	0%	20%	3%	0%	100%
13. NW 7 Ave: NW 101 St to NW 113 St	52%	0%	4%	43%	0%	0%	100%
14. NW 27 Ave: NW 79 St to NW 103 St	45%	0%	2%	52%	2%	0%	100%
15. NW 79 St: NW 22 Ave to Biscayne Blvd	56%	1%	1%	37%	1%	3%	100%
16. Miami Ave: NW 54 St to NW 71 St	50%	19%	3%	25%	0%	3%	100%
17. NE 2 Ave: NE 54 St to NE 71 St	63%	2%	0%	20%	5%	10%	100%
18. NW 62 St: NW 17 Ave to NW 2 Ave	76%	11%	0%	13%	0%	0%	100%
19. W 49 St: W 24 Ave to E 4 Ave	80%	2%	2%	14%	1%	1%	100%
20. W 12 Ave: W 25 St to W 72 St	65%	1%	1%	30%	3%	0%	100%
21. NW 27 Ave: SW 8 St to NW 16 Ave	79%	2%	0%	17%	0%	2%	100%
22. NW 12 Ave: SW 8 St to NW 14 St	74%	2%	2%	22%	0%	2%	100%
23. Flagler St: NW 22 Ave to S River Dr	78%	3%	0%	18%	0%	1%	100%
24. SW 40 St: SW 117 Ave to SW 57 Ave	71%	3%	0%	24%	0%	1%	100%
25. SW 8 St: SW 87 Ave to SW 57 Ave	65%	4%	0%	21%	6%	4%	100%
26. SW 88 St: SW 117 Ave to SW 77 Ave	73%	3%	2%	23%	0%	0%	100%
27. NW 47 Ave: NW 178 St to NW 187 St	8%	0%	0%	83%	8%	0%	100%
TOTAL	66%	3%	1%	28%	1%	1%	100%

The number of crashes per year in each corridor did not reveal large systematic increasing or decreasing trends although some corridors show suggestions of small trends. These data may be used to perform a time series statistical analysis to control for possible regression to the mean. Regression to the mean would pose a significant threat to the validity of any crash reductions associated with treatment because only high crash corridors were selected. A time series statistical approach controls for this problem.

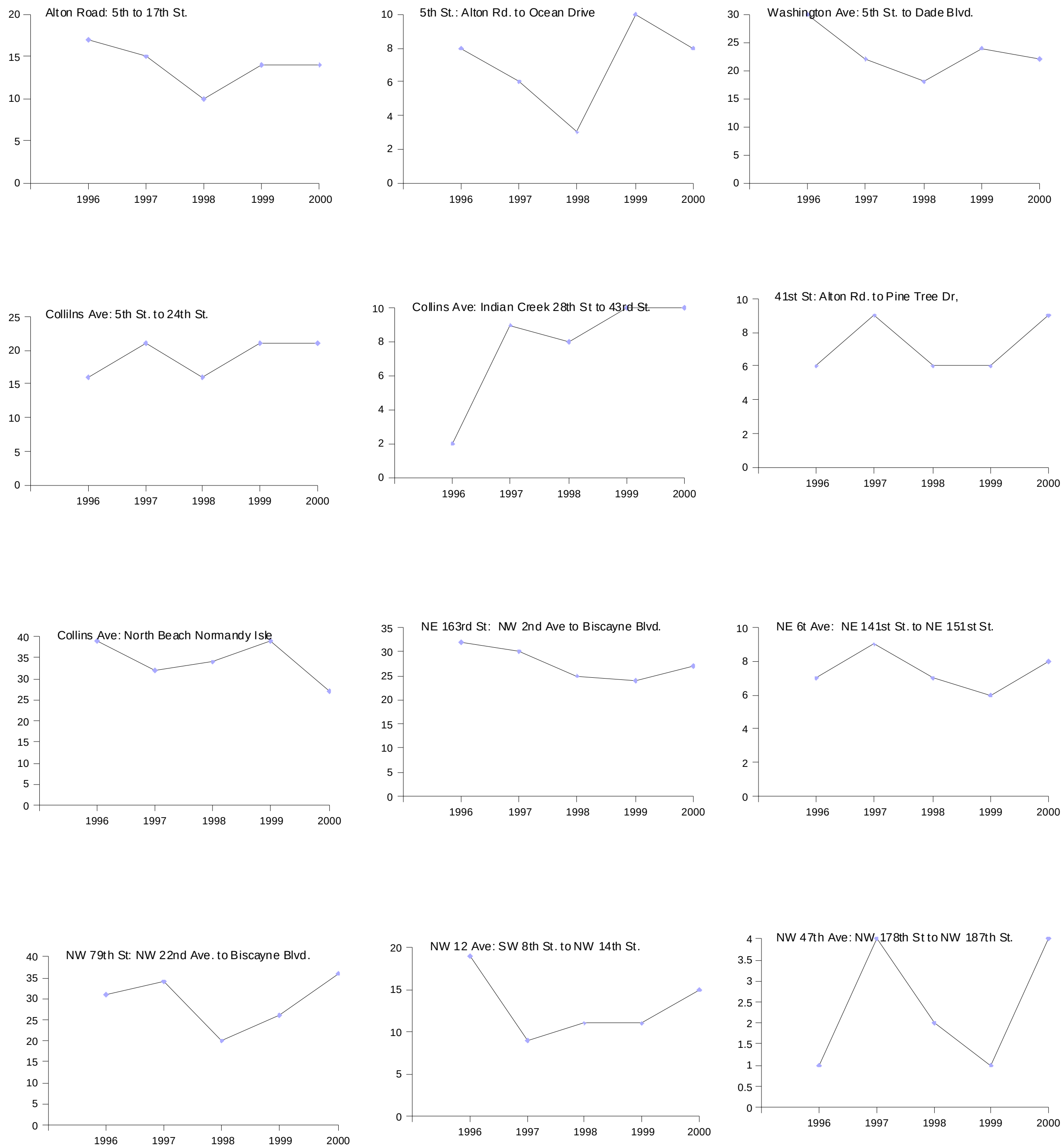
The number of crashes per year in each corridor between 1996 and 2000.

Miami-Dade County High Pedestrian Crash Corridors (1996-2000): Year of Crash

Corridor	1996	1997	1998	1999	2000	TOTAL
1. Alton Road: 5 St to 17 St	17	15	10	14	14	70
2. 5 St: Alton Rroad to Ocean Dr	8	6	3	10	8	35
3. Washington Ave: 5 St to Dade Blvd	30	22	18	24	22	116
4. Ocean Dr: 5 St to 15 St	12	6	5	5	12	40
5. Collins Ave: 5 St to 24 St	16	21	16	21	21	95
6. Collins Ave: Indian Creek 28 St to 43 St	2	9	8	10	10	39
7. 41 St: Alton Rd to Pine Tree Dr	6	9	6	6	9	36
8. North Beach/Normandy Isle	39	32	34	39	27	171
9. Collins Ave: Sunny Isles Cway to Lehman Cway	21	27	14	10	21	93
10. NE 163 St: NW 2 Ave to Biscayne Blvd	32	30	25	24	27	138
11. NE 6 Ave: NE 141 St to NE 151 St	7	9	7	6	8	37
12. NW 119 St: NW 17 Ave to NW 7 Ave	3	3	6	8	10	30
13. NW 7 Ave: NW 101 St to NW 113 St	5	6	6	5	1	23
14. NW 27 Ave: NW 79 St to NW 103 St	24	10	10	9	12	65
15. NW 79 St: NW 22 Ave to Biscayne Blvd	31	34	20	26	36	147
16. Miami Ave: NW 54 St to NW 71 St	8	8	6	4	6	32
17. NE 2 Ave: NE 54 St to NE 71 St	10	8	8	7	8	41
18. NW 62 St: NW 17 Ave to NW 2 Ave	13	8	8	8	8	45
19. W 49 St: W 24 Ave to E 4 Ave	20	17	19	22	17	95
20. W 12 Ave: W 25 St to W 72 St	20	12	10	19	19	80
21. NW 27 Ave: SW 8 St to NW 16 Ave	15	13	12	10	13	63
22. NW 12 Ave: SW 8 St to NW 14 St	19	9	11	11	15	65
23. Flagler St: NW 22 Ave to S River Dr	17	15	17	12	18	79
24. SW 40 St: SW 117 Ave to SW 57 Ave	13	20	16	22	19	90
25. SW 8 St: SW 87 Ave to SW 57 Ave	7	13	14	9	9	52
26. SW 88 St: SW 117 Ave to SW 77 Ave	19	11	9	11	16	66
27. NW 47 Ave: NW 178 St to NW 187 St	1	4	2	1	4	12
TOTAL	415	377	320	353	390	1855

Crashes are plotted across corridors are presented below. It can be seen that the percentage of pedestrians struck per year varied considerably along NW 47th St. This variance is the result of the small number of crashes per year in this tiny corridor. Corridors with larger numbers of crashes such as Washington Ave, Collins Ave between 5th and 24th St., Collins Ave North Beach Normandy Shores, NE 163rd St, and NW 79th St. show less yearly variation.

Crashes per year for each selected corridor from 1996 to 2000.



The percentage of intersection, non-intersection, and non-roadway crashes in each of the 27 corridors shows that non-roadway crashes accounted for 23% of all crashes. However, the percentage of non-roadway crashes varies from across corridors. Inspection of corridors reveals that the number and complexity of non-roadway parking seems to be the major factor associated with non-roadway crashes. In general the greater the number of parking lots and driveways the greater the percentage of non-roadway crashes.

The percentage of non-roadway crashes in each corridor.

Miami-Dade County High Pedestrian Crash Corridors (1996-2000): Crash Location					
Corridor	**Intersection**	**Non-Intersection**	**Non-Road**	**TOTAL**	**% Non-Road***
1. Alton Road: 5 St to 17 St	42	15	9	66	14%
2. 5 St: Alton Rroad to Ocean Dr	23	7	2	32	6%
3. Washington Ave: 5 St to Dade Blvd	58	46	6	110	5%
4. Ocean Dr: 5 St to 15 St	20	10	3	33	9%
5. Collins Ave: 5 St to 24 St	60	20	7	87	8%
6. Collins Ave: Indian Creek 28 St to 43 St	29	5	5	39	13%
7. 41 St: Alton Rd to Pine Tree Dr	22	6	5	33	15%
8. North Beach/Normandy Isle	81	54	22	157	14%
9. Collins Ave: Sunny Isles Cway to Lehman Cway	37	17	33	87	38%
10. NE 163 St: NW 2 Ave to Biscayne Blvd	60	31	36	127	28%
11. NE 6 Ave: NE 141 St to NE 151 St	18	11	8	37	22%
12. NW 119 St: NW 17 Ave to NW 7 Ave	14	6	10	30	33%
13. NW 7 Ave: NW 101 St to NW 113 St	16	3	2	21	10%
14. NW 27 Ave: NW 79 St to NW 103 St	38	14	12	64	19%
15. NW 79 St: NW 22 Ave to Biscayne Blvd	79	34	16	129	12%
16. Miami Ave: NW 54 St to NW 71 St	17	7	6	30	20%
17. NE 2 Ave: NE 54 St to NE 71 St	26	7	7	40	18%
18. NW 62 St: NW 17 Ave to NW 2 Ave	26	9	4	39	10%
19. W 49 St: W 24 Ave to E 4 Ave	32	16	39	87	45%
20. W 12 Ave: W 25 St to W 72 St	39	18	20	77	26%
21. NW 27 Ave: SW 8 St to NW 16 Ave	28	9	7	44	16%
22. NW 12 Ave: SW 8 St to NW 14 St	39	8	5	52	10%
23. Flagler St: NW 22 Ave to S River Dr	44	18	11	73	15%
24. SW 40 St: SW 117 Ave to SW 57 Ave	28	22	37	87	43%
25. SW 8 St: SW 87 Ave to SW 57 Ave	20	14	11	45	24%
26. SW 88 St: SW 117 Ave to SW 77 Ave	26	8	27	61	44%
27. NW 47 Ave: NW 178 St to NW 187 St	3	6	3	12	25%
TOTAL	925	421	353	1699	21%

Intersection Crash Data. In all but one corridor a higher percentage of crashes occurred at intersection rather than non-intersections locations and across all corridors a little more than two thirds of the crashes occurred at intersections. In one instance the proportion of non-intersection crashes was significantly less than expected, Washington Ave, and in another instance the proportion of non-intersection crashes was greater than expected (NW 12th Ave.).

The percentage of roadway crashes that occurred at intersections.

Percent of In Roadway Crashes at Intersections					
Corridor	**Intersection**	**Non-Intersection**	**Total**	**Crashes**	
1. Alton Road: 5 St to 17 St	42	15	57	74%	
2. 5 St: Alton Rroad to Ocean Dr	23	7	30	77%	
3. Washington Ave: 5 St to Dade Blvd	**58**	**46**	**104**	**56%**	*
4. Ocean Dr: 5 St to 15 St	20	10	30	67%	
5. Collins Ave: 5 St to 24 St	60	20	80	75%	
6. Collins Ave: Indian Creek 28 St to 43 St	29	5	34	85%	
7. 41 St: Alton Rd to Pine Tree Dr	22	6	28	79%	
8. North Beach/Normandy Isle	81	54	135	60%	
9. Collins Ave: Sunny Isles Cway to Lehman Cway	37	17	54	69%	
10. NE 163 St: NW 2 Ave to Biscayne Blvd	60	31	91	66%	
11. NE 6 Ave: NE 141 St to NE 151 St	18	11	29	62%	
12. NW 119 St: NW 17 Ave to NW 7 Ave	14	6	20	70%	
13. NW 7 Ave: NW 101 St to NW 113 St	16	3	19	84%	
14. NW 27 Ave: NW 79 St to NW 103 St	38	14	52	73%	
15. NW 79 St: NW 22 Ave to Biscayne Blvd	79	34	113	70%	
16. Miami Ave: NW 54 St to NW 71 St	17	7	24	71%	
17. NE 2 Ave: NE 54 St to NE 71 St	26	7	33	79%	
18. NW 62 St: NW 17 Ave to NW 2 Ave	26	9	35	74%	
19. W 49 St: W 24 Ave to E 4 Ave	32	16	48	67%	
20. W 12 Ave: W 25 St to W 72 St	39	18	57	68%	
21. NW 27 Ave: SW 8 St to NW 16 Ave	28	9	37	76%	
22. NW 12 Ave: SW 8 St to NW 14 St	**39**	**8**	**47**	**83%**	*
23. Flagler St: NW 22 Ave to S River Dr	44	18	62	71%	
24. SW 40 St: SW 117 Ave to SW 57 Ave	28	22	50	56%	
25. SW 8 St: SW 87 Ave to SW 57 Ave	20	14	34	59%	
26. SW 88 St: SW 117 Ave to SW 77 Ave	26	8	34	76%	
27. NW 47 Ave: NW 178 St to NW 187 St	3	6	9	33%	
TOTAL	925	421	1346	69%	

* z test for pooled proportions. Significant at .05, two tailed test.

The percentage of intersection crashes that were fatal or incapacitating at each corridor show that across all corridors 33% of intersection crashes were fatal or incapacitating. At one site, Collins Ave: 28th St to 43rd St. the percentage of fatal and incapacitating crashes were significantly higher than expected.

Intersection Related **Corridor**	**Fatal plus Incapacitating**	**Intersection Total**	**Percent fatal or incap**
1. Alton Road: 5 St to 17 St	19.00	42.00	45%
2. 5 St: Alton Rroad to Ocean Dr	8.00	23.00	35%
3. Washington Ave: 5 St to Dade Blvd	12.00	58.00	21%
4. Ocean Dr: 5 St to 15 St	3.00	21.00	14%
5. Collins Ave: 5 St to 24 St	14.00	59.00	24%
6. Collins Ave: Indian Creek 28 St to 43 St	**19.00**	**29.00**	**66%** *
7. 41 St: Alton Rd to Pine Tree Dr	6.00	21.00	29%
8. North Beach/Normandy Isle	23.00	79.00	29%
9. Collins Ave: Sunny Isles Cway to Lehman Cwa	14.00	37.00	38%
10. NE 163 St: NW 2 Ave to Biscayne Blvd	24.00	60.00	40%
11. NE 6 Ave: NE 141 St to NE 151 St	5.00	18.00	28%
12. NW 119 St: NW 17 Ave to NW 7 Ave	5.00	14.00	36%
13. NW 7 Ave: NW 101 St to NW 113 St	9.00	16.00	56%
14. NW 27 Ave: NW 79 St to NW 103 St	15.00	37.00	41%
15. NW 79 St: NW 22 Ave to Biscayne Blvd	21.00	77.00	27%
16. Miami Ave: NW 54 St to NW 71 St	4.00	17.00	24%
17. NE 2 Ave: NE 54 St to NE 71 St	2.00	22.00	9%
18. NW 62 St: NW 17 Ave to NW 2 Ave	8.00	26.00	31%
19. W 49 St: W 24 Ave to E 4 Ave	13.00	29.00	45%
20. W 12 Ave: W 25 St to W 72 St	14.00	39.00	36%
21. NW 27 Ave: SW 8 St to NW 16 Ave	10.00	28.00	36%
22. NW 12 Ave: SW 8 St to NW 14 St	10.00	38.00	26%
23. Flagler St: NW 22 Ave to S River Dr	9.00	42.00	21%
24. SW 40 St: SW 117 Ave to SW 57 Ave	15.00	30.00	50%
25. SW 8 St: SW 87 Ave to SW 57 Ave	7.00	20.00	35%
26. SW 88 St: SW 117 Ave to SW 77 Ave	13.00	27.00	48%
27. NW 47 Ave: NW 178 St to NW 187 St	2.00	3.00	67%
Grand Total	304.00	912.00	33%

Z test for pooled proportions. *significant .01, two tailed.

The percentage of crashes that involved left turning vehicles across the entire sample was 10% and the percentage of crashes that involved all turning vehicles was 28%. Crashes that involved left turning vehicles and crashes that involved all turning vehicles were significantly over-represented along the Alton Road and 41st St. corridors.

Intersection Crashes Involving Turning Vehicles					
Corridor	**Toal Crashes**	**% Left Turns**		**% All Turns**	
1. Alton Road: 5 St to 17 St	**42.00**	**24%**	**	**48%**	*
2. 5 St: Alton Rroad to Ocean Dr	23.00	4%		39%	
3. Washington Ave: 5 St to Dade Blvd	58.00	9%		38%	
4. Ocean Dr: 5 St to 15 St	21.00	0%		14%	
5. Collins Ave: 5 St to 24 St	60.00	15%		27%	
6. Collins Ave: Indian Creek 28 St to 43 St	29.00	17%		28%	
7. 41 St: Alton Rd to Pine Tree Dr	**22.00**	**23%**	*	**73%**	**
8. North Beach/Normandy Isle	80.00	15%		26%	
9. Collins Ave: Sunny Isles Cway to Lehman C	37.00	8%		38%	
10. NE 163 St: NW 2 Ave to Biscayne Blvd	60.00	10%		18%	
11. NE 6 Ave: NE 141 St to NE 151 St	18.00	6%		17%	
12. NW 119 St: NW 17 Ave to NW 7 Ave	14.00	0%		21%	
13. NW 7 Ave: NW 101 St to NW 113 St	16.00	6%		25%	
14. NW 27 Ave: NW 79 St to NW 103 St	38.00	0%		13%	
15. NW 79 St: NW 22 Ave to Biscayne Blvd	80.00	5%		14%	
16. Miami Ave: NW 54 St to NW 71 St	17.00	0%		24%	
17. NE 2 Ave: NE 54 St to NE 71 St	26.00	4%		15%	
18. NW 62 St: NW 17 Ave to NW 2 Ave	26.00	4%		12%	
19. W 49 St: W 24 Ave to E 4 Ave	32.00	19%		47%	
20. W 12 Ave: W 25 St to W 72 St	39.00	15%		46%	
21. NW 27 Ave: SW 8 St to NW 16 Ave	28.00	11%		39%	
22. NW 12 Ave: SW 8 St to NW 14 St	39.00	21%		38%	
23. Flagler St: NW 22 Ave to S River Dr	45.00	2%		7%	
24. SW 40 St: SW 117 Ave to SW 57 Ave	30.00	3%		33%	
25. SW 8 St: SW 87 Ave to SW 57 Ave	20.00	5%		10%	
26. SW 88 St: SW 117 Ave to SW 77 Ave	27.00	11%		26%	
27. NW 47 Ave: NW 178 St to NW 187 St	3.00	0%		0%	
Grand Total	930.00	10%		28%	

Z test for pooled samples. * Significant .05 two tail; significant .01, two tail

The percent of intersection crashes that were scored for pedestrian violations show that the proportion of pedestrian crashes for all corridors averaged 29 percent and ranged form 9% to 52% for the 12 corridors selected for treatment. The percent of pedestrian crashes that were scored for pedestrian violations along NE 163rd corridor was 52%, which was significantly higher than expected.

The percent of intersection crashes involving pedestrians that were scored for a pedestrian violation for each corridor.

Corridor				
1. Alton Road: 5 St to 17 St	7	42	0.17	
2. 5 St: Alton Rroad to Ocean Dr	2	23	0.09	
3. Washington Ave: 5 St to Dade Blvd	9	58	0.16	
4. Ocean Dr: 5 St to 15 St	3	21	0.14	
5. Collins Ave: 5 St to 24 St	10	60	0.17	
6. Collins Ave: Indian Creek 28 St to 43 St	7	29	0.24	
7. 41 St: Alton Rd to Pine Tree Dr	2	22	0.09	
8. North Beach/Normandy Isle	24	80	0.30	
9. Collins Ave: Sunny Isles Cway to Lehman Cway	7	37	0.19	
10. NE 163 St: NW 2 Ave to Biscayne Blvd	**31**	**60**	**0.52**	*
11. NE 6 Ave: NE 141 St to NE 151 St	9	18	0.50	
12. NW 119 St: NW 17 Ave to NW 7 Ave	8	14	0.57	
13. NW 7 Ave: NW 101 St to NW 113 St	7	16	0.44	
14. NW 27 Ave: NW 79 St to NW 103 St	11	38	0.29	
15. NW 79 St: NW 22 Ave to Biscayne Blvd	25	80	0.31	
16. Miami Ave: NW 54 St to NW 71 St	5	17	0.29	
17. NE 2 Ave: NE 54 St to NE 71 St	5	26	0.19	
18. NW 62 St: NW 17 Ave to NW 2 Ave	10	26	0.38	
19. W 49 St: W 24 Ave to E 4 Ave	10	32	0.31	
20. W 12 Ave: W 25 St to W 72 St	13	39	0.33	
21. NW 27 Ave: SW 8 St to NW 16 Ave	8	28	0.29	
22. NW 12 Ave: SW 8 St to NW 14 St	7	39	0.18	
23. Flagler St: NW 22 Ave to S River Dr	16	45	0.36	
24. SW 40 St: SW 117 Ave to SW 57 Ave	13	30	0.43	
25. SW 8 St: SW 87 Ave to SW 57 Ave	5	20	0.25	
26. SW 88 St: SW 117 Ave to SW 77 Ave	13	27	0.48	
27. NW 47 Ave: NW 178 St to NW 187 St	1	3	0.33	
Grand Total	268	930	0.29	

Pedestrian violations were: Dart out; Dash; Failed to yield misjudged gap;pedestrian failed to yield; Pedestrian failed to yield step out; pedestrian trapped.
Z test for pooled proportions. * significant .01, two tailed

The percent of intersection crashes where the motorist was scored at fault averaged 9% across all 27 corridors ranging from 5% to 50%. The percent of crashes where the pedestrian was scored at fault plus the percent of crashes where the motorist was scored at fault add to 17%. Unfortunately, information on who is at fault in a pedestrian crash is often lost because PBCAT only can assign a crash to one crash category. Future revisions of PBCAT should ensure that this data is not lost and can be disaggregated when researchers need to examine the role of particular causes related to pedestrian crashes.

The percent of pedestrian crashes that occurred at intersections that were scored for motorist at fault for each of the corridors.

Percent Motorist at fault (at Intersection)

Corridor	Intersection Total	Motorist failed to yield	Percent Motorist at fault
1. Alton Road: 5 St to 17 St	39	3	0.08
2. 5 St: Alton Rroad to Ocean Dr	21	2	0.10
3. Washington Ave: 5 St to Dade Blvd	54	4	0.07
4. Ocean Dr: 5 St to 15 St	19	2	0.11
5. Collins Ave: 5 St to 24 St	55	4	0.07
6. Collins Ave: Indian Creek 28 St to 43 St	23	4	0.17
7. 41 St: Alton Rd to Pine Tree Dr	20	1	0.05
8. North Beach/Normandy Isle	69	11	0.16
9. Collins Ave: Sunny Isles Cway to Lehman Cway	34	3	0.09
10. NE 163 St: NW 2 Ave to Biscayne Blvd	56	4	0.07
11. NE 6 Ave: NE 141 St to NE 151 St	17	1	0.06
12. NW 119 St: NW 17 Ave to NW 7 Ave	12	2	0.17
13. NW 7 Ave: NW 101 St to NW 113 St	16		0.00
14. NW 27 Ave: NW 79 St to NW 103 St	35	3	0.09
15. NW 79 St: NW 22 Ave to Biscayne Blvd	74	6	0.08
16. Miami Ave: NW 54 St to NW 71 St	15	2	0.13
17. NE 2 Ave: NE 54 St to NE 71 St	26		0.00
18. NW 62 St: NW 17 Ave to NW 2 Ave	25	1	0.04
19. W 49 St: W 24 Ave to E 4 Ave	30	2	0.07
20. W 12 Ave: W 25 St to W 72 St	38	1	0.03
21. NW 27 Ave: SW 8 St to NW 16 Ave	24	4	0.17
22. NW 12 Ave: SW 8 St to NW 14 St	35	4	0.11
23. Flagler St: NW 22 Ave to S River Dr	41	4	0.10
24. SW 40 St: SW 117 Ave to SW 57 Ave	28	2	0.07
25. SW 8 St: SW 87 Ave to SW 57 Ave	17	3	0.18
26. SW 88 St: SW 117 Ave to SW 77 Ave	25	1	0.04
27. NW 47 Ave: NW 178 St to NW 187 St	2	1	0.50
Grand Total	850	75	0.09

The percentage of non-intersection crashes that were fatal or incapacitating at non-intersection locations averaged 39%. The percentage of incapacitating crashes ranged from 15% to 83% in the 12 corridors that were selected for treatment. The proportion of non-intersection crashes that were fatal or incapacitating was significantly below expectation at one site, Collins Ave between 5th St and 24th St. This is likely the result of the slow speeds along this corridor. The percentage of fatal and incapacitating crashes was higher than expected at NW 47th St. Most of these crashes occurred at night under very poor lighting conditions and therefore occurred with little braking.

The percentage of fatal and incapacitating crashes in each of the 27 corridors.

	Non-Intersection Related			
Corridor	Fatal plus Incapacitating	Non-Intersection Location Total	Perecent fatal or incap	
1. Alton Road: 5 St to 17 St	4.00	15.00	27%	
2. 5 St: Alton Rroad to Ocean Dr	2.00	7.00	29%	
3. Washington Ave: 5 St to Dade Blvd	14.00	46.00	30%	
4. Ocean Dr: 5 St to 15 St	2.00	10.00	20%	
5. Collins Ave: 5 St to 24 St	3.00	20.00	15%	**
6. Collins Ave: Indian Creek 28 St to 43 St	1.00	4.00	25%	
7. 41 St: Alton Rd to Pine Tree Dr	3.00	6.00	50%	
8. North Beach/Normandy Isle	24.00	55.00	44%	
9. Collins Ave: Sunny Isles Cway to Lehman Cway	11.00	17.00	65%	
10. NE 163 St: NW 2 Ave to Biscayne Blvd	10.00	28.00	36%	
11. NE 6 Ave: NE 141 St to NE 151 St	6.00	11.00	55%	
12. NW 119 St: NW 17 Ave to NW 7 Ave	4.00	5.00	80%	
13. NW 7 Ave: NW 101 St to NW 113 St	2.00	3.00	67%	
14. NW 27 Ave: NW 79 St to NW 103 St	3.00	14.00	21%	
15. NW 79 St: NW 22 Ave to Biscayne Blvd	14.00	36.00	39%	
16. Miami Ave: NW 54 St to NW 71 St	1.00	6.00	17%	
17. NE 2 Ave: NE 54 St to NE 71 St	1.00	7.00	14%	
18. NW 62 St: NW 17 Ave to NW 2 Ave	5.00	9.00	56%	
19. W 49 St: W 24 Ave to E 4 Ave	6.00	14.00	43%	
20. W 12 Ave: W 25 St to W 72 St	7.00	19.00	37%	
21. NW 27 Ave: SW 8 St to NW 16 Ave	5.00	9.00	56%	
22. NW 12 Ave: SW 8 St to NW 14 St	3.00	8.00	38%	
23. Flagler St: NW 22 Ave to S River Dr	6.00	15.00	40%	
24. SW 40 St: SW 117 Ave to SW 57 Ave	9.00	22.00	41%	
25. SW 8 St: SW 87 Ave to SW 57 Ave	7.00	13.00	54%	
26. SW 88 St: SW 117 Ave to SW 77 Ave	4.00	8.00	50%	
27. NW 47 Ave: NW 178 St to NW 187 St	5.00	6.00	83%	**
Grand Total	162.00	413.00	39%	

Z test for pooled proportions. **significant .05, two tailed.

The pooled proportion of non-intersection crashes coded for a pedestrian violation for all 27 corridors was 65%. The percentage scored for pedestrian violation for the 12 corridors selected to receive treatment varied from 25% to 86%. The percent of crashes scored for pedestrian violations was less than expected for 3 of the 12 selected corridors. These were the Alton Rd. corridor, the Washington Ave. corridor and the Collins Ave corridor between 5th St. and 24th St.

The percentage of non-intersection pedestrian crashes coded for pedestrian violations for all 27 corridors.

Non-Intersection Roadway Crashes				
Corridor	Pedestrian at Fault	Total Crashes	% Ped at Fault	
1. Alton Road: 5 St to 17 St	4	13	0.31	*
2. 5 St: Alton Rroad to Ocean Dr	2	5	0.40	
3. Washington Ave: 5 St to Dade Blvd	10	29	0.34	*
4. Ocean Dr: 5 St to 15 St	3	5	0.60	
5. Collins Ave: 5 St to 24 St	5	14	0.36	*
6. Collins Ave: Indian Creek 28 St to 43 St	1	4	0.25	
7. 41 St: Alton Rd to Pine Tree Dr	3	6	0.50	
8. North Beach/Normandy Isle	25	40	0.63	
9. Collins Ave: Sunny Isles Cway to Lehman Cwa	11	15	0.73	
10. NE 163 St: NW 2 Ave to Biscayne Blvd	16	19	0.84	
11. NE 6 Ave: NE 141 St to NE 151 St	6	7	0.86	
12. NW 119 St: NW 17 Ave to NW 7 Ave	3	5	0.60	
13. NW 7 Ave: NW 101 St to NW 113 St	3	3	1.00	
14. NW 27 Ave: NW 79 St to NW 103 St	7	9	0.78	
15. NW 79 St: NW 22 Ave to Biscayne Blvd	11	19	0.58	
16. Miami Ave: NW 54 St to NW 71 St	3	6	0.50	
17. NE 2 Ave: NE 54 St to NE 71 St	3	4	0.75	
18. NW 62 St: NW 17 Ave to NW 2 Ave	4	7	0.57	
19. W 49 St: W 24 Ave to E 4 Ave	13	16	0.81	
20. W 12 Ave: W 25 St to W 72 St	12	16	0.75	
21. NW 27 Ave: SW 8 St to NW 16 Ave	6	7	0.86	
22. NW 12 Ave: SW 8 St to NW 14 St	5	7	0.71	
23. Flagler St: NW 22 Ave to S River Dr	10	10	1.00	
24. SW 40 St: SW 117 Ave to SW 57 Ave	18	20	0.90	
25. SW 8 St: SW 87 Ave to SW 57 Ave	11	12	0.92	
26. SW 88 St: SW 117 Ave to SW 77 Ave	4	7	0.57	
27. NW 47 Ave: NW 178 St to NW 187 St	3	4	0.75	
Grand Total	202	309	0.65	

z test for pooled proportions. No results significant at .01 two tailed test.

The percentage of crashes coded for a motorist violation for all 27 corridors show that motorists were only coded at fault for pedestrian crashes that occurred at non-intersection locations in 8% of the cases. This percentage varied from 0% to 56% across the 12 corridors that were selected to receive treatment in Phase 2. Four of the 12 corridors scheduled to receive treatment in Phase 2 scored significantly higher than expected: Alton road, 41st St., North Beach Normandy Isles, and NW 12th Ave.

The percentage of non-intersection crashes scored for driver violation for the 27 zones.

Percent Motorist at fault (not at intersection)

Corridor	Non-Intersection Total	Motorist failed to yield	Percent Motorist at fault	
1. Alton Road: 5 St to 17 St	9	5	0.56	*
2. 5 St: Alton Rroad to Ocean Dr	6	1	0.17	
3. Washington Ave: 5 St to Dade Blvd	43	1	0.02	
4. Ocean Dr: 5 St to 15 St	9	0	0.00	
5. Collins Ave: 5 St to 24 St	19	1	0.05	
6. Collins Ave: Indian Creek 28 St to 43 St	5	0	0.00	
7. 41 St: Alton Rd to Pine Tree Dr	4	2	0.50	*
8. North Beach/Normandy Isle	47	8	0.17	*
9. Collins Ave: Sunny Isles Cway to Lehman Cway	15	2	0.13	
10. NE 163 St: NW 2 Ave to Biscayne Blvd	30	0	0.00	
11. NE 6 Ave: NE 141 St to NE 151 St	9	1	0.11	
12. NW 119 St: NW 17 Ave to NW 7 Ave	6	0	0.00	
13. NW 7 Ave: NW 101 St to NW 113 St	3	0	0.00	
14. NW 27 Ave: NW 79 St to NW 103 St	14	0	0.00	
15. NW 79 St: NW 22 Ave to Biscayne Blvd	34	1	0.03	
16. Miami Ave: NW 54 St to NW 71 St	6	1	0.17	
17. NE 2 Ave: NE 54 St to NE 71 St	6	1	0.17	
18. NW 62 St: NW 17 Ave to NW 2 Ave	9	0	0.00	
19. W 49 St: W 24 Ave to E 4 Ave	16	0	0.00	
20. W 12 Ave: W 25 St to W 72 St	19	0	0.00	
21. NW 27 Ave: SW 8 St to NW 16 Ave	9	0	0.00	
22. NW 12 Ave: SW 8 St to NW 14 St	6	2	0.33	*
23. Flagler St: NW 22 Ave to S River Dr	18	0	0.00	
24. SW 40 St: SW 117 Ave to SW 57 Ave	20	2	0.10	
25. SW 8 St: SW 87 Ave to SW 57 Ave	14	0	0.00	
26. SW 88 St: SW 117 Ave to SW 77 Ave	7	1	0.14	
27. NW 47 Ave: NW 178 St to NW 187 St	5	1	0.20	
Grand Total	388	30	0.08	

z test for pooled proportions. *significant at .01, two tailed test.

1.1.7 Surrogate Measures

As an adjunct measure we also employed other techniques that were useful in identifying factors responsible for crashes in zones with high efficiency ratings. Visiting each of the zones and in order to observe driver and pedestrian behaviors was particularly helpful in understanding the cause of crashes in each corridor. We also examined the engineering devices already in place along each corridor. These visits allowed us to confirm or disconfirm hypothesis we had generated about the cause of crashes in each corridor based on analysis of GIS/PBCAT data. Based on our hypothesis and the site visits we next collected surrogate data at a number of the crash corridors with the highest risk score in order to validate our hypothesis. The nature of the surrogate data collected was tailored to the hypothesis we generated for each of these corridors. Examples of surrogate data collected were: The frequency of pedestrian crossings at intersections and at along some corridors at mid-block locations; motor vehicle /pedestrian conflicts; the percentage of pedestrians pressing the pedestrian call button; the percentage of pedestrians starting to cross and finishing their crossing during the WALK, flashing DON'T WALK and DON'T WALK indications; and driver yielding behavior. We also examined ADT as a surrogate measures.

Pedestrian Behavior. The percentage of pedestrians crossing during the WALK, Clearance and DON'T WALK pedestrian indications at several sites along three corridors in Miami Beach are presented in the next table. Between 20% and 37% of pedestrians crossing on Washington Ave started to cross during the WALK indication. At one location, Washington and 17th St., 71% of the pedestrians started to cross during the DON'T WALK indication while only 28% started to cross during the WALK and Clearance indication together. At all three Washington Ave. locations the number of conflicts occurring for pedestrians who started to cross during the WALK indication was low while the number that occurred when pedestrians started crossing during the DON'T WALK indication was relatively high. It is unclear whether more conflicts occur because these pedestrians cross against the signal or because people who take risks about when they cross also take other kinds of risks. The data collected at three intersections along Collins and four intersections along Alton Rd were very similar to the data collected along Washington Ave.

The percentage of pedestrians that started to cross during the DON'T WALK phase when the traffic signal facing the pedestrian was green, yellow and red, reveal that most persons crossing against the pedestrian signal on Washington Ave. and Collins Ave. started to do so when the signal was red while for 3 of the 4 crosswalks examined on Alton Rd., pedestrians started to cross when the traffic signal facing them was green. This pattern suggest that LED countdown timers may be more effective on Alton Rd than Washington Ave. or Collins Ave.

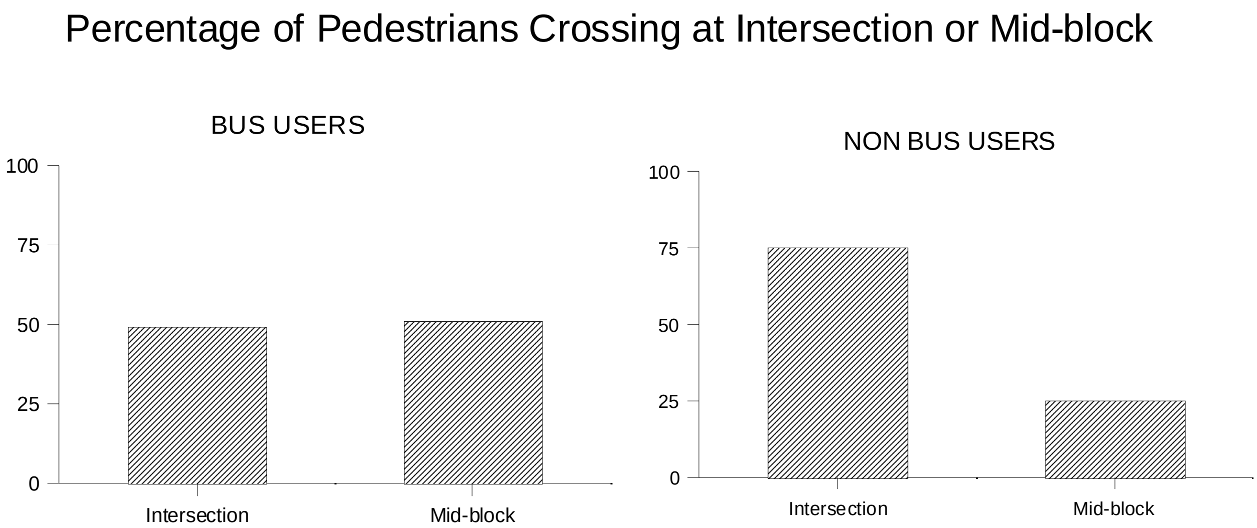
Intersection	Starts During					Starts During Clearance		Conflicts Ped Started During		
	WALK	Clearance	DON'T WALK			Finishes During		WALK	Clearance	DON'T WALK
			Green	Yellow	Red	DON'T WALK	Cross Traffic			
Washington & 11th	0.37	0.24	0.02	0.01	0.36	0.12	0.05	0.01	0.03	0.08
Washington & 12th	0.34	0.26	0.01	0.00	0.39	0.39	0.11	0.00	0.05	0.12
Washington & 17th	0.20	0.08	0.28	0.02	0.41	0.06	0.00	0.00	0.00	0.06
Collins & 17th	0.74	0.10	0.00	0.01	0.15	0.18	0.03	0.04	0.08	0.10
Collins & 21st	0.45	0.15	0.02	0.02	0.35	0.24	0.02	0.07	0.10	0.15
Collins & 41st	0.32	0.12	0.02	0.01	0.53	0.08	0.00	0.00	0.00	0.00
Alton & 15th	0.33	0.04	0.32	0.01	0.29	0.75	0.00	0.00	0.25	0.22
Alton & 16th	0.34	0.07	0.35	0.03	0.21	0.17	0.20	0.13	0.08	0.18
Alton & 17th	0.30	0.05	0.37	0.00	0.29	0.80	0.20	0.10	0.00	0.17
Alton & Lincoln	0.19	0.05	0.23	0.05	0.49	0.45	0.27	0.02	0.00	0.16

Data were also collected on the number of person who pressed the pedestrian call button on. These data indicated that only a small percentage of pedestrians press the call button at the 5 Alton Rd sites and the 1 Washington Ave. site. These data are very conservative because a button press was scored if any of the pedestrians waiting to cross pressed the button. Hence at the mid-block crosswalk on Alton Rd. the call button was not pressed by anyone 65% of the time even though vehicles were present.

Percent of Pedestrians Pressing Call Button	
Mid-block Alton Road	35%
Alton Rd and 15th St.	7%
Alton Rd and 16th St.	10%
Alton Rd and Lincoln Rd.	18%
Alton Rd and 17th St.	9%
Washington Ave and 17th St.	7%

In the Normandy Isles corridor the percentage of pedestrians crossing at the intersection vs. mid-block was scored at four locations along Collins Ave. Bus users comprised 27% of the pedestrians crossing at these locations. These data show that bus patrons were twice as likely to cross mid-block than other pedestrians. Because signals were spaced relatively far apart, many bus stops were located at uncontrolled location. Hence the placement of bus stops served as the pedestrian generators for these crossing.

The percentage of bus users and non-bus users crossing at intersections and mid-block locations.



Driver Behavior. Surrogate data were also collected on driver behavior at traffic signals and uncontrolled locations. These data show the percentage of drivers yielding to pedestrians at a number of locations along Alton Rd. and Washington Ave. Less than half of motorists yielded to pedestrians at 5 of the 6 sampled sites.

Driver Yielding Behavior at Traffic Signals	
Location	% Yielding
Alton Rd. and 15th St.	38%
Alton Rd. and 16th St.	41%
Alton Rd. and Lincoln Rd.	45%
Alton Rd. and 17th St.	26%
Washington Ave and 11th St.	55%
Washington Ave and 16th St.	43%

The percentage of drivers yielding to pedestrians at crosswalks at uncontrolled locations averaged only 24% and only 8% of drivers yielded to pedestrians at the mid-block crosswalk on Washington Ave. These data show that improved engineering devices and increased enforcement are going to be required in order to obtain improved mobility and safety for pedestrians.

Driver Yielding Behavior at Uncontrolled Locations	
Location	% Yielding
Collins Ave. at 7th St.	25%
Collins Ave. at 9th St.	24%
Collins Ave. at 12th St.	22%
Collins Ave at 13th St.	9%
Alton Rd. at 1st St.	35%
Mid-block Crosswalk Washington Ave.	8%
Washington Ave at 16th St.	43%

Only about half of the southbound drivers turning right off Collins Ave and Washington Ave. onto 5th Street came to a complete stop, and 38% and 28% of the vehicles respectively came to a rolling stop. It is important to note that 14% of the vehicles turning from Collins Ave and 17% of the vehicles turning from Washington Ave only slowed minimally while turning. Because the wide turning radii at these sites, vehicles were able to turn at a relatively high rate of speed. Only 23% of motorists turning right from Collins and 30% of motorists turning right from Washington looked right before turning. Most just looked left for vehicular traffic. Conflicts averaged 8% for vehicles turning right from Collins Ave and 2% for vehicles turning right from Washington Ave.

Southbound Drivers Turning Right onto 5th St.					
Turning Off	% Full Stop	% Rolling Stop	% Min Slowing	% Looked Rt.	% Conflicts
Collins Ave.	48%	38%	14%	23%	8%
Washington Ave.	56%	28%	17%	30%	2%

1.1.8 Experience Using PBCAT

The purpose of this discussion is to summarize some of the limitations of PBCAT, which were found during the site reviews in Miami-Dade as part of the FHWA ITS Pedestrian safety study. Also, the results of these observations were used to suggest changes that we believe would enhance the usefulness of a newer version of PBCAT, particularly relative to engineering analysis and countermeasure selection at intersections and corridors. For some of the initial site visits as part of the NHTSA program, sorted police crash reports were used in the field, in addition to crash summary listings (one line summary per crash). For the site visits in the FHWA study, we made use only of sorted 1-line listings of pedestrian crashes with selected crash variables (e.g., age of pedestrian crash severity, movement of vehicle, pedestrian crash type, driver age, date of the crash, time of day, weather condition, etc.) bound in booklet form.

During our site visits, we observed traffic and pedestrian movements and behavior, reviewed the crash information in terms of probable crash causes, reviewed geometric conditions, traffic control features, and other site conditions, and developed a list of recommended countermeasures for each location and/or segment along the high-crash corridors under review. Knowledge of the pedestrian crash experience was essential to understand the specific site deficiencies and/or problems, which are in need of corrective treatments.

The reason for not using police hard-copy reports in this study is that the process of copying and sorting multiple sets (one set of crash reports for each reviewer) was found to be too time-consuming and costly an undertaking, particularly, since we were dealing with hundreds of pedestrian crash reports each day and we had as many as 12 pedestrian crashes per intersection at some locations (over a 5-year period). Another problem with dealing with so many pedestrian crash reports is that it is very time consuming to read reports in the field, extremely cumbersome to handle at the high-crash sites, and it is difficult to find the relevant trends between crash reports. Often, a single crash report has several pages of narrative and/or witness statements. Sometimes, the handwriting on the report is very difficult to read while in the field. A few key phrases of the officer's narrative of key information would be very helpful and save time.

The use of the 1-line crash listings was much more efficient, saved time, made the site review easier in many respects, and saved personnel, and copy costs (i.e., compared to having staff personnel sort and copy several sets of hundreds of pedestrian crash reports). However, there were limitations in what can be learned from having only the PBCAT information, relative to understanding the crash causes and potential countermeasures.

Limitations with using current PBCAT information in the field. ***All of the pedestrian crashes in the high-crash corridors were typed using PBCAT along with other crash variables of interest on the 1-line crash listings. The problems and limitations that we had from not having the hard-copy police reports were:***

1. There was no certainty in terms of the leg of the intersection where the crash occurred. The officer's code of direction was often clearly incorrect (e.g., a vehicle said to be traveling southbound on a road that runs east/west). There is no way to know where the pedestrian was walking when struck. For example, if a vehicle was said to be traveling south and making a right turn, it was not clear whether the pedestrian was struck in the crosswalk on the near (north) side of the intersection, or on the far (west) leg of the intersection. The precise placement of many countermeasures such as a leading pedestrian phase depends on which leg pedestrians were struck. For example if pedestrians were only struck by vehicles turning off one of two roads comprising an intersection, the LPI would only need be specifically placed on only one road rather than the entire intersection. Many engineers would not wish to use a shotgun approach, by placing the treatment everywhere because it would needless reduce green time in some cases. Most engineers would rather adopt a cost benefit that delivered treatments only where they are required.

2. Without reading the police report, it was not clear whether the pedestrian was in the crosswalk, or some distance (10 feet, 20 feet, 50 feet) from the crosswalk, and/or

what direction that the pedestrian was coming from. Specific information of this type can have a large bearing on the selection of countermeasures.

3. Without the police report, there was no way to know (from PBCAT alone) about special features related to the crash location. In N. Miami Beach, for example, along Collins Avenue, there was at least one pedestrian crash per year for several years in the same grocery store parking lot. A site review of the lot showed a very unorthodox design of parking stalls and traffic flow, which was causing obvious conflicts between motorists and pedestrians. Without an indication of the specific parking lot of the crashes, a reviewer may incorrectly assume that the crashes happened from pedestrians crossing Collins Avenue.

4. Without the police report forms, there is no way to have the police officer's narrative that may be critical in understanding the crash causes and related characteristics. Having a few key phrases would be very helpful (e.g., "vehicle backed out of space at Kroger lot" or… "Pedestrian was struck in driveway of Foster's Restaurant when motorist failed to look to his right for pedestrian crossing the driveway,".”pedestrian was on in-line skates and skated into the intersection while talking on cell phone on the DON'T WALK signal and was struck by a motor vehicle"). Having such a brief summary of information on a printed file (in conjunction with a revised PBCAT program) would be a valuable addition for use in the field.

5. The current PBCAT software does not provide details about the type or location of traffic control devices present at the crash sites. Knowing which crashes occurred at traffic signals vs. uncontrolled locations could be helpful when studying the pattern of crashes within a specific corridor.

6. Because crashes are only assigned one type, much information is lost. For example, the percent of intersection crashes where the pedestrian was scored (pedestrian violation) at fault plus the percent of crashes where the motorist was scored at fault (motorist violation) add to 17%. Unfortunately, information on who is at fault in a pedestrian crash is often lost because PBCAT only assigns a crash to one crash category. Future revisions of PBCAT should ensure that this data is not lost and can be disaggregated when researchers need to examine the role of particular causes related to pedestrian crashes.

Recommended Changes to PB CAT. It is recommend that revisions be made to enhance PBCAT to address the issues listed above. Such revisions would allow PBCAT to be a much more useful tool for safety engineers and pedestrian safety officials who need to conduct site reviews to better identify crash location and appropriate solutions. Coding each crash for many potential causes and then using software to assign one specific cause could help resolve part of the problem with PBCAT. This would allow all of the information to remain in the file so it could be extracted when looking for the role of a specific factor one suspects is related to crashes at a particular location.

Section 2: Countermeasure Selection

1.2.1 Method Used to Match Countermeasures

Specific engineering interventions were matched to the identified corridors using the methodology described above. Many of the more effective pedestrian safety engineering countermeasures available to date have been developed or evaluated by either Mr. Zegeer or Dr. Ron Van Houten, so they were well positioned to select the most cost-effective variants of this emerging technology.

Chapter 3 of the "Pedestrian Facilities Users Guide: Providing Safety and Mobility" describes how to select pedestrian safety improvements based on PBCAT crash typing, while chapter 4 contains the details of 47 different engineering improvements for pedestrians. We plan to implement proven low-cost techniques appropriate for each crash type on a zone wide basis. More expensive interventions could also be introduced over time using a phased approach. This approach offers several advantages. First, this strategy has the greatest likelihood of wide scale dissemination and adoption. Second, the high cost/effectiveness ratio of initial applications will help ensure a series of quick wins that will help the program to conserve its momentum. Third, because most treatments work best when applied at multiple locations and in combination with other treatments, it is important that the treatments are not so expensive that they can only be used sparingly. Fourth, it allows time required to budget for more costly interventions should they be required.

The lists presented below identify some of the general engineering measures and ITS applications, by category, which have been documented to be effective in promoting pedestrian safety. These vary in cost and documented effectiveness. They are the most cost effective only when applied in zones where they are specifically required rather than on a citywide basis. It is important to note that ITS countermeasures for pedestrians have been studied less than some of the other interventions. The second list matches effective interventions from the first list to each of the 13 crash types identified by PBCAT.

Signals, Signs, Markings and General Improvements

1. Advance Yield Markings at Crosswalks with an Uncontrolled Approach. Placing yield markings and a sign between 10 and 15 meters in advance of a crosswalk reduces conflicts by 80 percent at crosswalks on multilane roads with an uncontrolled approach. The markings and signs employed will be identical to those in the FHWA NPA which is in the final stages of the approval process.

2. Offset Stop Bars for Intersections with Traffic Signals. At signalized intersections the vehicle stop line can be moved further back from the pedestrian crosswalk. The recessed stop lines provide a clear zone making it easier for pedestrians and drivers to see each other and more time to assess one another's intentions. Data also show that this intervention produces a marked reduction in the percentage of through vehicles blocking the crosswalk. This treatment is in compliance with the MUTCD.

3. Leading Pedestrian Intervals. A leading pedestrian interval (LPI) gives pedestrians an advance WALK signal 3 seconds before the motorists get a green light. This intervention has proven highly effective in reducing conflicts with turning vehicles, and has been associated with crash reductions. This treatment is in compliance with the MUTCD.

4. “TURNING VEHICLES YIELD TO PEDESTRIANS” symbol signs for drivers. We would evaluate this sign used to remind motorists that turning vehicles must yield to pedestrians at traffic signals. These signs would be placed next to the traffic signal or mounted on in-roadway knockdown signs located at the centerline. The in roadway sign will be same as proposed in the MUTCD NPA. The sign placed next to the traffic signal will require approval. The proposed sign will be a mixed text symbol sign. The sign is illustrated below.

5. Eliminate Permissive Left Turns at Signalized Intersections. We would examine the effects of eliminating permissive left turns at some high crash signalized locations. This would be particularly important for multilane roadways where drivers of left-turning vehicles would be more attentive to gaps in the opposing traffic stream than looking for pedestrians in the far side crosswalk. The effectiveness of this treatment will be dependent on whether pedestrians wait for they WALK sign to cross. This treatment is in compliance with the MUTCD.

6. Roadway lighting Improvements. This intervention can improve visibility and reduce nighttime crashes by improving sight distance. This treatment is in compliance with the MUTCD.

7. In-Roadway Knock Down Signs. In pavement knockdown signs in the current NPA will be systematically evaluated at various locations. These signs can be employed at uncontrolled and signalized locations.

8. PEDESTRIAN ZONE Warning sign. This sign is designed to warn motorists that pedestrians are present in large numbers and that they should watch for them.

Traffic Calming Measures

1. Crossing Islands. Adding crossing islands has been demonstrated to decrease the percentage of pedestrian crashes. Because of drainage problems, crossing islands are more expensive in Miami-Dade County and cannot be extensively employed.

2. Curb Radius Reduction. A wide turn radius usually results in vehicles making higher speed turning movements. Tightening the turning radius will reduce speeds, shorten the crossing distance, and improve sight distance between motorists and pedestrians. Because of drainage problems in Miami this treatment may be cost prohibited.

ITS Solutions

1. ITS Pedestrian Detection. Many pedestrians fail to press buttons required to provide them with adequate time to cross the street. Automatic pedestrian detection devices can put in a call for a longer time to cross, and some devices can also extend the length of the pedestrian clearance phase to provide enough time for slower pedestrians to cross. This device will be evaluated at selected mid-block crosswalks. This intervention is in compliance with the MUTCD.

2. ITS Pedestrian Direction Warning Sign for Drivers. This sign is designed for crosswalks with uncontrolled approaches. The sign indicates to motorists that a pedestrian is about to enter the crosswalk, the direction relative to the driver that the pedestrian is crossing from and a reminder to look for the pedestrian. Research has demonstrated that this signal is more effective than a yellow flashing beacon that is activated when pedestrians are in the crosswalk. Permission to experiment has already been granted at other sites. This permission can be extended to the sites employed in this research.

3. ITS Smart Lighting at Crosswalks with Nighttime Crashes. The level of lighting could be increased when a pedestrian is detected attempting to cross the street. It is unclear whether adding extra light requires permission to experiment. We will explore this with FHWA and request permission if necessary.

4. ITS No Right Turn on Red Signs. An LED sign can be used to prohibit right turn on red only when pedestrians are using the intersection. The exact working of this sign will be negotiated with FHWA.

5. ITS Pedestrian Signals (Countdown Timers and Animated Eyes Pedestrian Signal Head). Because the use of animated eyes and countdown timers are part of the FHWA NPA for inclusion in the MUTCD, it would be desirable to evaluate their effect on crashes and pedestrian safety. Each of these modifications addresses a different problem with the old pedestrian signal head. The eyes address the problem of the WALK signal not making it clear that there may be conflicts with turning vehicles. The countdown time helps to clarify the message of the flashing DON'T WALK. The animated eyes can also be seen further by low vision pedestrians – this addresses an ADA issue.

6. ITS Speed Warning Sign. Sign flashes SPEEDING SLOW DOWN. Vehicles speeding in high pedestrian crash zones would activate the flashing beacon mounted on a SPEEDING SLOW DOWM sign.

7. LED Transponders to Guide Blind Pedestrians. LED pedestrian signals are imperceptible pulsed for energy savings. When the WALK and DON'T WALK indications are pulsed at different frequencies and blind pedestrians are given a hand held optical receiver, the blind pedestrian can be informed whether it is their turn to cross. Because LEDs are directional this device may also help the blind pedestrian to stay within the crosswalk. This device could be compared with alternative devices.

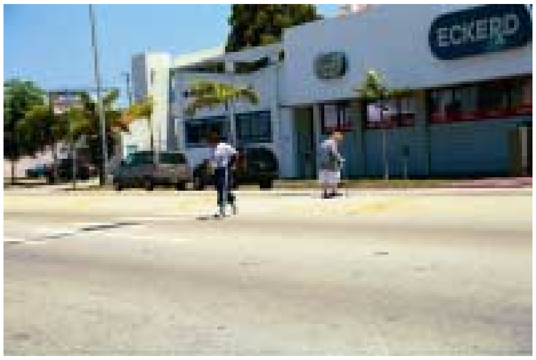
8. ITS Push Button that Lights and Emits a Tone when Depressed. Many pedestrians who push the call button do not wait for the WALK sign to cross the street. Many do not press the button at all. We will examine whether more pedestrians wait when the button provides feedback that it has taken the call. This treatment is in compliance with the MUTCD.

Countermeasures for Each Crash Type

Countermeasures will be matched to crash type using engineering judgment and knowledge of the strengths and weakness of each intervention. Some of the innovative treatments have not been carefully evaluated to date. These countermeasures do not appear in the Pedestrian Facilities Users Guide. Other countermeasures that appear in the guide are too expensive to be included in this project but may be added in the future when new safety projects are approved.

1.2.2 Matching Treatments to High Crash Corridors Including Innovative Strategies

Zone 1. Alton Rd: 5th to 17th Street



Many pedestrians do not press the call button even at mid-block crosswalks.

Summary of Zone 1 Crash Characteristics

- Predominantly daytime crashes
- High percentage of Seniors
- ¾ of crashes at intersections and half of these fatal or incapacitating (significantly higher than other sites - .05 level)
- Half of these involved left turning vehicles (statistically higher than other sites - .01 level)
- Few non-intersection crashes and only 25% of these were fatal or incapacitation.
- Surrogate data show that most pedestrians cross at signals and that most motorists do not yield to pedestrians.
- Surrogate data show that most pedestrians do not press the call button.
- Because most crashes occurred at signalized intersections it is recommended that countermeasures be concentrated at traffic signals. Interventions should be selected that increase pedestrian vigilance, and improve compliance with crossing signals. Interventions focused on drivers should increase yielding and reduce left turning conflicts.

Description of the Corridor
This corridor is two-way four lane multilane road with 2 lanes in each direction and parking on both sides of the street. Crosswalks are only painted at the 10 signalized intersections and 1 mid-block crosswalk. The two way ADT is 45,500. The speed limit is 35mph for the length of this corridor.

PBCAT Crash Profile.

Overall Statistics. This street had a crash index of 13, which is the 3rd highest of the 27 corridors that were identified with the GIS spectral analysis. Over the 5 year period it averaged 60 crashes per mile and had 21.7 incapacitating or fatal crashes per mile. The number of crashes over the 5-

year period remained essentially stable over this baseline period. Older pedestrians were somewhat over represented at this location accounting for 29 percent of the pedestrian crashes and children and youth up to 17 years old were only involved in 4% of the crashes. Crashes occurred predominantly during daylight hours on this corridor with 74% of crashes occurring during the day. A predominance of daytime crashes is to be expected at this location because the area is predominantly residential and removed from the South Beach entertainment district. The demographic breakdown of pedestrians struck on Alton Road was 87% White, 3% Afro-American, and 9% Hispanic.

Intersection Crashes. The percentage of intersection crashes in this corridor averaged 74 percent with 45% of these either fatal or incapacitating. Twenty four percent of the intersection crashes involved left turning vehicles (significant .01 level, one tail z test for pooled samples) and 48% of intersection crashes involved turning vehicles (significant at .05 level, one tail z test for pooled samples). Only 17% percent of intersection crashes involved pedestrian violations.

Non-Intersection Crashes. It is interesting to note that only 27% of the non-intersection roadway crashes were fatal or incapacitating. The pedestrian was scored at fault in 31% of the non-intersection crashes in this corridor.

Off-Roadway Crashes. Off roadway crashes accounted for only 14 percent of the crashes along this corridor.

Site Visit

During the site visit the team walked the entire corridor and observed driver and pedestrian behavior at each intersection. Most pedestrians crossed at controlled intersections. Drivers often violated pedestrian right-of-way and a number of motor vehicle conflicts were observed. Pedestrians did not always watch for turning vehicles and many did not push the call button, even at the mid-block crosswalk. Very few pedestrians were observed attempting to cross mid-block or at uncontrolled locations.

Surrogate Behavioral Data

Data collected at crosswalks on Alton Rd on weekdays during daytime hours in June and July of 2002 revealed that most turning vehicles did not yield to pedestrians in the crosswalk that starting crossing during the WALK sign. At Alton and 17th St. only 26% of drivers yielded, on Alton and Lincoln 45% yielded, at Alton and 16th 41% yielded, at Alton and 15th 38% yielded and at Alton and 11th 39% of turning motorists yielded to pedestrians. The percentage of conflicts that required evasive action on the part of the motorist or pedestrian ranged from 3% to 10% at these locations. Data were also collected on the percent of cycles pedestrians crossed that at least one of them pressed the call button. At the mid-block crosswalk only 35% of pedestrians pressed the call button. Data were also collected on the percent of button presses at four busy signalized intersections along Alton Rd, Alton and 15th St (7% pressed the button), Alton and 16th St. (10% pressed the button), Alton and Lincoln Rd. (18% pressed the button) and Alton and 17th St.(9% pressed the button). The higher percentage pressing at the mid-block location may indicate that pedestrians crossing at locations with full signals may be watching the traffic signal rather than the pedestrian signal head. A previous survey reported by Dr. Guerrier indicated that 60% of pedestrians that knew about the pedestrian call button but did not press it, indicated that they refrained from pressing because they were not sure it worked. These results suggest that a button that confirmed that it had been pressed should lead to better push button compliance.

Additional data collected at Alton and 15th, Alton and 16th Alton and 17th and Alton and Lincoln, indicated that only 33%, 34%, 30%, and 19% of pedestrians respectively started to cross during the WALK indication, while 62% 59%, 66% and 77% began crossing during the DON'T WALK indication. Thus more pedestrians started to cross during the DON'T WALK than during the WALK condition. It is also interesting to note that conflicts for those crossing during the WALK averaged 0%, 13%, 10% and 2% respectively, while conflicts for those crossing during the DON'T WALK averaged 22%, 18%, 17% and 16% respectively. The higher percentage of conflicts for pedestrians crossing during the DON'T WALK may be a function of the increased danger in crossing against the signal or that people who cross against the signal are inclined to engage in more risk taking behavior and hence more likely to have conflicts regardless of when they cross. However, these data do suggest that a may be beneficial to increase pedestrian compliance with pedestrian signals.

Recommendations:

Because most crashes occurred at signalized intersections it is recommended that countermeasures be concentrated at traffic signals. Interventions should be selected that increase pedestrian vigilance, and improve compliance with crossing signals. Interventions focused on drivers should increase yielding and reduce left turning conflicts. Therefore, the following intersection specific countermeasures are recommended at this site.

1. Install ITS Pedestrian Signals, which are self-explanatory with animated eyes to remind motorists to watch for turning vehicles and a countdown timer to improve signal compliance (44 LED pedestrian signals).
2. Install TURNING VEHICLES YIELD signs to remind motorists to yield to pedestrians in crosswalks to reduce the number crashes with turning vehicles (16 signs).
3. Install ITS push buttons, which acknowledge the pedestrian call by lighting and providing an audible cue, to increase the percentage of pedestrians pressing the button and reduce the percentage of pedestrians violating the signal (24 push buttons).
4. Install ITS pedestrian detection to supplement the pedestrian call button at locations where most pedestrians do not press the call button (one set at mid-block crosswalk).
5. Install ITS pedestrian detector to extend the clearance phase for slower pedestrians (one set at mid-block crosswalk).
6. Install LPI on side street locations (10 installations).

Treatment Locations for Zone 1

Zone 1 Alton Road: 5th St. to 17th St.

TYPE OF DEVICE	ITS LED PED Signals	ITS Push button acknowldegement	ITS Automatic Spot Detection	ITS Detector that Monitors Cross	Leading Ped Phase	Turning Veh Yield Sign	Eliminate Permissive Left
5th St.		2					
6th St.		2			2		1
7th St.							
8th St.	8	4			2		1
9th St.							
10th St.							
11th St.							
12th St.							
13th St.							
14th St.							
Midblock Crosswalk			2	2			
15th St.	8	4			2	4	
16th St.	8	4			2	4	1
Lincoln Rd.	8	4				4	1
17th St.	8	4			2	4	
TOTAL	**40**	**24**	**2**	**2**	**10**	**16**	**4**

Zone 2. 5th St: Alton Road to Ocean Drive

Wide curb radii such as this one are common along 5th St. (note: this example is not on 5th)

Summary of Zone Crash Characteristics

- This corridor starts as a two-way four lane multilane road with 2 lanes in each direction at Ocean Drive, and West of Collins Ave it becomes an 8-lane road with 4 lanes in each direction. The two-way ADT on this road is 45,500
- High percentage of crashes at intersections
- Most intersection crashes involved right turning vehicles. Left turning vehicles only involved in 4% of crashes.
- Surrogate data showed that less than a third of drivers turning right looked to the right for pedestrians.
- About half the drivers turning right on red did not come to a complete stop.
- Because most crashes occurred at intersections and appeared to involve vehicles turning right on red or right on green it is recommended that countermeasures be concentrated at reducing the threat posed by inattentive drivers turning making right turns.

Description of the Corridor
This corridor starts as a two-way four lane multilane road with 2 lanes in each direction at Ocean Drive, and West of Collins Ave it becomes an 8-lane road with 4 lanes in each direction. The two-way ADT on this road is 45,500 vpd. The speed limit is 35 mph for the length of this corridor.

PBCAT Crash Profile.

Overall Statistics. This street had a crash index of 16.8, which is highest ranked of the 27 corridors that were identified with the GIS spectral analysis. Over the 5 year period this corridor averaged 70 crashes per mile and 24 incapacitating or fatal crashes per mile. The number of crashes over the 5-year period remained essentially stable over this baseline period. Older pedestrians were somewhat over represented at this location accounting for 31 percent of the pedestrian crashes. Children up to 13 only comprised 3% of the crashes and youth aged 13 to 17 made up 6 percent of the crashes. A little less than half the crashes on this corridor occurred during daylight conditions (46%). The demographic breakdown of pedestrians struck on 5th Street 69% White, 11% Afro-American, and 20% Hispanic.

Intersection Crashes. The percentage of intersection crashes in this corridor averaged 77 percent with 35% of these either fatal or incapacitating. Only 4% of the intersection crashes involved left turning vehicles, however, 39% of intersection crashes involved turning vehicles. This indicates a high percentage of right turn on green and right turn on red crashes. Only 9% percent of intersection crashes involved pedestrian violations. It is likely that the use of wide turn radii contribute to these crashes.

Non-Intersection Crashes. At this location, 23% of crashes occurred at non-intersection locations with 29% of these crashes fatal or incapacitating. Pedestrians were scored at fault in 40% of the non-intersection roadway crashes were fatal or incapacitating.

Off-Roadway Crashes. Only 6% of the crashes on this corridor occurred off the roadway. Unlike Alton Road there are few parking lots along this corridor.

Site Visit

During the site visit the team walked the entire corridor and observed driver and pedestrian behavior at each intersection. Most pedestrians crossed at controlled intersections. Drivers often violated pedestrian right-of-way. It was also noted that drivers turning right on red rarely came to a full stop, and many performed free flow right turns. Pedestrians did not always watch for turning vehicles. Very few pedestrians were observed attempting to cross mid-block or at uncontrolled locations.

Surrogate Behavioral Data

Data were collected on south bound vehicles turning right from Washington Ave. on to 5th Street and from Collins Ave onto 5th St during the month of July during weekday afternoons. These data show that only 23% of drivers turning right off Collins looked right for pedestrians in the crosswalk and only 30% of drivers turning right off Washington looked for pedestrians in the crosswalk. Of those drivers turning right on red, 14% of the drivers on Collins and 17% of the drivers on Washington only slowed minimally to complete the turn, and 38% and 28% respectively made a rolling stop. Drivers who do not look for pedestrians and make turns without significant slowing place pedestrians in considerable risk. We judge that the wide turning radii on these and other roads along this corridor contribute to this problem. Conflicts that required either pedestrian or driver evasive action to avoid a crash occurred 8% and 2% of the instances at the two respective sites. These data were collected during daylight hours. During evening hours one would expect the risk level to increase.

Recommendations:

Because most crashes occurred at intersections and appeared to involve vehicles turning right on red or right on green it is recommended that countermeasures be concentrated at reducing the threat posed by inattentive drivers turning making right turns. Therefore, the following intersection specific countermeasures are recommended at this site.

1. Install ITS NRTOR signs to reduce the threat of right on red turns at the two intersection with the highest crash frequency (install 2 signs).
2. Install in-roadway signs at traffic signals to remind motorists to yield to pedestrians in crosswalks should reduce the number crashes with turning vehicles (12 Signs).

3. Install ITS push buttons, which acknowledge the pedestrian call by lighting and providing an audible cue, should reduce the percentage of pedestrians violating the signal (12 push buttons for Washington and Collins).
4. Install TURNING VEHICLES MUST YIELD signs (16 location).

Treatment Locations for Zone 2

Zone 2   5th St. Alton Rd. to Ocean Dr.

TYPE OF DEVICE	ITS Push button acknowldegement	Turning Veh Yield Sign	In Roadway Signs	ITS No RTOR Sign
UNIT COST OF DEVICE				
Ocean Dr.				
Collins	4	4	2	1
Washington Ave.	4	4	2	1
Eculid Ave.				
Meridian Ave	2	4	2	
Jefferson Ave	2	2		
Michigan Ave		2		
Lenox Ave.				
TOTAL	12	16	6	2

Zone 3. Washington Ave: 5th St. to Dade Blvd

Washington is busy with many pedestrians and a good deal of turning traffic.

Summary of Zone Crash Characteristics

- This corridor is two-way four lane multilane road with 2 lanes in each direction and on road parking between 5th St. and Dade Blvd. The two way ADT on this road is 19,084. It is located in an area of South Beach with a good deal of night activity.
- About half the crashes occurred at night.
- 44% of the crashes occurred at non-intersection locations.
- Observation indicated that people cross all along this road.
- Because crashes occurred at both intersection and non-intersection locations it is recommended that countermeasures be directed at both types of locations. Interventions should focus on making this a pedestrian zone.

Description of the Corridor
This corridor is two-way four lane multilane road with 2 lanes in each direction and on road parking between 5th St. and Dade Blvd. The two way ADT on this road is 19,084. The speed limit is 35 mph.

PBCAT Crash Profile.

Overall Statistics. This street had a crash index of 12.7, which is ranked 4th of the 27 corridors that were identified with the GIS spectral analysis. Over the 5-year period it averaged 72.5 crashes per mile and 17.5 incapacitating or fatal crashes per mile. The number of crashes over the last 4-years of the 5-year period remained essentially stable. Older pedestrians and children and youth were not over represented at this location accounting 19% and 3 percent of the crashes respectively. A little more than half of the crashes on this corridor occurred during daylight hours (54%). This corridor is within the South Beach entertainment area, which is very active during at night. The demographic breakdown of pedestrians struck on Washington Ave was 70% White, 6% Afro-American, and 20% Hispanic.

Intersection Crashes. The percentage of intersection crashes in this corridor averaged 56 percent, which is somewhat lower than the average for all sites. Only 21% of these crashes were fatal or incapacitating which is again is below the average for all sites. Nine percent of the intersection crashes involved left turning vehicles, which is close to the corridor average, however, 38% of intersection crashes involved turning vehicles, which is above the corridor average. This indicates a high percentage of right turn on green and right turn on red crashes. Pedestrian violations accounted for 16 percent of intersection crashes at this site. It is likely that pedestrians crossing against the signal accounted for many of the intersection crashes on Washington.

Non-Intersection Crashes. At this location, 44% of roadway crashes occurred at non-intersection locations with 30% of these crashes fatal or incapacitating. Pedestrians were scored at fault in 34% of the non-intersection roadway crashes. This is less than the average for all corridors.

Off-Roadway Crashes. Only 5% of the crashes on this corridor occurred off the roadway. Like Alton Road there are few marking lots along this corridor.

Site Visit
During the site visit the team walked the entire corridor and observed driver and pedestrian behavior at each intersection. Almost as many pedestrians crossed at non-intersection locations as at intersections locations. Drivers often violated pedestrian right-of-way but pedestrians also often violated driver right-of-way, particularly at non-intersection locations. One multi-lane mid-block crosswalk with an uncontrolled approach had a number of serious crashes. Drivers did not yield to pedestrians at this location.

Surrogate Behavioral Data
Surrogate data were collected at two signalized intersections on Washington Ave. and at a marked mid block crosswalk at an uncontrolled location during weekdays during June and July of 2002. Data collected at Washington and 16th indicated that 43% of turning vehicles yielded to pedestrians crossing with the WALK sign with 2% conflicts requiring evasive action on the part of the driver or pedestrian. At the intersection of Washington Ave and 11th Street 58% of motorists yielded to pedestrians and conflicts averaged 3%. At one very busy intersection, Washington and Lincoln Rd. only 7% of pedestrians pressed the pedestrian call button. Data collected at the uncontrolled marked mid block crosswalk indicated that 8% of drivers yielded to pedestrians with 3% conflicts. Conflicts are likely more frequent during evening hours.

Marked multilane mid-block crosswalk on Washington is difficult to cross.

Additional surrogate data collected at Washington and 11th, 12th and 17th, indicated that only 37%, 34% and 20% pedestrians respectively started to cross during the WALK indication, while 39% 40% and 71% began crossing during the DON'T WALK indication. Thus more pedestrians started to cross during the DON'T WALK than during the WALK condition. It is also interesting to note that conflicts for those crossing during the WALK averaged 1%, 0% and 0% respectively, while conflicts for those crossing during the DON'T WALK averaged 8%, 12% and 6% respectively. These data show that increasing pedestrian compliance with the pedestrian signals is an important goal at this location.

Recommendations:

Because crashes occurred at both intersection and non-intersection locations it is recommended that countermeasures be directed at both types of locations. Because violations involved both motorist and pedestrian violations both should be targeted. Therefore, the following intersection specific countermeasures are recommended at this site.

1. Install TURNING VEHICLES YIELD signs to remind motorists to yield to pedestrians in crosswalks should reduce the number crashes with turning vehicles (16 Signs).
2. Install Leading Pedestrian Intervals at most intersection (14 installations).
3. Install an ITS Pedestrian Direction Warning Sign at the mid-block showing when pedestrians are crossing and the direction they are crossing (2 units)
4. Install advance yield bars at the mid-block location (2 bars)
5. Install ITS automatic detection at the mid-block location (2 units).
6. Install ITS dynamic lighting at the midblock location (2 units).

Treatment Locations for Zone 3

Zone 3 Washington Ave: 5th Street to Dade Blvd

TYPE OF DEVICE	Eliminate Permissive Left	ITS Push Button	ITS Pedestrian Detector	Leading Ped Phase	Turning Veh Yield Sign	ITS Pedestrian Direction Warning Sign	ITS Crosswalk Lighting	Advance Yield Bar	ITS Speed Warning Sign	Pedestrian Zone Signs
6th St.										
7th St.										1
8th St.										
9th St.		4								2
10th St.				2	2				1	
11th St.				2	2					2
12h St.		4		2	2					
13th St.										2
14th St.				2	2				2	
Espanola Way										2
15th St.		2								
16th St.		4		2	2				1	2
Midblock cross		2				2	2	2		
Lincoln	1			2	4				1	
17th St.		4	2	2	2					1
TOTAL	**1**	**20**	**2**	**14**	**16**	**2**	**2**	**2**	**5**	**12**

Zone 5. Collins Ave: 5th St to 24th St.

Many conflicts occur at signalized and uncontrolled locations along Collins.

Summary of Zone Crash Characteristics

- This corridor is a two-way road with one lane in each direction and parking on both sides of the street until Espanola Way. North of Espanola Way the road is carries two lanes in each direction with no parking. North of 23rd St. parking is again permitted. The two way ADT on this corridor is 29,500 in the four lane segment. In core South Beach area.
- Half the crashes occur at night.
- ¾ of crashes at intersection locations but only a quarter were fatal or incapacitating.
- Because most serious crashes occurred at both controlled and uncontrolled intersection locations it is recommended that countermeasures be directed at both these locations.

Description of the Corridor

This corridor is a two-way road with one lane in each direction and parking on both sides of the street until Espanola Way. North of Espanola Way the road is carries two lanes in each direction with no parking. North of 23rd St. parking is again permitted. The two way ADT on this corridor is 29,500 in the four lane segment. The speed limit is 35 mph.

PBCAT Crash Profile.

Overall Statistics. This street had a crash index of 5.3, which is ranked 13th of the 27 corridors that were identified with the GIS spectral analysis. Over the 5-year period it averaged 52.8 crashes per mile but only 10 incapacitating or fatal crashes per mile. The number of crashes over the last 4-years of the 5-year period remained essentially stable. Older pedestrians were not over represented at this location accounting for only 12 percent of the pedestrian crashes. This corridor is in the heart of the South Beach entertainment area and it is therefore not surprising that just under a half of the crashes occurred during daylight hours (49%). The demographic breakdown of pedestrians struck on Washington Ave was 68% White, 17% Afro-American, and 12% Hispanic.

Intersection Crashes. The percentage of intersection crashes in this corridor averaged 75 percent, which is somewhat higher than the average for all sites. Only 24% of these crashes were fatal or incapacitating which is again is below the average for all sites. Fifteen percent of the intersection crashes involved left turning vehicles, which is a little above the corridor average, and 27% of intersection crashes involved turning vehicles, which is about average for this corridor. Pedestrian violations accounted for 17 percent of intersection crashes at this site.

Non-Intersection Crashes. At this location, only 25% of roadway crashes occurred at non-intersection locations with only 15% of these crashes fatal or incapacitating. This is well below the rate for all corridors and is likely a function of the lower speed of vehicles traveling along this corridor. Pedestrians were scored at fault in 36% of the non-intersection roadway crashes, which is less than the average for all of the corridors.

Off-Roadway Crashes. Only 8% of the crashes on this corridor occurred off the roadway. Like Alton Road there are few marking lots along this corridor.

Site Visit

During the site visit the team walked the entire corridor and observed driver and pedestrian behavior at each intersection. Most pedestrians cross at marked crosswalks at traffic signals or at uncontrolled locations. Many drivers failed to yield to pedestrians and some pedestrians failed to wait for the WALK signal. Parking is permitted too close to marked crosswalks at uncontrolled locations screening driver's view of pedestrians entering the crosswalk.

Surrogate data

Yielding at uncontrolled locations increased from 14% to 34% at intersections along this corridor since the introduction of an enforcement program in March of 2002. The percent of evasive conflicts at uncontrolled locations during daylight hours have decreased from 2.5% to 1.5% since the start of the crosswalk enforcement program. Data collected weekdays during day time hours during the month of July 2002 at traffic signals at Collins and 17th and Collins and 21st indicated that 74% and 45% of pedestrians started crossing during the WALK indication and 15% and 39% started crossing during the DON'T WALK indication. These data are better than those collected at Washington and Alton Rd. The percentage of conflicts for pedestrians starting during the WALK indication was 4% and 7% respectively and for pedestrians that started to cross during the DON'T WALK was 10% and 15% respectively.

Recommendations:

Because most serious crashes occurred at both controlled and uncontrolled intersection locations it is recommended that countermeasures be directed at both these locations. Therefore, the following intersection specific countermeasures are recommended at this site.

1. The implementation of a 3 second leading pedestrian signal phase is recommended at all traffic signals along this corridor should help reduce conflicts and crashes at intersection locations (8 installations).
2. The use of TURNING VEHICLES YIELD signs to remind motorists to yield to pedestrians in crosswalks should reduce the number crashes with turning vehicles (14 signs).
3. Eliminate parking 20 feet in advance of all crosswalks at uncontrolled locations.
4. Use of Advance Yield Markings (8 yield bars).

Zone 5 Collins Ave: 5th St. to 24th St.

TYPE OF DEVICE	Leading Ped Phase	Turning Veh Yield Sign	Advance Yield Bar
6th St.			
7th St.		1	2
8th St.			
9th St.			
10th St.			
11th St.	1	2	
12th St.			
13th St.			2
14th St.	1	2	
15th St.			
16th St.	2	4	
Lincoln Rd.	1		
17th St.	1	2	
18th St			
19th St			
20th St			
21st St	2	4	
22nd St			
23rd St			
24th St.			
TOTAL	**8**	**15**	**4**

Zone 6. Collins Ave: 28th St. to 43rd St.

Summary of Zone Crash Characteristics

- This corridor is one-way road with three lanes and parking on both sides of the road. This area is under development and has many unoccupied buildings. The ADT on this corridor is 47,500 vpd.
- Speeds are somewhat higher at this location.
- Half the pedestrians struck were seniors (significantly greater than other corridors - .01 level).
- Most crashes during daylight hours.
- 85% of crashes occurred at intersections and 66% were fatal or incapacitating (significant at the .01 level). This is likely the result of the greater vehicle speed and the age of the pedestrians.
- During the site visit the team walked the entire corridor and observed driver and pedestrian behavior. The number of pedestrians observed as low compared to many of the other corridors with a high crash index. Pedestrians were observed to cross at intersections, at both controlled and uncontrolled locations. Drivers did not yield at uncontrolled locations. Traffic signals were widely spaced.
- Because most crashes occurred at intersections, and intersection crashes were roughly two and a half times more likely to lead to a serious injury than crashes at non signalized locations, it is recommended that countermeasures be directed at intersection locations and that the treatments focus on reducing vehicle speeds.

Description of the Corridor
This corridor is one-way road with three lanes and parking on both sides of the road. This area is under development and has many unoccupied buildings. The two way ADT on this corridor is 47,500 vpd. The speed limit is 35 mph on this corridor.

PBCAT Crash Profile.

Overall Statistics. This street had a crash index of 10.1, which is ranked 7th of the 27 corridors that were identified with the GIS spectral analysis. Over the 5-year period it averaged 43.3 crashes per mile and 23.3 incapacitating or fatal crashes per mile. The number of crashes over the last 4-years of the 5-year period showed an increase in 1997 and has remained high since. Older pedestrians comprise 53% of the pedestrian crashes in this corridor, which is significantly greater than expected (significant at .01 level, two tail z test for pooled proportions). Countermeasures deployed in this zone need to address the needs of older pedestrians. Children and youth were not over represented in crashes in this corridor. In this corridor 74% of crashes occurred during daylight hours. This is somewhat greater than the mean for all of the corridors. The demographic breakdown of pedestrians struck on this segment of Collins Ave. was 89% White, 5% Afro-American, and 5% Hispanic.

Intersection Crashes. The percentage of intersection crashes in this corridor averaged 85%, which is somewhat higher than the average for all sites. Sixty six percent of the intersection crashes in this corridor were fatal or incapacitating which is significantly greater than the corridor average (significant .01, two tailed z test for pooled samples) The proportion of intersection crashes that involved left turning vehicles was 17% while the percentage of crashes that involved turning vehicles was 28%. These figures are close to the corridor average. Pedestrian violations accounted for 24 percent of intersection crashes at this site.

Non-Intersection Crashes. At this location, 26% of roadway crashes occurred at non-intersection locations with 25% of these crashes fatal or incapacitating. This is below the rate for all corridors. Pedestrians were scored at fault in 25% of the non-intersection roadway crashes, which is significantly less than the average for all of the corridors.

Off-Roadway Crashes. The percentage of off the roadway crashes in this corridor averaged 13%. This is somewhat less than the average for all corridors and likely a consequence of the relatively smaller percentage of parking lots along this corridor.

Site Visit

During the site visit the team walked the entire corridor and observed driver and pedestrian behavior. The number of pedestrians observed as low compared to many of the other corridors with a high crash index. Pedestrians were observed to cross at intersections, at both controlled and uncontrolled locations. Drivers did not yield at uncontrolled locations. Traffic signals were widely spaced.

Recommendations:

Because most crashes occurred at intersections, and intersection crashes were roughly two and a half times more likely to lead to a serious injury than crashes at non signalized locations, it is recommended that countermeasures be directed at intersection locations. The following intersection specific countermeasures are recommended at this site.

1. Install TURNING VEHICLES YIELD signs to remind motorists to yield to pedestrians in crosswalks should reduce the number crashes with turning vehicles (14 signs).
2. Install Advance Yield Markings and YIELD HERE TO PEDESTRIAN signs to remind motorists to yield to pedestrians at uncontrolled locations (8 signs).
3. Install ITS pedestrian detection at mid-block crosswalk (2 detectors).
4. Install ITS detectors to monitor crosswalk and extend time for slow pedestrians (2 units).
5. ITS NRTOR sign (1 location).

6. Install ITS Speed warning signs at 4 locations to reduce speeding in the corridor.

Zone 6 Collins Ave: Indian Creek 28th St. to 43rd St.

TYPE OF DEVICE	ITS Automatic Spot Detection	ITS Detector that Monitors Cross	ITS No RTOR Sign	Turning Veh Yield Sign	ITS Speed Warning Sign
UNIT COST INSTALLATION					
Collins Ave. and 28th St.					
Colllins Ave. and 29th ST.					
Collins Ave and 30th St.					
Coliins Ave and 31st St.					
Collins Ave and 32nd St.					1
Collins Ave and 33rd St.					
Collins Ave and 34th St.					
Collins Ave and 35th St.					1
Collins Ave and 36th St.					
Collins Ave and 37th St.					
Collins Ave and 39th St.					1
Midblock	2	2			
Collins Ave and 40th St.					
Collins Ave and 41st St.				2	
Collins ave and 42nd St.					
Indian Creek and 41st St.			1	2	
TOTAL	2	2	1	4	3

Zone 7. 41st St: Alton Rd to Pine Tree Dr.

Summary of Zone Crash Characteristics

- This corridor is two-way road with two travel lanes in each direction and parking on both sides of the street at some locations. This area is a commercial zone with many pedestrians and a school. All intersections in this corridor are controlled. Most of the turns from 41st St. to side streets are protected followed by permissive phasing. The two way ADT on this corridor is 39,000 vpd.
- Older pedestrians comprise 49% of the pedestrian crashes in this corridor, which is significantly greater than expected (.01 significance level, two tail z test for pooled proportions).
- 81% of crashes occurred during daylight hours.
- 79% of crashes at intersections.
- ¼ of crashes involved left turning vehicles (significant at .05 level).
- Because most crashes occurred at signalized intersections, it is recommended that countermeasures be directed at these locations.

Description of the Corridor

This corridor is two-way road with two travel lanes in each direction and parking on both sides of the street at some locations. This area is a commercial zone with many pedestrians and a school. All intersections in this corridor are controlled. Most of the turns from 41st St. to side streets are protected followed by permissive phasing. The two way ADT on this corridor is 39,000 vpd. The posted speed limit is 30 mph along this corridor.

PBCAT Crash Profile.

Overall Statistics. This street had a crash index of 5.1, which is ranked 14th of the 27 corridors that were identified with the GIS spectral analysis. It is included because it is in located within the South Beach high crash zone. Over the 5-year period it averaged 42.2 crashes per mile and 12.2 incapacitating or fatal crashes per mile. The number of crashes over the last 4-years of the 5-year period have remained essential stable. Older pedestrians comprise 49% of the pedestrian crashes in this corridor, which is significantly greater than expected (.01 significance level, two tail z test for pooled proportions). Countermeasures deployed in this zone need to address the needs of older pedestrians. Children and youth were not over represented in this corridor. In this corridor 81% of crashes occurred during daylight hours. This is greater than the mean for all of the corridors highest percent of daytime crashes for all 27 corridors. The demographic breakdown of pedestrians struck on 41st St. was 83% White, 9% Afro-American, and 9% Hispanic.

Intersection Crashes. The percentage of intersection crashes in this corridor averaged 79%, which is higher than the average for all sites. Only 29% of the intersection crashes in this corridor were fatal or incapacitating which is less than the average for all corridors. The proportion of intersection crashes that involved left turning vehicles was 23% which was significantly higher than the average for all corridors (.05 significance level, two tail z test for pooled proportions), and the percentage of crashes involving turning vehicles was 73% which was the highest for all of the corridors (.01 significance level, two tailed z test for pooled proportions). Only 9% of these crashes involved pedestrian violations, which is less than the average for all intersections.

Non-Intersection Crashes. At this location, 21% of roadway crashes occurred at non-intersection locations, which are less than the average for all corridors, but 50% of these crashes were fatal or incapacitating. This is well above the rate for all corridors. Pedestrians were scored at fault in half of these crashes, which is less than the average for all of the corridors.

Off-Roadway Crashes. The percentage of off the roadway crashes in this corridor averaged 15%. This is somewhat less than the average for all corridors and likely a consequence of the relatively smaller percentage of parking lots along this corridor.

Site Visit

During the site visit the team walked the entire corridor and observed driver and pedestrian behavior. We saw many examples of motorist violating pedestrian right of way, drivers blocking crosswalks, and pedestrians crossing against the signal. Although most pedestrians crossed in crosswalks, some crossed mid-block.

Recommendations:

Because most crashes occurred at signalized intersections, it is recommended that countermeasures be directed at these locations. However, the seriousness of non-intersection crashes warrants directing some efforts to reduce them. The following intersection specific countermeasures are recommended at this site.

1. Install YIELD TO PEDESTRIANS warning signs to remind motorists to yield to pedestrians in crosswalks should reduce the number crashes with turning vehicles (14 signs).
2. Elimination of the permissive left turn phase at where possible should reduce the threat posed by left turning vehicles (8 locations).
3. Install ITS pedestrian signals that warn drivers to watch for turning vehicles and show the amount of time remaining to cross (56 signals).

4. Provide visually impaired pedestrians with LED transponders to enable them to tell when it is their turn to cross (4 units- no charge).
5. Install ITS push buttons that confirms the initiation of a pedestrian call. (15 units).

Zone 7 41st St (Arthur Godfrey) Alton Rd to Pine Tree Dr.

TYPE OF DEVICE	ITS LED Ped Signals	ITS Push button acknowldegement	Eliminate Permissive Left
Alton Rd	8	2	
Midblock			
Merridian Ave	8	2	
Chase Ave.	8	2	
Prairie Ave.			
Mid Block			
Royal Palm Ave	8	2	2
Midblock			
Sherridan Ave		2	2
Pine Tree Dr.	8	3	2
TOTAL	**40**	**13**	**6**

Zone 8. North Beach Normandy Isle

Pedestrians cross at the bus stop in the middle of the block. Signals are spaced far apart.

Summary of Zone Crash Characteristics

- This corridor is a paired one-way roadway system. Collins Ave. is a one way two-lane street carrying northbound traffic with on street parking. North of 71st St. Collins is widened to three lanes. The speed limit is 30 mph in this are. Harding Ave is a one way two-way road with two travel lanes in each direction and on street parking. This is a major transit corridor with many bus routes. This area is also a commercial zone with many pedestrians. The two way ADT on this corridor is 27,000 vpd.
- The percentage of intersection crashes in this corridor averaged 59%, which is somewhat lower than the average for all sites. Only 29% of the intersection crashes in this corridor were fatal or incapacitating which is less than the average for all corridors.
- At this location, 41% of roadway crashes occurred at non-intersection locations, which is somewhat more than the average for all corridors, and 44% of these crashes were fatal or incapacitating. Pedestrians were scored at fault in 63% of these crashes.
- Surrogate data collected along Collins Rd indicated that half of the pedestrians crossing Collins were transit users during peak transit hours. Half of the bus users cross at the crosswalk and the remaining half cross midblock.
- Because most crashes occurred at intersections, it is recommended that countermeasures be directed at intersection locations. However, the seriousness of non-intersection crashes warrants some attention as well. Making this a pedestrian zone and speed reductions are major objectives.

Description of the Corridor

This corridor is a paired one-way roadway system. Collins Ave. is a one way two-lane street carrying northbound traffic with on street parking. North of 71st St. Collins is widened to three lanes. The speed limit is 30 mph along this corridor. Harding Ave is a one way two-way road with two travel lanes in each direction and on street parking with a speed limit of 30 mph. This is a major transit corridor with many bus routes. This area is also a commercial zone with many pedestrians. The two way ADT on this corridor is 27,000 vpd.

PBCAT Crash Profile.

Overall Statistics. This street had a crash index of 10.5, which is ranked 6th of the 27 corridors that were identified with the GIS spectral analysis. Over the 5-year period it averaged 43.7 crashes per mile and 24.1 incapacitating or fatal crashes per mile. The number of crashes over the last 4-years of the 5-year period have remained essential stable with a small decline in 2000. Older pedestrians comprise 30%, which is significantly higher than the average for the 27 corridors (.01 significance level, two tailed z test for pooled proportions). The percentage on Collins and Harding is somewhat higher at 38%. Children less than 13 years of age were slightly over represented in this corridor but youth aged 13 to 17 were not. In this corridor 63% of crashes occurred during daylight hours. This is slightly less than the mean for all 27 corridors. The demographic breakdown of pedestrians struck on 41st St. was 66% White, 12% Afro-American, and 21% Hispanic.

Intersection Crashes. The percentage of intersection crashes in this corridor averaged 59%, which is somewhat lower than the average for all sites. Only 29% of the intersection crashes in this corridor were fatal or incapacitating which is less than the average for all corridors. The proportion of intersection crashes that involved left turning vehicles was 15%, which was somewhat higher than the average for all corridors, and the percentage of crashes involving turning vehicles was 26%. Thirty percent of these crashes involved pedestrian violations, which is around the average for all corridors.

Non-Intersection Crashes. At this location, 41% of roadway crashes occurred at non-intersection locations, which is somewhat more than the average for all corridors, and 44% of these crashes were fatal or incapacitating. Pedestrians were scored at fault in 63% of these crashes.

Off-Roadway Crashes. The percentage of off the roadway crashes in this corridor averaged 14%. This is somewhat less than the average for all corridors and likely a consequence of the relatively smaller percentage of parking lots along this corridor.

Site Visit

During the site visit the team walked the entire corridor and observed driver and pedestrian behavior. We saw many examples of motorist violating pedestrian right of way, drivers blocking crosswalks, and pedestrians crossing against the signal. Although most pedestrians crossed in crosswalks, some crossed mid-block. Most of the pedestrians crossing mid-block or at uncontrolled locations were either going to or leaving bus stops. Signals tended to be spaced far apart and many buses stopped between signals.

Surrogate Data

Surrogate data collected during morning and afternoon rush hour periods during the month of July of 2002 along Collins Ave indicated that half of the pedestrians crossing Collins were transit users during peak transit hours.

Recommendations:

Because most crashes occurred at intersections, it is recommended that countermeasures be directed at intersection locations. However, the seriousness of non-intersection crashes warrants some attention as well. The following intersection specific countermeasures are recommended at this site.

1. Install TURNING VEHICLES YIELD signs to remind motorists to yield to pedestrians in crosswalks should reduce the number crashes with turning vehicles (18 Signs).
2. Install ITS Pedestrian Direction warning signs at a mid-block or uncontrolled crossing (1 units).
3. Install Pedestrian Zone Warning signs (8 Signs).
4. Install Dynamic Lighting at the mid-block crosswalk with the ITS sign (1).
5. Install ITS Pedestrian Speed sign (1 sign).
6. Install advance yield lines (4 yield lines)
7. Install ITS Pedestrian Detection at ITS Pedestrian Direction Warning sign location (2units).
8. Smart lighting (1 unit)

Zone 8 North Beach/Normandy Isle

TYPE OF DEVICE	ITS Pedestrian Detection	Turning Veh Yield Sign	ITS Warning Signs	ITS Crooswalk Lighting	Advance Yield Lines	ITS Speed Warning Sign	Pedestrian Zone Sign
Collins Ave and 65th St.							1
Collins Ave and 67th St.							
Collins Ave and 69th St.							1
Collins Ave and 71st St.							
Collins Ave and 72nd St.							
Colliins Ave and 73rd St.							1
Colliins Ave and 74th Ave							
Collins Ave and 75th St.		2					1
Collins Ave and 76th St.							
Indian Creek and 65th St		2					1
Indian Creek and 67th St.							
Harding Ave. and 72nd Street							
Harding Ave and 75th St.		2					1
Normandy Dr. and Bay Drive		2					1
Midblock Crossing Collins	2		1	1	2	1	1
TOTAL	**2**	**8**	**1**	**1**	**2**	**1**	**8**

Zone 10. NE 163rd St.: NW 2nd Ave. to Biscayne Blvd.

Many vehicles block crosswalks on this corridor.

Summary of Zone Crash Characteristics

- This corridor is two-way road with three travel lanes in each direction with on street parking and right and left turning bays. 163rd Street becomes 167th St. just east of 8th Ave. The posted speed limit is 40 mph. This area is a commercial zone with many pedestrians. There are numerous bus stops along this route and many crashes may be transit related. Almost all intersections in this corridor are controlled. The two-way ADT on this corridor is 56,000 vpd.
- 80% of crashes in this corridor occurred during daylight hours, which is higher than the average for all 27 zones.
- A pedestrian violation was coded for 52% of the crashes in this zone. This was significantly higher than the average for all of the zones (.01 significance level).
- Pedestrians were scored at fault in 84% of the non-intersection crashes in this corridor.
- Numerous examples of poor signal maintenance were noted at this location. Many push buttons and signals did not work.
- Because pedestrian and motorist violations are both high, it is recommended that countermeasures be directed at both groups. We also recommend new LED pedestrian signals because of maintenance issues. The use of scanning eyes with the WALK and the countdown feature would both assist to increase pedestrian care and compliance crossing the street.

Description of the Corridor

This corridor is two-way road with three travel lanes in each direction with on street parking and right and left turning bays. 163rd Street becomes 167th St. just east of 8th Ave. The posted speed limit is 35 mph. This area is a commercial zone with many pedestrians. There are numerous bus stops along this route and many crashes may be transit related. All intersections in this corridor are controlled. The two-way ADT on this corridor is 56,000 vpd.

PBCAT Crash Profile.

Overall Statistics. This corridor had a crash index of 8, which is ranked 9th of the 27 corridors that were identified with the GIS spectral analysis. Over the 5-year period it averaged 53.1 crashes per mile and 15 incapacitating or fatal crashes per mile. The number of crashes over the 5-year period has shown a slight decline. Older pedestrians comprise 21% of the pedestrian crashes in this corridor, which is close to the average for all of the corridors. However, youth aged 13 to 17 were somewhat over represented in this corridor with 12% of the crashes involving this age group compared with the corridor average of 6%. In this corridor 80% of crashes occurred during daylight hours, which is higher than the average for all 27 zones. The demographic breakdown of pedestrians struck on 41st St. was 52% White, 40% Afro-American, and 5% Hispanic.

Intersection Crashes. The percentage of intersection crashes in this corridor averaged 66%, which is close to the average for all 27 corridors. Forty percent of the intersection crashes in this corridor were fatal or incapacitating, which is somewhat higher than the average for all corridors. The proportion of intersection crashes that involved left-turning vehicles was 10%, and the percentage of crashes involving turning vehicles was 18%, which was lower than the average for all 27 corridors. A pedestrian violation was coded for 52% of the crashes in this zone. This was significantly higher than the average for all of the zones (.01 significance level, two tailed z test for pooled proportions).

Non-Intersection Crashes. At this location, 34% of roadway crashes occurred at non-intersection locations. The percentage of fatal and incapacitating crashes was 36% in this corridor. Pedestrians were scored at fault in 84% of the crashes in this corridor.

Off-Roadway Crashes. The percentage of off the roadway crashes in this corridor averaged 28%.

Site Visit

During the site visit the team walked the entire corridor and observed driver and pedestrian behavior. We saw many examples of motorist violating pedestrian right of way, drivers blocking crosswalks, pedestrians crossing against the signal, and pedestrians crossing outside of crosswalks. At the intersection of 167th and NE 6th Ave. 20 pedestrians have been struck in the past 5 years. If you stand on the NW corner the push button does not function. In addition, two of the signals heads are aimed in the wrong direction and are not visible to pedestrians. There is a permissive left phase at this intersection. Pedestrians are crossing outside of the crosswalk on the east end of the intersection; however, the pedestrian head is not visible from the South East corner. We also noted that there are clusters of crashes on 6th Ave. north and south of 167th. Installing raised refuge islands at uncontrolled intersections where people cross to catch the bus.

At the intersection of NE 8th Avenue there are pedestrian push buttons but no pedestrian signals. There is also a protected left turn phase at this intersection. There was a conflict with a left turning vehicle. The pedestrians who were looking at the signals and could not tell that it was not safe to cross. Again we noticed pedestrians crossing away from the intersection. Many people did not press the pedestrian call button at the mid-block where Charger intersects 163rd. The DON'T walks sign also is turned on many seconds before traffic is released at some sites. At the intersection of 163rd and NE 15th Ave. many pedestrians crossed against the signal. Three of the DON'T WALK signals were burned out at this intersection so the signals went from WALK to dark phase.

At the intersection of 163rd and 19th Ave. one there is only a crosswalk on one side of the intersection, which appears to terminate at a service station entrance. On the other side there are curb cuts for a crosswalk, but no markings. This crosswalk terminates at the entrance to the parking lot of a Burger King.

Recommendations:
Because pedestrian and motorist violations are both high, it is recommended that countermeasures be directed at both groups. We also recommend new LED pedestrian signals because of maintenance issues. The use of scanning eyes with the WALK and the countdown feature would both assist to increase pedestrian care and compliance crossing the street.

1. Install YIELD TO PEDESTIAN warning signs to remind motorists to yield to pedestrians in crosswalks should reduce the number crashes with turning vehicles (28 signs).
2. The installation of offset stop lines to produce a clear zone for pedestrians and reduce the percentage of motorist blocking crosswalks (move 14 stop bars).
3. Install ITS Pedestrian Signals that warn drivers to watch for turning vehicles and show the amount of time remaining to cross (install 72 signals).
4. Installation ITS Push Buttons that confirm calls with a light and a tone (install 28 push buttons).
5. Install ITS Pedestrian Detection at two mid-block signals (4 detectors).
6. Install ITS Detectors to monitor crossing and extend of crossing interval at one mid-block signal. This device should help ensure very slow pedestrians have sufficient time to cross and at the same time will allow motorists to proceed earlier because most pedestrians cross fairly rapidly at this site (2 detectors).

Zone 10 NE 163th St: NW 2nd Ave. to Biscayne Blvd

TYPE OF DEVICE	ITS LED Ped Signals	Offset Stop Lines *	ITS Push button acknowldegement	ITS Automatic Spot Detection	ITS Detector that Monitors Cross	Turning Veh Yield Sign
NE 167th St. and NE 2nd Ave	8					
NE 167th St.and NE 6th St.	8	2	4	2		
NE 167th St. and NE 8th Ave.	8	2	4			4
900 Miami Beach Blvd Midbl			4	2	2	
NE 193rd St. and 12 Ave.	8	2	4			
NE 163rd St. and 13th Ave.						
Midblock between 13th & 14th						
NE 163rd St. and 15th Ave	8	2	4			
NE 163rd St. and 16th Ave.						
NE 163rd St. & NE 16th Ave.						
NE 163rd St. & NE 17th St.						
NE 163rd St. & NE 18th St.	8	2	4			
NE 163rd. St. & 19th Ave	8	2	4			4
NE 163rd. St. & W Dixie Hwy	8	2				
NE 163rd St. & Biscayne Blvd	8					
TOTAL	72	14	28	4		8

Zone 11. NE 6th Ave: NE 141st St. to NE 151st St.

Many pedestrians violate signals.

Summary of Zone Crash Characteristics

- This corridor is two-way road with 2 lanes in each direction. There is no on street parking and the speed limit is 40 mph. This area is a low-income area. The two way ADT on this corridor is 26,500 vpd. There is also a school zone in this short corridor.
- Children under 13 were over represented in this corridor comprising 34% of the pedestrians struck, compared with the corridor average of 8%. %. This is significantly greater than the mean for all of the corridors (01 significance level, two tailed z test for pooled proportions). The demographic breakdown of pedestrians struck on NW 6th Ave. was 19% White, 73% Afro-American, and 8% Hispanic.
- At this location, 38% of roadway crashes occurred at non-intersection locations, which is somewhat higher than the average for all corridors, but 55% of these crashes were fatal or incapacitating. This is significantly above the rate for all corridors (z test for pooled proportions). Pedestrians were scored at fault in 86% of these crashes, which is significantly more than the average for all 27 corridors.
- We noted a good deal of aggressive driving at this location, which certainly contributes, to the problem.
- Many of the crashes in this corridor involved pedestrian violations. I is particularly important to note that children under 13 were significantly more involved in crashes in the zone. Therefore, outreach should focus on school age children. Intersection specific countermeasures along with treatments to increase driver mindfulness should be implemented along this relatively short corridor.

Description of the Corridor

This corridor is two-way road with 2 lanes in each direction. There is no on street parking and the speed limit is 30 mph. This area is a low-income area. The two way ADT on this corridor is 26,500 vpd.

PBCAT Crash Profile

Overall Statistics. This street had a crash index of 14.4, which is ranked 2nd of the 27 corridors that were identified with the GIS spectral analysis. Over the 5-year period it averaged 61.7 crashes per mile and 23.3 incapacitating or fatal crashes per mile. The number of crashes over the last 4-years of the 5-year period have remained essential stable. Older pedestrians comprise 9% of the pedestrian crashes in this corridor, which is lower than the percentage for all corridors. In this corridor 70% of crashes occurred during daylight hours. Children under 13 were over represented in this corridor comprising 34% of the pedestrians struck, compared with the corridor average of 8%. This is significantly greater than the mean for all of the corridors (01 significance level, two tailed z test for pooled proportions). The demographic breakdown of pedestrians struck on NW 6th Ave. was 19% White, 73% Afro-American, and 8% Hispanic.

Intersection Crashes. The percentage of intersection crashes in this corridor averaged 62%, which is somewhat lower than average for all sites. Only 28% of the intersection crashes in this corridor were fatal or incapacitating which is less than the average for all corridors. The proportion of intersection crashes that involved left turning vehicles was 6% which was somewhat lower than the corridor average, and the percentage of crashes involving turning vehicles was 17% which was also somewhat lower for all of the corridors. Exactly half of these crashes involved pedestrian violations, which is higher than the average for all intersections.

Non-Intersection Crashes. At this location, 38% of roadway crashes occurred at non-intersection locations, which is somewhat higher than the average for all corridors, but 55% of these crashes were fatal or incapacitating. This is significantly above the rate for all corridors (z test for pooled proportions). Pedestrians were scored at fault in 86% of these crashes, which is significantly more than the average for all 27 corridors.

Off-Roadway Crashes. The percentage of off the roadway crashes in this corridor averaged 22%. This value is very close to the average for all 27 corridors.

Site Visit

During the site visit the team walked the entire corridor and observed driver and pedestrian behavior. We saw examples of motorist violating pedestrian right of way, and pedestrians violating the motorist right of way. At 149th St. there were no pedestrian signals on the southeast leg in either direction. On the northeast leg, one pedestrian signal is turned away from pedestrians at a 45 degree angle and is not visible from the crosswalk. On the southeast corner the pedestrian signal was also twisted away from the pedestrian and there is no signal on the other side. Vandalism appears to be a problem at this site. We noted a good deal of aggressive driving at this location, which certainly contributes, to the problem.

Many of the crashes at NE 145th St. involved children and youth. This intersection is located at the school zone for North Miami Elementary School. This intersection averaged 2 pedestrian crashes per year for the past 5 years. This location has two lanes in each direction with left turn lane. Inventory includes large signal heads, a ladder style crosswalk, school warning signs and a "NO TURN WHEN PEDS IN CROSSWALK" sign.

Recommendations:
Many of the crashes in this corridor involved pedestrian violations. I is particularly important to note that children under 13 were significantly more involved in crashes in the zone. Therefore, outreach should focus on school age children. Intersection specific countermeasures along with treatments to increase driver mindfulness should be implemented along this relatively short corridor.

1. Install ITS Pedestrian Signals that warn pedestrians to watch for turning vehicles and show the amount of time remaining to cross (8 pedestrian signals).
2. Install pedestrian push buttons that confirm activation by lighting and emitting a tone (4 buttons).
3. Install Pedestrian Zone Warning signs (2 signs).
4. Install YIELD TO PEDESTRIANS in roadway signs at uncontrolled locations (4 signs).
5. If possible install raised pedestrian refuge at 145th St.
6. Install ITS speed signs (2 units)
7. Install Advance Yield bars (10 bars).

Zone 11 NE 6th Ave: NE 141st St. to NE 151st St.

TYPE OF DEVICE	ITS LED Ped Signals	ITS Push button acknowldegement	In Roadway Signs	Advance Yield Bar	ITS Speed Warning Sign	Pedestrian Zone Sign
UNIT COST INSTALLATION						
NE 6th Ave & NE 141st St.			1	2		1
NE 6th St. & NE 142ns Ave.			1			
NE 6th St. & NE 143rd Ave.				2	1	
NE 6th St. & NE 144th Ave.						
NE 6th St. & NE 145th St.	4					
NE 6th St. & NE 147th St.						
NE 6th St. & NE 148th St.			1	2		
NE 6thh St. & NE 149th St.	4	4				
NE 6th St. & NE 150th St.			1		1	1
TOTAL	8	4	4	6	2	2

Zone 15. NW 79th St.: NW 22nd Ave to Biscayne Blvd.

Summary of Zone Crash Characteristics

- This corridor is two-way with three lanes in the East bound direction and a single lane going Westbound with a painted median. The two way ADT on this corridor is 30,000 vpd. This corridor is located in the predominantly African American neighborhood of Liberty City.
- Youth aged 13 to 17 accounted for 11% of the crashes compared with the average of 6% for all of the corridors which is significantly higher than expected (.01 significance level, two tailed z test for pooled proportions..
- Because most crashes occurred at intersections, at both controlled and uncontrolled locations, it is recommended that countermeasures be directed at intersection locations.

Description of the Corridor

This corridor is two-way with three lanes in the East bound direction and a single lane going Westbound with a painted median. The two way ADT on this corridor is 30,000 vpd. This corridor is located in the predominantly African American neighborhood of Liberty City. The speed limit is 35 mph east of NW 6th Ct. and 40 mph west of NW 6th Ct.

PBCAT Crash Profile.

Overall Statistics. This street had a crash index of 9.0 which is ranked 8th of the 27 corridors that were identified with the GIS spectral analysis. Over the 5-year period it averaged 53.6 crashes per mile and 16.8 incapacitating or fatal crashes per mile. The number of crashes over the last 4-years of the 5-year period have remained essential stable. Older pedestrians comprise 10% of the pedestrian crashes in this corridor, which is significantly less than expected (.01 significance level, two tail z test for pooled proportions). Youth aged 13 to 17 accounted for 11% of the crashes compared with the average of 6% for all of the corridors which is significantly higher than expected (.01 significance level, two tailed z test for pooled proportions. In this corridor 56% of crashes occurred during daylight hours. The demographic breakdown of pedestrians struck on NW 79th St. was 28% White, 63% Afro-American, and 8% Hispanic.

Intersection Crashes. The percentage of intersection crashes in this corridor averaged 71%, which is close to the average of 69% for all 27 corridors. Only 27% of the intersection crashes in this corridor were fatal or incapacitating which is less than the average for all corridors. The proportion of intersection crashes that involved left turning vehicles was 5% which was half the average for all corridors, and the percentage of crashes involving turning vehicles was 14% which was again half the value for all of the corridors. Only 31% of these crashes were scored as involving pedestrian violations, which is close to the average for all 27 corridors.

Non-Intersection Crashes. At this location, 30% of roadway crashes occurred at non-intersection locations, which is close to the average for all corridors, 39% of these crashes were fatal or incapacitating, which is the exact value for all 27 corridors. Pedestrians were scored at fault in 58% 0f these crashes, which is somewhat less than the average for all of the corridors.

Off-Roadway Crashes. The percentage of off the roadway crashes in this corridor averaged 12%.

Site Visit

Pedestrians crossed the roadway between signals at uncontrolled locations. Vehicle speeds are high with random pedestrian crossings.

Recommendations:

Because most crashes occurred at intersections, at both controlled and uncontrolled locations, it is recommended that countermeasures be directed at intersection locations. The following intersection specific countermeasures should address both types of crashes.

1. Install in roadway warning signs to remind motorists to yield to pedestrians in crosswalks at controlled intersections to reduce crashes with turning vehicles (install 28 signs).
2. Installation of offset stop lines to produce a clear zone for pedestrians and reduce the percentage of motorist blocking crosswalks (move 28 bars).
3. Install of advance yield markings at uncontrolled locations (install 10 sets of markings).
4. Install in roadway warning signs to remind motorist to yield to pedestrians at uncontrolled locations (10 signs).
5. If possible a raised median island would help to address random pedestrian crossings.

15 NW 79th St: NW 22nd Ave to Biscayne Blvd.

TYPE OF DEVICE	Offset Stop Lines *	In Roadway Signs	Advance Yield Bar
NW 79th St. & NW 22nd Ave	4	2	
NW 79th St. & NW 19th Ave		2	
NW 79th St. & NW 18th Ave		2	
NW 79th St. & NW 17th Ave	2	2	
NW 79th St. & NW 16th Ave		2	2
NW 79th St. & NW 13th Ave	2	2	
NW 79th St. & NW 12 Ave	2	2	
NW 79th St. & NW 11th Ave		2	2
NW 79th St. & NW 10th CT	2	2	
NW 79th St. & NW 9th Ave		2	2
NW 79th St. & NW 8th Ave		2	
NW 79th St. & NW 7th Ave	4	2	
Midblock Signal	2	2	
NW 79th St. & NW 4th Ct.		2	2
NW 79th St. & NW 2nd Ave	2	2	
NW 79th St. & Miami PL.		2	
NW 79th St. & Miami CT.		2	2
NW 79th St. & Miami Ave.	2		
NW 79th St. & NE Miami CT		2	
NW 79th St. & NE 2nd Ave.	2	2	
NW 79th St. & NE 4th Ave.	2		
NW 79th St. & NE 5th Ave.	2		
TOTAL	**28**	**38**	**10**

Zone 20. NW 12th Ave: SW 8th St. to NW 14th St.

Summary of Zone Crash Characteristics

- This corridor is in Little Havana. This is a two-way road with two travel lanes in each direction and on street parking. This street is 4 lanes North of 1st St. and two lane with turn lanes at intersections south of 1st Street. This area is a commercial zone with many pedestrians. The two way ADT on this corridor is 21,400 vpd.
- The demographic breakdown of pedestrians struck on NW 12th Ave. was 45% White, 10% Afro-American, and 44% Hispanic. Outreach efforts in the corridor must be available in Spanish as well as English.
- The percentage of intersection crashes in this corridor averaged 83%, which is significantly higher than the average for all sites (.05 significance level, two tail z test for pooled samples). Only 26% of the intersection crashes in this corridor were fatal or incapacitating which is less than the average for all corridors.
- During the site visit the team examined the corridor and observed driver and pedestrian behavior. We observed pedestrians crossing against the signal at the start of the leading protected left turn phase, and instances of drivers not yielding to pedestrians. We did not observe many pedestrians crossing at non-intersection locations.
- Because most crashes occurred at intersections, it is recommended that countermeasures be directed at intersection locations.

Description of the Corridor

This corridor is in Little Havana. This is a two-way road with two travel lanes in each direction and on street parking. This street is 4 lanes North of 1st St. and two lane with turn lanes at intersections south of 1st Street. This area is a commercial zone with many pedestrians. The two way ADT on this corridor is 21,400 vpd. The speed limit is 30 mph south of NW 11th St. and 40 mph north of NW 11th St.

PBCAT Crash Profile.

Overall Statistics. This street had a crash index of 7.1, which is ranked 10th of the 27 corridors that were identified with the GIS spectral analysis. Over the 5-year period it averaged 48.5 crashes per mile and 14.6 incapacitating or fatal crashes per mile. The number of crashes over the 5-year period has remained essential stable. Older pedestrians comprise 28% of the pedestrian crashes in this corridor, which is close to the average for all 27 corridors. Children and youth did not account for more than the expected number of crashes in this corridor. In this corridor 74% of crashes occurred during daylight hours, which is somewhat higher than the average for all 27 corridors. The demographic breakdown of pedestrians struck on NW 12th Ave. was 45% White, 10% Afro-American, and 44% Hispanic. Outreach efforts in the corridor must be available in Spanish as well as English.

Intersection Crashes. The percentage of intersection crashes in this corridor averaged 83%, which is significantly higher than the average for all sites (.05 significance level, two tail z test for pooled samples). Only 26% of the intersection crashes in this corridor were fatal or incapacitating which is less than the average for all corridors. The proportion of intersection crashes that involved left turning vehicles was 21%, which was higher than the average for all corridors, and the percentage of crashes involving turning vehicles was 38% which was higher than the average for all 27 corridors. Eighteen percent of these crashes involved pedestrian violations, which is less than the average for all intersections.

Non-Intersection Crashes. At this location, 17% of roadway crashes occurred at non-intersection locations, which is less than the average for all corridors, 38% of these crashes were fatal or incapacitating. Pedestrians were scored at fault in half of these crashes, which is very close to the average for all of the corridors. The pedestrian was scored at fault in 71 percent of these crashes.

Off-Roadway Crashes. The percentage of off the roadway crashes in this corridor averaged 10%. This is less than half the average for the 27 corridors.

Site Visit

During the site visit the team examined the corridor and observed driver and pedestrian behavior. We observed pedestrians crossing against the signal at the start of the leading protected left turn phase, and instances of drivers not yielding to pedestrians. We did not observe many pedestrians crossing at non-intersection locations.

Recommendations:

Because most crashes occurred at intersections, it is recommended that countermeasures be directed at intersection locations. The following intersection specific countermeasures are recommended at this site.

1. Install TURNING VEHICLES YIELD signs to remind motorists to yield to pedestrians in crosswalks should reduce the number crashes with turning vehicles (20 signs).
2. Install ITS Push Buttons that acknowledge the pedestrian call by illuminating and sounding a tone to reduce crossing against the signal (40 push buttons).
3. The installation of offset stop lines to produce a clear zone for pedestrians and reduce the percentage of motorist blocking crosswalks (move back 20 stop bars).
4. In roadway signs at 3 uncontrolled locations (6 signs).

22 NW 12th Ave: SW 8th St. to NW 14th St.

TYPE OF DEVICE	Offset Stop Lines *	ITS Push button acknowledgement	Turning Veh Yield Sign	In Roadway Signs
UNIT COST 0F DEVICE				
12th Ave SW & SW 8th St.	4	4	4	
12th Ave SW & SW 7th St.	2	4	2	
12th Ave SW & SW 6th St.	2	4	2	
12th Ave SW & SW 5th St.				
12th Ave SW & SW 3rd St.				
Midblock Signal				
12th Ave SW & SW 2nd St.				2
12th Ave SW & SW 1st St.	2	4	2	
NW 12th Ave & Flagler St.	2	4	2	
NW 12th Ave & NW 1st St.				
NW 12th Ave & NW 2nd St.	2	4	2	
NW 12th Ave & NW 3rd St.				2
NW 12th Ave & NW 4th St.	2	4	2	
NW 12th Ave & NW 5th St.				2
NW 12th Ave & NW 7h St.	2	4	2	
NW 12th Ave & NW 11th St.	2	4	2	
NW 12th Ave & NW 12th St.		4		
TOTAL	20	40	20	6

Zone 27. NW 47th Ave: NW 178th St. To NW 187th St.

Pedestrians are being struck crossing between housing and a convenience store. This photo was taken during the day.

Summary of Zone Crash Characteristics

- This corridor is two-way road with one wide travel lane in each direction with no median island. Public housing is on the East side of the road, and a strip mall with a convenience store is on the right side of the road. Lighting is poor in this area. The two way ADT on this corridor is 18,700 vpd.
- This corridor was included because it had the highest percentage of crashes at night with only 8% occurring during day light hours.
- At this location, 67% of roadway crashes occurred at non-intersection locations, which is the highest percentage for of all of the 27 corridors. Pedestrians were scored at fault in 75% of these crashes..
- Because most crashes occurred at night along a small strip of roadway at intersections, it is recommended that countermeasures be directed at nighttime crashes.

Description of the Corridor
This corridor is two-way road with one wide travel lane in each direction with no median island. Public housing is on the East side of the road, and a strip mall with a convenience store is on the right side of the road. Lighting is poor in this area. The two way ADT on this corridor is 18,700 vpd. The speed limit is 40 mph.

PBCAT Crash Profile.

Overall Statistics. This street had a crash index of 3.4, which is ranked 18th of the 27 corridors that were identified with the GIS spectral analysis. It is included because it had the highest percentage of crashes at night with only 8% occurring during day light hours. Over the 5-year period this short corridor averaged 24 crashes per mile and 14 incapacitating or fatal crashes per mile. The number of crashes over the last 4-years of the 5-year period have varied widely but do not show a trend. Older pedestrians comprise 27% of the pedestrian crashes in this corridor, which is close to the average for the corridor. No children or youth were struck in this corridor. The demographic breakdown of pedestrians struck on NW 47th Ave. were 33% White, 50% Afro-American, and 8% Hispanic.

Intersection Crashes. The percentage of intersection crashes in this corridor averaged 33%, which is lower than the average for all corridors and is the lowest percentage for all corridors.

Sixty seven percent of intersection related crashes were fatal or incapacitating, which is the highest percentage for all of the corridors. None of these crashes involved turning vehicles

Non-Intersection Crashes. At this location, 67% of roadway crashes occurred at non-intersection locations, which is the highest percentage for of all of the 27 corridors. Pedestrians were scored at fault in 75% of these crashes..

Off-Roadway Crashes. The percentage of off the roadway crashes in this corridor averaged 25%.

Site Visit

During the site visit the team walked the entire corridor and observed driver and pedestrian behavior. Pedestrians crossed mid-block between the housing project and the strip mall just north of Miami Gardens. Pedestrians were frequently trapped at the centerline. Most of the crashes occurred within this 150 ft. segment of road.

Recommendations:

Because most crashes occurred at night along a small strip of roadway at intersections, it is recommended that countermeasures be directed at nighttime crashes. The following intersection specific countermeasures are recommended at this site.

1. Increasing the lighting level over a 100-yard stretch of roadway where most of the crashes have occurred.
2. The installation of WATCH FOR PEDESTRIANS AT NIGHT signs on each end of this short corridor (2 signs).
3. If possible a short segment of raised median 100 ft. long would be helpful.

11 NW 47th Ave: Short corridor between Miami Gardens and 185th

TYPE OF DEVICE	Refuge Island	Watch for Pedestrians At Night	Increased Lighting
Short midblock Crash Corridor	1	2	2
TOTAL	**1**	**2**	**2**

Summary

The table presented below shows the treatments assigned to each of the corridors. The median Islands are optional because of the lead-time required may not fall within the study period.

Treatments Matched to Corridors

Corridor	ITS Pedestrian Signals	Offset Advanced Stop Lines	ITS Push button that confirm call	ITS Pedestrian Detection	ITS Ped Detection That Extends	Leading Pedestrian Phase	Turning Vehicles Yield Signs	In Roadway Yield Signs (signals)	Eliminate Permissive Left Turns	ITS No RTOR Signs	LED Transponders for blind peds	ITS Pedestrian Crossing Signal for	ITS Smart Crosswalk Lighting	Advance Yield Markings	ITS Speed Warning Signs	In Roadway Yield Signs (no sig)	Pedestrian Zone Warning Sign	Move Parking Back from Crosswk	Increased Lighting	Pedestrian Refuge Islands
1. Alton Road	X		X	X	X	X	X		X											
2. 5 St.			X				X	X		X										
3. Washington Ave			X	X		X	X					X	X	X	X		X			
5. Collins Ave: 5 St to 24 St						X	X							X				X		
6. Collins Ave: 28 St to 43 S				X	X		X			X				X	X					
7. 41 St.	X		X				X		X		X									
8. North Beach: Normandy Isle				X			X					X	X	X	X		X			
10. NE 163 St.	X	X	X	X	X		X													
11. NE 6 Ave.	X		X				X	X						X	X		X			
15. NW 79 St.							X							X						
22. NW 12 Ave.			X				X	X												
27. NW 47 Ave.																	X		X	X

Estimation of Countermeasures to be Installed

Estimates of the number of devices to be installed at each location are based on current cost estimates. The cost of devices at the time of installation may vary, and the cost of installation may increase or decrease based on unforeseen factors at individual locations. Therefore, the actual number of devices installed may vary based on the cost at the time of installation. If costs go down the number of devices would increase, and if costs go up the number of devices installed would decrease.

1.2.3 Milestones

We propose the following Milestones for Phase 2.

FHWA Ped Safety Study Phase 2: Milestones

Item	Target Due
Interagency Agreement	January 4, 2003
Begin Data Collection ITS Push Buttons And Advance Yield Markings	April 1, 2003
Begin Data Collection ITS Pedestrian Signals	June 1 2003
Begin data collection ITS Pedestrian Detection	August 15, 2003
Begin data collection ITS Speed Warning Signs And ITS Pedestrian Extension	Nov 1, 2003
Begin data collection on Elimination of Permissive Left Turns	Feb 1, 2004
Begin data collection on ITS Directional Warning Sign And ITS No RTOR on red sign	April 15, 2004
Begin data collection on Smart Lighting and Lead Pedestrian Phase	June 15, 2004
Begin data collection on TURNING VEHICLES YIELD TO PEDESTRIANS symbol signs and in roadway knockdown signs.	Sept 1, 2004
Begin data collection on In roadway knockdown signs at signals Locations and Pedestrian Zone signs.	Nov 15, 2004
Reserve for delays	Feb 15/ 2005
2.3.1: Detailed Description of Data to be Collected in each Corridor to Evaluate the Treatments.	March 15, 2003
Task 2.3.2: Collection of Data After Implementation of Countermeasures. Reports due 90 days after each treatment is Introduced.	
Task 2.3.3: Draft Final Technical Report	Dec 31, 2006
Task 2.3.4: Final Technical Report	Feb 28, 2006

Task 4: Consult on How to Manual

Task 5: Draft Executive Summary Report	Jan 31, 2006
Task 2.5.1: Executive Summary Report	Feb 28, 2006

Deliverable Item	Date Due
Quarterly Progress Reports should include a summary of the previous quarter=s activities and accomplishments, as well as the proposed activities for the upcoming quarter. Any decisions and actions required in the upcoming quarter should be included in the report. The Recipient shall supply one copy of the progress report to the Agreement Officer=s Technical Representative (AOTR) and one copy to the Agreement Officer	Every 90 days after date of award

1.2.4 Budget for Installing Countermeasures

ESTIMATED COST OF MATERIALS AND INSTALLATION OF PROPOSED SAFETY COUNTERMEASURES LISTED BY ZONE

Corridor	Number of Intersections	Material Cost	Installation Cost	Total Material and Installation
Zone 1 Alton Road: 5th St. to 17th St.	8	$22,112	$25,015	$47,127
Zone 2 5th St. Alton Rd. to Ocean Dr.	6	$10,260	$28,344	$38,604
Zone 5 Collins Ave: 5th St. to 24th St.	9	$0	$12,238	$12,238
Zone 6 Collins Ave: Indian Creek 28th St. to 43rd St.	6	$9,817	$24,747	$34,564
Zone 7 41st St (Arthur Godfrey) Alton Rd to Pine Tree Dr.	6	$18,565	$9,498	$28,063
Zone 8 North Beach/Normandy Isle	8	$6,321	$35,805	$42,126
Zone 10 NE 163th St: NW 2nd Ave. to Biscayne Blvd	7	$6,528	$15,374	$21,902
Zone 11 NE 6th Ave: NE 141st St. to NE 151st St.	6	$3,860	$11,759	$15,619
PROPOSED TREATMENT TOTAL (EXLCUDES ZONE 3)	**56**	**$77,463**	**$162,780**	**$240,243**
Zone 3 Washington Ave: 5th Street to Dade Blvd	13	$18,464	$78,032	$96,496
TOTAL if funding for zone 3 is included	**69**	**$95,927**	**$240,812**	**$336,739**

ESTIMATED COST OF MATERIALS AND INSTALLATION OF PROPOSED SAFETY COUNTERMEASURES LISTED BY COUNTERMEASURE

Treatment	Number of Installations	Material Cost	Installation Cost	Total Material and Installation
ITS LED Pedestrian Signals	88	$37,840	$4,554	$42,394
Offset Stop Line	0	$0	$0	$0
ITS Push button Acknowledgement	81	$8,505	$6,257	$14,762
ITS Automatic Spot Detection	10	$5,980	$23,000	$28,980
ITS Detector that Monitors Crosswalk	6	$3,588	$690	$4,278
Leading Pedestrian Phase	18	$0	$414	$414
Turning Vehicle Yield Sign	67	$0	$31,668	$31,668
In Roadway Signs	18	$0	$19,274	$19,274
Eliminate Passive Left	10	$0	$13,007	$13,007
ITS No RTOR Sign	4	$12,000	$11,385	$23,385
ITS LED Transponders	0	$0	$0	$0
ITS Warning Signs	1	$3,650	$16,100	$19,750
ITS Crosswalk Lighting	1	$0	$0	$0
Advance Yield Bar	10	$0	$12,411	$12,411
ITS Speed Sign	4	$5,900	$20,240	$26,140
Pedestrian Zone Sign	8	$0	$3,781	$3,781
PROPOSED TOTAL (EXLCUDES ZONE 3)	**326**	**$77,463**	**$162,780**	**$240,243**
Zone 3 treatments included	76	$18,464	$78,032	$96,496
TOTAL if funding for zone 3 is included	**402**	**$95,927**	**$240,812**	**$336,739**

1.2.5 Maintenance

Miami-Dade County is responsible for the maintenance on all roads in the County. The County has agreed to maintain the devices installed. These devices fall into the following categories:

- Signs. Maintenance for signs such, as the TURNING VEHICLES YIELD signs, the pedestrian zone signs, are relatively low cost. Signs have a long life span and only need to be replaced if damaged.
- Changes in signal phases. The restriction of permissive left turns and the leading pedestrian signal phase involve no maintenance costs except those normally part of the maintenance of the cities computerized traffic system. These treatments will have little impact on these costs.
- LED pedestrian signals require less maintenance then incandescent pedestrian signals so maintenance should not be an issue until the end of their anticipated lifetime.
- The ITS devices used in these studies will use long life LEDs. Therefore, the ITS Warning sign showing the direction the pedestrian is crossing, and the ITS NO RIGHT TURN ON RED signs, the LED push button, and the ITS Speed Signs should require little maintenance.
- Markings. The use of offset stop lines once installed adds little to maintenance, because stop markings normally need to be replaced. The advance yield markings will add to the maintenance budget.
- Increased Lighting. Once installed increased lighting becomes part of the normal maintenance infrastructure.
- Refuge Islands require little maintenance
- Microwave sensors. These devices have a long history of use in traffic engineering and typically have a long service life.
- In Roadway Signs. These signs can be damaged and some may need to be replaced from time to time. However, these signs are not very expensive.

1.2.6 Measures of Effectiveness (MOEs)

Treatment 1: ITS Pedestrian Signals (scanning eyes and countdown timer)

- Crash Frequency – The frequency of intersection pedestrian-vehicle crashes at the treated sites would be compared.
- Crash Severity – The severity of pedestrian-vehicle crashes at the treated sites would be compared.
- Frequency of Pedestrian Vehicle Evasive Conflicts by Age: The frequency of pedestrian-vehicle conflicts would be compared at the treated sites. Only score conflicts when the vehicle and pedestrian are on a collision course and the motorist had to make an evasive maneuver such as sudden braking or swerving to avoid a crash.
- *Vehicle counts/flow.*
- *Pedestrian counts/flow.*
- *Pedestrian delay.*
- *Frequency of pedestrian trapped.*
- *Estimated pedestrian's age.*
- *Frequency of parent with children.*
- *Frequency of system failure.*
- Frequency of pedestrian signal violations that involve the pedestrian starting to cross during the DON'T WALK phase.
- Frequency of pedestrian signal violations that involve the pedestrian starting to cross during the pedestrian clearance phase.
- Percentage of turning drivers that yield to pedestrians.
- *Frequency of vehicle compliance.*
- *Frequency of pedestrian compliance.*
- *Frequency of pedestrians not detected.*
- *Intersection delay.*

Treatment 2: Offset Stop Lines at Traffic Signals

- Crash Frequency – The frequency of intersection pedestrian-vehicle crashes at the treated sites would be compared.
- Crash Severity – The severity of pedestrian-vehicle crashes at the treated sites would be compared.
- Frequency of Pedestrian Vehicle Evasive Conflicts by Age: The frequency of pedestrian-vehicle conflicts would be compared at the treated sites. Only score conflicts when the vehicle and pedestrian are on a collision course and the motorist had to make an evasive maneuver such as sudden braking or swerving to avoid a crash.
- *Vehicle counts/flow.*
- *Pedestrian counts/flow.*
- *Pedestrian delay.*
- *Estimated pedestrian's age.*
- Percentage of turning vehicles that yield to pedestrians.
- Percentage of vehicles that block (or partially block) the crosswalk.

- The distance that through vehicles stop in front of the crosswalk. This MOE would be scored by marking the distance in 5 ft intervals and scoring the nearest interval they stopped behind.

Treatment 3: ITS Push Buttons that Confirm Placing Call

- Crash Frequency – The frequency of intersection pedestrian-vehicle crashes at the treated sites would be compared.
- Crash Severity – The severity of pedestrian-vehicle crashes at the treated sites would be compared.
- Frequency of Pedestrian Vehicle Evasive Conflicts by Age: The frequency of pedestrian-vehicle conflicts would be compared at the treated sites. Only score conflicts when the vehicle and pedestrian are on a collision course and the motorist had to make an evasive maneuver such as sudden braking or swerving to avoid a crash.
- *Vehicle counts/flow.*
- *Pedestrian counts/flow.*
- *Pedestrian delay.*
- *Estimated pedestrian's age.*
- *Frequency of parent with children.*
- *Frequency of system failure.*
- Frequency of pedestrian signal violations that involve the pedestrian starting to cross during the DON'T WALK phase.
- *The percentage of pedestrians that push the button.*
- *Intersection delay.*

Treatment 4: ITS Pedestrian Detection

- *Crash Frequency – The frequency of intersection pedestrian-vehicle crashes at the treated sites would be compared.*
- *Crash Severity – The severity of pedestrian-vehicle crashes at the treated sites would be compared.*
- Frequency of Pedestrian Vehicle Evasive Conflicts by Age: The frequency of pedestrian-vehicle conflicts would be compared at the treated sites. Only score conflicts when the vehicle and pedestrian are on a collision course and the motorist had to make an evasive maneuver such as sudden braking or swerving to avoid a crash.
- *Vehicle counts/flow.*
- *Pedestrian counts/flow.*
- *Pedestrian delay.*
- *Frequency of pedestrian trapped.*
- *Estimated pedestrian's age.*
- *Frequency of parent with children.*
- *Frequency of system failure.*
- Percentage of pedestrians crossing in the crosswalk that were not detected.
- Percentage of false detections.

- Frequency of pedestrian signal violations that involve the pedestrian starting to cross during the DON'T WALK phase.
- Percent of pedestrians that cross the second half of the intersection when the WALK sign is lighted (only at signalized locations).
- *Intersection delay.*

Treatment 5: ITS Regulation of Pedestrian Clearance Interval

- *Crash Frequency – The frequency of intersection pedestrian-vehicle crashes at the treated sites would be compared.*
- *Crash Severity – The severity of pedestrian-vehicle crashes at the treated sites would be compared.*
- Frequency of Pedestrian Vehicle Evasive Conflicts by Age: The frequency of pedestrian-vehicle conflicts would be compared at the treated sites. Only score conflicts when the vehicle and pedestrian are on a collision course and the motorist had to make an evasive maneuver such as sudden braking or swerving to avoid a crash.
- *Vehicle counts/flow.*
- *Pedestrian counts/flow.*
- *Pedestrian delay.*
- *Frequency of pedestrian trapped.*
- *Estimated pedestrian's age.*
- *Frequency of parent with children.*
- *Frequency of system failure.*
- *Frequency of vehicle compliance.*
- *Frequency of pedestrian compliance.*
- *Intersection delay.*
- *Frequency of pedestrian signal violations that involve the pedestrian starting to cross during the pedestrian clearance phase.*

Treatment 6: Leading Pedestrian Phase

- Crash Frequency – The frequency of intersection pedestrian-vehicle crashes at the treated sites would be compared.
- Crash Severity – The severity of pedestrian-vehicle crashes at the treated sites would be compared.
- *Frequency of Pedestrian Vehicle Evasive Conflicts by Age: The frequency of pedestrian-vehicle conflicts would be compared at the treated sites. Only score conflicts when the vehicle and pedestrian are on a collision course and the motorist had to make an evasive maneuver such as sudden braking or swerving to avoid a crash.*
- *Vehicle counts/flow.*
- *Pedestrian counts/flow.*
- *Pedestrian delay.*
- *Frequency of pedestrian trapped.*
- *Estimated pedestrian's age.*
- *Frequency of parent with children.*
- *Frequency of system failure.*
- Percentage of turning drivers that yield to pedestrians.

- Percentage of pedestrians that yield to vehicles.
- Percentage of vehicles that enter the intersection during the red signal phase.
- *Intersection delay.*
- *Frequency of pedestrian compliance.*
- *Frequency of pedestrian signal violations that involve the pedestrian starting to cross during the pedestrian clearance phase*

Treatment 7: Turning Vehicles Yield to Pedestrians Sign

- Crash Frequency – The frequency of intersection pedestrian-vehicle crashes at the treated sites would be compared.
- Crash Severity – The severity of pedestrian-vehicle crashes at the treated sites would be compared.
- Frequency of Pedestrian Vehicle Evasive Conflicts by Age: The frequency of pedestrian-vehicle conflicts would be compared at the treated sites. Only score conflicts when the vehicle and pedestrian are on a collision course and the motorist had to make an evasive maneuver such as sudden braking or swerving to avoid a crash.
- *Vehicle counts/flow.*
- *Pedestrian counts/flow.*
- *Pedestrian delay.*
- *Frequency of pedestrian trapped.*
- *Estimated pedestrian's age.*
- *Frequency of vehicle compliance.*
- Percentage of turning drivers that yield to pedestrians.
- Percentage of vehicles that block (or partially block) the crosswalk.

Treatment 8: In Roadway Yield Signs (signalized locations)

- Crash Frequency – The frequency of intersection pedestrian-vehicle crashes at the treated sites would be compared.
- Crash Severity – The severity of pedestrian-vehicle crashes at the treated sites would be compared.
- Frequency of Pedestrian Vehicle Evasive Conflicts by Age: The frequency of pedestrian-vehicle conflicts would be compared at the treated sites. Only score conflicts when the vehicle and pedestrian are on a collision course and the motorist had to make an evasive maneuver such as sudden braking or swerving to avoid a crash.
- *Vehicle counts/flow.*
- *Pedestrian counts/flow.*
- *Pedestrian delay.*
- *Frequency of pedestrian trapped.*
- *Estimated pedestrian's age.*
- *Frequency of vehicle compliance.*
- Percentage of turning drivers that yield to pedestrians.
- Percentage of vehicles that block (or partially block) the crosswalk.

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Treatment 9: Eliminate Permissive Left Turns

- Crash Frequency – The frequency of intersection pedestrian-vehicle crashes at the treated sites would be compared.
- Crash Severity – The severity of pedestrian-vehicle crashes at the treated sites would be compared.
- Frequency of Pedestrian Vehicle Evasive Conflicts by Age: The frequency of pedestrian-vehicle conflicts would be compared at the treated sites. Only score conflicts when the vehicle and pedestrian are on a collision course and the motorist had to make an evasive maneuver such as sudden braking or swerving to avoid a crash.
- *Vehicle counts/flow.*
- *Pedestrian counts/flow.*
- *Pedestrian delay.*
- *Frequency of pedestrian trapped.*
- *Estimated pedestrian's age.*
- *Intersection delay.*
- *Frequency of vehicle compliance.*
- Vehicle-Vehicle Crash Frequency that Involves Left Turning Vehicles – Left turn vehicle-vehicle crashes may decline following the introduction of this treatment.
- *Percentage of turning drivers that yield to pedestrians.*

Treatment 10: ITS No RTOR Signs

- *Crash Frequency – The frequency of intersection pedestrian-vehicle crashes at the treated sites would be compared.*
- *Crash Severity – The severity of pedestrian-vehicle crashes at the treated sites would be compared.*
- Frequency of Pedestrian Vehicle Evasive Conflicts by Age: The frequency of pedestrian-vehicle conflicts would be compared at the treated sites. Only score conflicts when the vehicle and pedestrian are on a collision course and the motorist had to make an evasive maneuver such as sudden braking or swerving to avoid a crash.
- *Vehicle counts/flow.*
- *Pedestrian counts/flow.*
- *Pedestrian delay.*
- *Frequency of pedestrian trapped.*
- *Estimated pedestrian's age.*
- *Frequency of system failure.*
- Percentage of motorists who turn right on red when pedestrians are present when the No RTOR sign is in the dark phase.
- Percentage of motorists who turn right on red when pedestrians are present and the No RTOR sign is illuminated.
- *Intersection delay.*

Treatment 11: ITS LED Transponders for the Blind

- *Customer satisfaction surveys.*
- *The percentage of travelers who stay within the crosswalk with and without the transponder device.*

Treatment 12: ITS Warning Signs that Indicate the Direction Pedestrians are Crossing

- *Crash Frequency – The frequency of intersection pedestrian-vehicle crashes at the treated sites would be compared.*
- *Crash Severity – The severity of pedestrian-vehicle crashes at the treated sites would be compared.*
- Frequency of Pedestrian Vehicle Evasive Conflicts by Age: The frequency of pedestrian-vehicle conflicts would be compared at the treated sites. Only score conflicts when the vehicle and pedestrian are on a collision course and the motorist had to make an evasive maneuver such as sudden braking or swerving to avoid a crash.
- *Vehicle counts/flow.*
- *Pedestrian counts/flow.*
- *Pedestrian delay.*
- *Frequency of pedestrian trapped.*
- *Estimated pedestrian's age.*
- *Frequency of parent with children.*
- *Frequency of system failure.*
- The percentage of drivers yielding to pedestrians in crosswalks.
- *Vehicle speed at the crosswalk.*
- The distance that through vehicles yield in advance of the crosswalk. This would be scored by marking the distance in 5 ft intervals and scoring the nearest interval they stopped behind.

Treatment 13: Smart Crosswalk Lighting

- *Crash Frequency – The frequency of intersection pedestrian-vehicle crashes at the treated sites would be compared.*
- *Crash Severity – The severity of pedestrian-vehicle crashes at the treated sites would be compared.*
- Frequency of Pedestrian Vehicle Evasive Conflicts by Age: The frequency of pedestrian-vehicle conflicts would be compared at the treated sites. Only score conflicts when the vehicle and pedestrian are on a collision course and the motorist had to make an evasive maneuver such as sudden braking or swerving to avoid a crash.
- *Vehicle counts/flow.*
- *Pedestrian counts/flow.*
- *Pedestrian delay.*
- *Frequency of pedestrian trapped.*
- *Estimated pedestrian's age.*
- *Frequency of system failure.*
- The percentage of drivers yielding to pedestrians in crosswalks.

- The distance that through vehicles yield in advance of the crosswalk. This would be scored by marking the distance in 5 ft intervals and scoring the nearest interval they stopped behind.
- *The percentage of pedestrians that push the light button.*

Treatment 14: Advance Yield Markings

- *Crash Frequency – The frequency of intersection pedestrian-vehicle crashes at the treated sites would be compared.*
- *Crash Severity – The severity of pedestrian-vehicle crashes at the treated sites would be compared.*
- Frequency of Pedestrian Vehicle Evasive Conflicts by Age: The frequency of pedestrian-vehicle conflicts would be compared at the treated sites. Only score conflicts when the vehicle and pedestrian are on a collision course and the motorist had to make an evasive maneuver such as sudden braking or swerving to avoid a crash.
- *Vehicle counts/flow.*
- *Pedestrian counts/flow.*
- *Pedestrian delay.*
- *Frequency of pedestrian trapped.*
- *Estimated pedestrian's age.*
- *Frequency of parent with children.*
- *Frequency of vehicle compliance.*
- The percentage of drivers yielding to pedestrians in crosswalks.
- The distance that through vehicles yield in advance of the crosswalk. This would be scored by marking the distance in 5 ft intervals and scoring the nearest interval they stopped behind.
- Percentage of vehicles that block (or partially block) the crosswalk.

Treatment 15: ITS Speed Warning Signs

- Crash Frequency – The frequency of intersection pedestrian-vehicle crashes at the treated sites would be compared.
- Crash Severity – The severity of pedestrian-vehicle crashes at the treated sites would be compared.
- Frequency of Pedestrian Vehicle Evasive Conflicts by Age: The frequency of pedestrian-vehicle conflicts would be compared at the treated sites. Only score conflicts when the vehicle and pedestrian are on a collision course and the motorist had to make an evasive maneuver such as sudden braking or swerving to avoid a crash.
- *Vehicle counts/flow.*
- *Pedestrian counts/flow.*
- *Pedestrian delay.*
- *Frequency of pedestrian trapped.*
- *Estimated pedestrian's age.*
- *Frequency of parent with children.*
- *Frequency of system failure.*
- The percentage of drivers yielding to pedestrians in crosswalks.

- Vehicle speed at the crosswalk.

Treatment 15: In Roadway Yield Signs (uncontrolled locations)

- Crash Frequency – The frequency of intersection pedestrian-vehicle crashes at the treated sites would be compared.
- Crash Severity – The severity of pedestrian-vehicle crashes at the treated sites would be compared.
- Frequency of Pedestrian Vehicle Evasive Conflicts by Age: The frequency of pedestrian-vehicle conflicts would be compared at the treated sites. Only score conflicts when the vehicle and pedestrian are on a collision course and the motorist had to make an evasive maneuver such as sudden braking or swerving to avoid a crash.
- *Vehicle counts/flow.*
- *Pedestrian counts/flow.*
- *Pedestrian delay.*
- *Frequency of pedestrian trapped.*
- *Estimated pedestrian's age.*
- *Frequency of parent with children.*
- *Frequency of system failure.*
- Percentage of turning drivers that yield to pedestrians.
- *Vehicle speed at the crosswalk.*
- *Percentage of vehicles that block (or partially block) the crosswalk.*
- *Frequency of vehicle compliance.*

Treatment 16: Pedestrian Zone Warning Sign

- Crash Frequency – The frequency of intersection pedestrian-vehicle crashes at the treated sites would be compared.
- Crash Severity – The severity of pedestrian-vehicle crashes at the treated sites would be compared.
- Frequency of Pedestrian Vehicle Evasive Conflicts by Age: The frequency of pedestrian-vehicle conflicts would be compared at the treated sites. Only score conflicts when the vehicle and pedestrian are on a collision course and the motorist had to make an evasive maneuver such as sudden braking or swerving to avoid a crash.
- *Vehicle counts/flow.*
- *Pedestrian counts/flow.*
- *Pedestrian delay.*
- *Frequency of pedestrian trapped.*
- *Estimated pedestrian's age.*
- *Frequency of parent with children.*
- Percentage of drivers yielding to pedestrians.
- Vehicle speed at the crosswalk.

Treatment 17: Move Parking Back from Crosswalk

- *Crash Frequency – The frequency of intersection pedestrian-vehicle crashes at the treated sites would be compared.*
- *Crash Severity – The severity of pedestrian-vehicle crashes at the treated sites would be compared.*
- Frequency of Pedestrian Vehicle Evasive Conflicts by Age: The frequency of pedestrian-vehicle conflicts would be compared at the treated sites. We would only score conflicts when the vehicle and pedestrian are on a collision course and the motorist had to make an evasive maneuver such as sudden braking or swerving to avoid a crash.
- *Vehicle counts/flow.*
- *Pedestrian counts/flow.*
- *Pedestrian delay.*
- *Frequency of pedestrian trapped.*
- *Estimated pedestrian's age.*
- *Frequency of parent with children.*
- Percentage of drivers yielding to pedestrians.
- *The distance that through vehicles yield in advance of the crosswalk. This would be scored by marking the distance in 5 ft intervals and scoring the nearest interval they stopped behind.*
- *The percentage of vehicles that block (or partially block) the crosswalk.*

Treatment 18: Increased Lighting

- Crash Frequency – The frequency of intersection pedestrian-vehicle crashes at the treated sites would be compared.
- Crash Severity – The severity of pedestrian-vehicle crashes at the treated sites would be compared.
- *Frequency of Pedestrian Vehicle Evasive Conflicts by Age: The frequency of pedestrian-vehicle conflicts would be compared at the treated sites. Only score conflicts when the vehicle and pedestrian are on a collision course and the motorist had to make an evasive maneuver such as sudden braking or swerving to avoid a crash.*
- *Vehicle counts/flow.*
- *Pedestrian counts/flow.*
- *Pedestrian delay.*
- *Frequency of pedestrian trapped.*
- *Estimated pedestrian's age.*
- *Frequency of parent with children.*
- *Frequency of system failure.*
- *The percentage of drivers yielding to pedestrians in crosswalks.*
- *The distance that through vehicles yield in advance of the crosswalk. This would be scored by marking the distance in 5 ft intervals and scoring the nearest interval they stopped behind.*

Treatment 19: Pedestrian Refuge Islands

- Crash Frequency – The frequency of intersection pedestrian-vehicle crashes at the treated sites would be compared.
- Crash Severity – The severity of pedestrian-vehicle crashes at the treated sites would be compared.
- *Frequency of Pedestrian Vehicle Evasive Conflicts by Age: The frequency of pedestrian-vehicle conflicts would be compared at the treated sites. Only score conflicts when the vehicle and pedestrian are on a collision course and the motorist had to make an evasive maneuver such as sudden braking or swerving to avoid a crash.*
- *Vehicle counts/flow.*
- *Pedestrian counts/flow.*
- *Pedestrian delay.*
- *Frequency of pedestrian trapped.*
- *Estimated pedestrian's age.*
- *Frequency of parent with children.*

1.2.7 Research Methodology

One way to evaluate treatments is to randomly assign a large number of crosswalk locations to control and various treatment conditions. Unfortunately, several logistical problems mitigate against adopting strategy. First, the number of sites required would to perform the number of parametric and comparative studies would be too costly. Second, it would be difficult to get jurisdictions to commit themselves to implementing treatments at a large number of sites for experimental treatments. Third, we can only install small numbers of some of the more innovative technologies because of the unit cost per installation.

One frequently employed alternative is the use of before and after studies. First baseline data is collected before the treatment in introduced, followed by the introduction of the treatment and the collection of after treatment data. This design has one major drawback: it does not control for possible confounding variables that might be correlated with the introduction of the treatment. The list of potential confounding variable is legion: weather changes; changes in traffic patterns or road user population; change in the level of enforcement or perceived enforcement; etc. Many of the changes can easily lead to significant differences. Unfortunately they may not be caused by the treatment.

One alternative to simple before and after studies is the use of designs based on replication logic. One alternative to traditional groups designs are designs based on replication logic. One variant of this design termed a reversal design involves extending the before after design by removing the treatment after the effect is documented and reintroducing it again in order to replicate the results of the first treatment application. For example, advance yield markings are introduced on a multilane road. After obtaining a significant treatment effect the treatment is removed and then reintroduced again at the same site. If the results return to the level evidenced during the before phase the treatment is reintroduced. By documenting that the positive effects are dependent on the treatment in this way it is possible to rule out confounding variables as being responsible for the treatment effects. This design is illustrated with a block diagram below.

	Phase 1	Phase 2	Phase 3	Phase 4
Site 1	Baseline	Treatment	Baseline	Treatment
Site 2	Baseline	Treatment	Baseline	Treatment
Site 3	Baseline	Treatment	Baseline	Treatment
Site 4	Baseline	Treatment	Baseline	Treatment

A second design can be used when it is suspected that the treatment may produce such a robust effect that it could persist after the treatment is removed. This design variant is termed a multiple baseline design. Before data are collected at several sites with each site receiving the treatment at a different point in time. Each time a site receives the treatment another before measure is obtained at the untreated locations. The untreated sites serve as a control for possible confounding variables since significant changes should only be detected following the introduction of the treatment at each site. The multiple baseline is illustrated below.

	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5
Site 1	Baseline	Treatment	Treatment	Treatment	Treatment
Site 2	Baseline	Baseline	Treatment	Treatment	Treatment
Site 3	Baseline	Baseline	Baseline	Treatment	Treatment
Site 4	Baseline	Baseline	Baseline	Baseline	Treatment

The third design variant is used for comparing the relative efficacy of several treatments at a small number of sites. This design is termed the alternating treatment design. With the alternating treatment design before data is collected at each site. Next the infrastructure for several treatments is introduced at each site. For example, in roadway lighting and an overhead electronic sign that shows the direction that the pedestrian is crossing can be introduced at each location. During the after phase each of these treatments are in effect for a portion of the day with the order in which each is applied each day being randomly determined. More specifically, a data set may be collected first with the in roadway lighting followed by a second data set being collected with the electronic overhead sign. A switch in the controller cabinet determines the treatment that is being applied at any one time. The only valid alternative design would involve randomly assigning many sites to one or the other condition.

An advantage of each of these designs is that they use replication logic to control for potential confounding variables that would be a threat to the validity of the research. Simple before and after studies offer little control for confounds such as site characteristics, changes in weather, user demographics, enforcement, etc. These designs also allow researchers to manipulate the independent variable in such a manner as to perform a parametric analysis of factors such as location, size, and duration of operation of the device being tested. Such analysis are the mark of a mature science that aims to not only determine if a treatment can work, but how it should be implemented in order to produce the best results. Because small differences in how a treatment is applied can make the difference between success and failure, it is particularly important that we understand how to maximize treatment effects.

It has been said of traffic safety research that we should add the caveat “Results may vary”. Many times treatments that work in one study fail to produce an effect in another study even though the treatment was implemented in a very similar manner. One reason for such discrepancies is the control contextual variable exert over human behavior. In other words the effects of many treatments are dependent upon an interaction with the context in which it is applied. This research project should determine the range of conditions under which a treatment can work. For example, it is possible that one treatment may work well on narrow roads but not on wide multilane roads, or a treatment may work if traffic is traveling at lower speeds, but may not work well when traffic is traveling at higher speeds. It is important to understand in which contexts the treatment is effective and under which conditions it is not effective. The traditional method used to perform this type of analysis has been to compare the measures of effectiveness over a large number of matched sites, some of which have the treatment of interest and some that do not using correlational tools. However, because treatments are not randomly placed, it is possible that differences may be the result of factors confounded with the placement of the treatment or the types of persons attracted to the treatment. Replication logic designs provide a cost effective alternative to this type of methodology.

In this project we plan to use the multiple baseline design. This design has the advantage of not having to be removed once it is introduced. This minimizes the possibility that users might still follow similar behavior due to their experience with the specific countermeasure, phenomena know as irreversibility.

1.2.8 Research Plan

The following outline describes the research plan to be following in this research. All data will be scored from videotapes unless otherwise stated. The number of hours for data reduction has been adjusted to reflect the time to score each of the MOEs. Many of the MOEs involve more independent scoring (e.g. pedestrian delay, vehicle speed, etc.).

Because we are using a multiple baseline design to evaluate each treatment we will collect baseline data for the first third of the study. Introduce the treatment at half the sites for the middle third, while collecting baseline data as a control at untreated sites. Finally, we will treat the remaining half of the sites during the last third of the study period.

	Treatment	Installation Plan	1st Inst	2nd Inst	3rd Inst	Sites	hrs	Hrs Data reduction
1	ITS Pedestrian Signal	At time of treatment	Zone 1	Zone 7	10,11	6	180	360
2	ITS Call Buttons	At time of treatment	Zone 1	Zone 10	2,710,11	4	120	240
3	**ITS Pedestrian Detection**	Advance of treatment	1,10,6,8			2	120	240 Evaluate with 5
4	**ITS Pedestrian Extension**	Advance of treatment	1,10,6	Zone 10	6	2	60	160
5	Lead Pedestrian Phase	At time of treatment	Zone 1	Zone 5	1	2	60	120
6	Turning Vehicles Yield (mast arm)	At time of treatment	Zone 1	Zone 5		3	90	180
7	In Roadway Signs at Signals	At time of treatment	Zone 5	Zone 6		2	60	120
8	Eliminate Permissive Left	At time of treatment	Zone 7	Zone 10		2	60	180
9	ITS NRTOR Signs	At time of treatment	2,6			2	60	180
10	ITS LED Transponders	None Required	Zone 7					NA
11	**ITS Directional Warning Sign**	Prior to treatment	Zone 8			2	120	540 Evaluate with 13
12	**Smart Lighting**	Prior to treatment	Zone 8			2	60	210
13	Advance Yield Markings	At time of treatment	Zone 5	Zone 6	8,11	2	60	210
14	ITS Speed Warning	Prior to Treatment	6,8			2	60	210
15	In Roadway Knockdown Signs	At time of treatment	Zone 5	Zone 5		2	80	280
16	Pedestrian Zone Signs	At time of treatment	Zone 8	Zone 11		2	60	180

The data presented in the table below shows the implementation plan for each study cycle. We plan to finish all data collection within a 24month period using 6 camera systems. The systems will typically collect data during high exposure periods, however it is possible to capture data any time during the day. The camera system also provides excellent image quality during evening hours (note: for cycle 1 camera 1 the 3 indicates the treatment (ITS push button acknowledgement) while the 1 represents the camera system).

X = Treatment number and Y=Site number

Study Cycle	**Start Date**	**Data Collection System Number**					
		1	**2**	**3**	**4**	**5**	**6**
1	04/1/2003	3.1	3.2	3.3	3.4	14.1	14.2
2	06/1/2003	1.1	1.2	1.3	1.4	1.5	1.6
3	08/15/2003	4.1	4.2				
4	11/1/2003	15.1	15.2	5.1	5.2		
5	02/1/2003	9.1	9.2				
6	04/15/2004	12.1	10.1	10.2			
7	06/15/2004	13.1	6.1	6.2			
8	09/1/2004	7.1	7.2	7.3	16.1	16.2	
9	11/15/2004	8.1	8.2	17.1	17.2		
10	02/15/2004						

Because a multifaceted approach to safety that includes several treatments designed to influence drivers and pedestrians is most likely to produce a detectable reduction in pedestrian crashes we have strived to employ a package approach to treating the problems identified in each corridor. Although this approach has an excellent change of producing important changes in driver and pedestrian behaviors, it can introduce treatment interactions. Many of these interactions should be synergistic and hence desirable. However, we have taken several actions to limit these effects in the early periods of particular evaluations. First, in order to better determine the effects of individual treatments we have attempted to ensure that treatments are introduced that are unlikely to influence the same MOEs. For example, LED push buttons can be introduced at a site used to evaluate warning signs directed at drivers. Second, we also have attempted to introduce each treatment designed to influence similar behaviors at separate sites within the corridor (leading pedestrian phase and warning signs both attempt to reduce the threat posed by left turning vehicles). Third, we never plan to evaluate more than one treatment in a corridor at a time. Although these precautions do not eliminate all potential for positive interaction effects at the time of evaluation, it is never possible to eliminate all potential interactions in any research project.

1) **Evaluation of ITS Pedestrian Signals.** A multiple baseline across two corridors design will be employed to evaluate this intervention. Data will be scored from videotapes at six busy sites in each corridor. First, baseline data would be collected at intersections along the Alton Rd. and 41st corridors. Next, the new signals would then be installed along the Alton Rd. corridor while the 41st St. corridor sites remain in the baseline condition. Once the effect of the treatment has been assessed on Alton Rd. the treatment will be introduced at the 41st St. corridor. The use of animated eyes and countdown timers are part of the current NPA and therefore may be in the MUTCD by the time they are introduced. If these changes are still in progress we will obtain permission to experiment from FHWA.

2) **ITS Call Buttons That Confirm Activation.** A multiple baseline across two corridors design will be employed to evaluate this intervention. Data will be scored from videotapes at two busy sites on the Alton Rd corridor and 2 sites along the NE 163rd St. corridor. First, baseline data would be collected at intersections along the Alton Rd. and NE 163rd corridors. Next the new pedestrian call buttons would be installed at the two sites in the Alton Rd. corridor while the NE 163rd corridor remains in the baseline condition. Once the effect of the treatment has been assessed on Alton Rd. the treatment will be introduced at the NE 163rd corridor. This intervention does not require permission to experiment.

3) **ITS Detection of Pedestrians at Mid-block Signals.** A multiple baseline design will be employed to evaluate this intervention. Data will be scored from videotapes at two busy mid-block signals. The first signal is located on Alton Rd. and the second signal is located on NE 163rd St. First, baseline data would be collected at both crosswalks. Next automatic detection will be added to the pedestrian call button at one site. Once the effects of the treatment have been assessed at the first site the device will be activated at the second site. This device does not require permission to experiment.

4) **ITS Extended Crossing Time for Slower Pedestrians.** A multiple a baseline design will be employed to evaluate basing crossing time on pedestrian crossing speed at the two sites used to evaluate spot detection of pedestrians. Sensors to base crossing time on pedestrian speed will be introduced first at the mid-block crosswalk on Alton Rd. Next

they will be introduced at the crosswalk on NE 163rd St. This ITS intervention does not require permission to experiment.

5) **Leading Pedestrian Phase.** The leading pedestrian phase will be evaluated using a multiple baseline across two sites. Baseline data will be collected at one site on Alton Rd and one busy site on Collins Ave. between 5th St. and 24th St. The treatment will first be installed at the signal on Collins Ave while the intersection on Alton Rd remains in the baseline condition. Next the treatment will be installed at the intersection on Alton Rd. The use of a leading pedestrian phase is in compliance with the MUTCD.

6) **TURNING VEHICLES YIELD TO PEDESTRIANS symbol sign.** This sign will be evaluated using a multiple baseline design across one site in each of two corridors: Collins Ave between 5th St. and 24th St. and Alton Rd. First, baseline data would be collected at all three intersections. Next the treatment would be sequentially introduced across the three-intersections beginning with the intersection on 5th St. and followed by the intersection on Alton Rd. The symbol sign, which will be tested in this study, requires permission to experiment. Dr. Van Houten has already discussed this with the member of the FHWA MUTCD team who does not see a problem with getting approval.

7) **In Roadway Signs at Signalized Locations.** In roadway signs have been found to be effective at uncontrolled crossing and have been used by some jurisdictions at traffic signal locations. This sign will be evaluated using a multiple baseline design across a site in Zone 5 and a site in Zone 6. We will apply for permission to experiment to evaluate this alternative.

8) **Eliminate Permissive left Turns.** This treatment will be evaluated at a busy intersection along Zone 7 and Zone 10 using a multiple baseline across intersections design. This treatment is in compliance with the MUTCD.

9) **ITS NRTOR Sign.** The ITS No RTOR signs will be evaluated on using a multiple baseline design across one site in Zone 2 and one site in Zone 6. We would apply for permission to experiment for this device.

10) **ITS LED Transponders for Blind Pedestrians.** This intervention will be given to blind pedestrians to evaluate. They will be evaluated by a survey instrument designed by SAIC. Does not require permission to experiment. Messages emitted by device will be in compliance with the MUTCD.

11) **ITS Warning Signs Showing Direction Pedestrian is Crossing and Smart Crosswalk Lighting.** These treatments will be evaluated using a reversal design in zone 8. If sufficient funding is granted to include zone 3 we will instead use a multiple baseline design across Zones 3 and 8. Following a baseline data collection phase at each site the both treatments will be installed. Each night the LED sign will be activated alone for a third of the data collection, the dynamic lighting will be activated alone for a third of the data collection, and the ITS sign plus dynamic lighting will be activated for a third of the data collection. The order of the three phases will be randomly determined each day.

The ITS sign will be examined during day light hours using a multiple baseline across the Collins Ave. and Washington Ave. sites prior to the evaluation and comparison of the ITS sign and dynamic lighting at night. The use of advance yield markings will be introduced with these treatments to ensure that increased yielding produced by either treatment does not increase exposure to multiple threat crashes. FHWA has already granted Florida permission to experiment with this device. This site will be added to that permission.

12) **Smart Lighting.** This treatment will be evaluated using a reversal design at the same site where the ITS Directional Warning sign is being introduced (Zone 8). If zone 3 is funded we will employ a multiple baseline design across a site in Zone 3 and a site in Zone 8.

13) **Advanced Yield Marking.** This treatment will be evaluated using a multiple baseline design across one site in Zone 5 and one site in Zone 6.

14) **ITS Speed Warning Signs.** This treatment will be evaluated using a multiple baseline design across Zone 6 and Zone 8.

15) **In Roadway Signs at Uncontrolled Locations.** This treatment will be evaluated using a at different distances from the crosswalk using a counterbalanced reversal design at two sites in zone 5. After obtaining baseline at both locations on Collins Ave the in roadway sign will be introduced at the crosswalk marking. Next the sign will be located at 10 ft., 20 ft., and 60 ft. in advance of the crosswalk in randomized blocks of sessions. In this way the signs effectiveness can be evaluated as a function of how far it is placed in advance of the crosswalk. These signs were in the NPA but were removed because more testing was requested. FHWA should therefore approve a study to further test this device. We will apply for permission to experiment.

16) **Pedestrian Zone Signs.** The use of the pedestrian zone signs will be evaluated across two sites using a multiple baseline design. These signs will be evaluated at Zones 8 and 11. We will apply for permission to experiment for this device.

Statistical Analysis

The statistical analysis of data depends upon a number of factors, including the design, the distribution the data (if the data are not normally distributed less powerful non parametric tests may need to be used), whether the variance is similar between different conditions (requires tests for homoscedasticity), whether the data requires variance stabilizing or normalizing transformations if required), sample size, etc. Because these factors may vary from measure to measure different methods of analysis may be appropriate for different measures. However, the designs proposed afford excellent experimental control and usually the method of analysis can be anticipated. This example is for illustrative purposes but the data may dictate a different analysis in different instances. In all cases a statistician needs to examine the data and decide which test is most appropriate. Although a test of the null hypothesis is useful, it is also desirable to determine the confidence interval for any difference in the means identified.

1. An ANOVA with multiple post hoc comparisons would typically be appropriate if the assumptions of the test are met. The assumptions of the ANOVA are: Normality of each condition; equal variances for each condition; and independence of the data sample from each conditions. If unequal variances or lack of normality it is often possible to correct by applying a transformation. Log transformation may be used for skewed distributions and square root transformations are sometimes used for lack of normality. Determination of the appropriate transformation can only be selected after examining the data. Data across conditions may be examined for significance by using Post hoc comparisons methods could include Tukey's method of pair wise comparisons or Scheffe's method for all possible simultaneous contrasts. Other options are the use of non-parametric tests, which do not assume an underlying normal distribution. However these tests are not as powerful as parametric tests. Typically however, the MOEs and designs proposed herein amenable to the classical ANOVA technique after appropriate transformations have been applied when needed.

2. The SAS (Statistical Analysis System) or Minitab would be an appropriate package to carry out the above analysis.

3. We would employ the .05 significance level. Statistical significance indicates that it would be rare (1 time in 20 or less) of seeing such a large difference in the data assuming no real difference. We also propose using a 95% confidence interval, which provides confidence that the real difference lies within a calculated range.

Worked Example

Multiple Baseline Design to Evaluate Offset Stop Lines
Data Input (as per evaluation methodology):

Collecting data with MOEs identified in evaluation methodology.

Data collection periods include:

- Condition 1: Baseline (existing). This is just a pre-treatment assessment to serve as a benchmark to evaluate the treatment against. Data is collected at three independent locations before the Offset Stop Lines are introduced.

- Condition 2: Offset Stop Lines are installed at one site. This allows a before after comparison at the first site. Because the second site does not receive the treatment it serves as a control for other factors such as weather, enforcement, etc.

- Condition 3: Offset Stop Lines are installed at second site and remains in effect at the first site. This serves as a replication and also demonstrates that the failure of the second site to change when the first site was treated was not do to this site being insensitive to treatment.

- Condition 4: Offset Stop Lines are installed at the third site and remain in effect at the other two sites.

Data collection under each condition includes 50 pedestrians for 5 consecutive weekdays. This provides a minimum of 250 observations per site per condition. This sample size is determined by the likely accumulation of useful data from the least frequently occurring MOE. In the case of this study pedestrian-motor vehicle conflicts would be the least frequently occurring event. These data tend to average between 10% of crossings. This would a minimum sample size of between 25 conflict events per condition. This would be sufficient to detect a moderate to large safety benefit. Data on yielding, blocking the crosswalk, stopping distance, etc would constitute a much larger sample size. For these data small treatment effects should be easily detected.

Analysis Procedure:

- Definition: Each day of data collection under each condition will be termed a "session".

- Calculate the mean percentage of each MOE for the 50 pedestrians crossing when vehicles were present for each session.

- Plot the MOE versus the session for each study site. If there is no trend during baseline conditions and little overlap between baseline and treatment conditions the results will be highly significant. If the results are more equivocal, the statistical analysis may still yield significant effects.

Section 3: Outreach and Awareness Campaigns

1.3.1 Proposed Methodology

There are four basic strategies that can be used to target pedestrians and drivers using outreach and awareness campaigns. These strategies can be employed in isolation or combination to address a particular problem.

- First, one can blanket the entire community with information using flyer sent out with phone or power bills, frequent public service announcements on broadcast on cable television, or radio stations, and newspaper articles and advertisements. This strategy is fairly costly but can be effective provided the messages are repeated often.

- Second, one can target a particular segment of the population by handing out educational materials to children, seniors, or other groups identified as particularly at risk. This strategy can be effective but requires repetition and can be somewhat costly.

- Third, one can target a particular zone, by distributing flyers, posters or other educational materials to individuals that live in the area where the problem occurs. This strategy is most effective when the pedestrians or drivers involved in crashes live in the area where the problem occurs. It becomes less effective as the percentage of persons involved in crashes that live outside the area where the crashes take place increases.

- Fourth, educational materials can be placed in close proximity to the devices. This strategy is very effective at targeting the population who use the device regardless where they live, and is even effective in educating visitors to the area. Typically signs, and posters are placed either at locations where the countermeasures are installed or in locations where people using the corridor will see them (i.e., in bus shelters or on buses, or in local schools).

Outreach and awareness strategies will be designed to educate pedestrian in the appropriate use of each of the installed countermeasures where appropriate. The most cost effective way to educate drivers and pedestrians about traffic engineering countermeasures placed in there area is to place them in close proximity to the devices themselves. Therefore, this strategy will be used as often as possible. The second planned approach is to disseminate materials within corridors where most of the persons struck live close to the corridor. This could be achieved by placing educational materials in community centers and recreational areas, in local schools, and in local businesses that serve the public such as bars and restaurants.

The effective use of educational materials involves the timely presentation of information and reminders. The recommended strategy proposed by the Miami-Date team meets this objective in a cost effective manner. From a psychological perspective it is also important that education and outreach material be focused and specific in nature, because specific reminders have been repeatedly been shown to be superior to general reminders in inducing behavior change. With these points in mind, the outreach and awareness strategies were matched to each of the 12 corridors identified to receive treatment.

1.3.2 The Message and Audience to be Targeted for Each Intervention

Each technology requires a somewhat different outreach and awareness solution. Some devices will require a good deal of educational activity while drivers and pedestrians more intuitively understand others. In some cases may be undesirable to provide outreach and awareness because it may be more desirable to not inform pedestrians that the technology is being introduced so they not become overly dependent upon it. This is typically the case with tactics that focus on the driver but may also relate to automatic detection implemented to back up push button calls. If pedestrians are aware of automatic detection they may stop using the pedestrian call button even in areas where automatic detection is not provided. The specific strategy proposed for each intervention is outlined below.

1. ITS Pedestrian Signals. These features are more intuitive than the traditional signal and should not require much in the way of outreach and awareness strategies. We would provide flyers for students in elementary school classes in the zones, and posters for senior centers that explain these features (especially Collins Ave. 28th St. to 43rd St. and the 41st St. corridor. We also could install posters in Stores in the area where the pedestrian signals are installed. Materials will need to be in Spanish, Creole, as well as English for NW 12th Ave.

2. Offset Stop Lines. No specific educational measures are required for this treatment. Drivers typically understand this basic traffic-engineering feature and there is no specific response required of pedestrians.

3. ITS Push buttons that confirm the call being placed are similar to elevator buttons and should not require outreach and awareness efforts to be understood as indicators of positive activation of the pedestrian push button. Nevertheless, pedestrians need to be educated about the operation of the push button in allocating crossing time to pedestrians. Surrogate data also indicate that a substantive number of pedestrians may not trust the usefulness of the buttons. Pamphlets in English, Spanish, and Créole (as appropriate) will be developed in order to disseminate information to pedestrians about the proper use of and expectations for the push buttons. These pamphlets will be made available in well-marked, accessible dispensers at the sites where these buttons are used.

4. ITS pedestrian detection, and extension of clearance for slow pedestrians. This device is a back up for those who fail to press the button. It is best that pedestrians not count on this device. Therefore, it would be ill advised to educate pedestrians on the presence of the device.

5. Leading Pedestrian Phase. Explanation of this intervention would be valuable because it allows pedestrian a better opportunity to take advantage of the lead. Signs explaining this intervention could be erected in line of sight with the pedestrian signal (next to the signal head or by the push button).

6. TURNING VEHICLES YIELD TO PEDESTRIANS SIGN. Education could include posters explaining the need to yield to pedestrians at crosswalks. Outreach to drivers will require that the means used will reach them while driving. Besides the posters that can be displayed in various key areas including banks, grocery stores, and on the display boards of buses. In addition, public service announcements on the radio and on television could be aired. Short spots in newspapers can also be used. In fact, we have experience using the “Neighbor” section of the Miami Herald to disseminate information (fee of charge) to a large audience. The former could be most effective since most vehicles have radio and drivers often listen to the radio. A similar effort is currently being conducted on radio for a Florida Department of Transportation project on pedestrian safety targeting the Haitian community. Other approaches include message boards beside the traffic light reminding drivers to yield to pedestrians when turning.

7. In Roadway Signs. The best way to educate motorists about in roadway signs is through pedestrian enforcement operations. Associated enforcement with the signs increases the efficacy of the signs. We will not increase enforcement after the installation of the signs because it could confound the effect of the sign with the effects of enforcement.

8. Elimination of Permissive Left Turns. Because traffic signals are well understood, there is no need to educate drivers on this countermeasure.

9. ITS NRTOR Signs. If a text message is used and most drivers can read English messages this sign should be self-explanatory. Given the demographics of Miami-Dade, large numbers of drivers do no speak English since it is not a requirement to obtain a driver’s license. Consequently, a symbol sign forbidding right on red might be most appropriate. However, if a symbol sign is used there will be a need to educate drivers. Some of the means used would include those mentioned above to educate drivers on yielding to pedestrians.

10. ITS LED Transponder for Blind Pedestrians. Outreach and awareness would involve instruction by a mobility specialist. It may also be appropriate to develop information materials in Braille that can be distributed to blind pedestrians. We will also consult with the Lighthouse for the Blind in Miami Dade as to how we can best reach blind pedestrians. We should also note that the LED Transponder will also be very helpful to individuals with poor or low vision, among whom are many elderly pedestrians. Consequently, outreach and awareness campaigns will also be carried out using workshops at neighboring adult congregate living facilities, senior newsletters in the areas targeted, and senior centers.

11. ITS Warning Sign that Shows the Direction the Pedestrian is Crossing. Signs should be placed at the crosswalk instructing pedestrians that the signs do not stop motorists but instead alert them to the presence of the pedestrian in the crosswalk. Posters installed on buses and in other public areas should encourage pedestrians to use crosswalks.

12. Smart Crosswalk Lighting. This intervention does not require outreach and awareness activities for pedestrians because it is automatic and the effects of improved lighting are a direct improvement in visibility.

13. Advance Yield Markings. Signs directing motorists to yield at the markings are the best way to educate drivers about the markings. Flyers explaining the danger of multiple threats can also help motivate motorists to yield in advance of the crosswalk.

14. Pedestrian Zone Warning Signs. These signs do not require specific outreach and awareness strategies.

15. Increased Lighting. Posters showing what the pedestrians sees and what the driver sees is a proven way to teach pedestrians that light sources are not the same as reflected light. These posters will be used in zones with a higher than usual level of nighttime crashes including bars and convenience stores. Posters should be installed on NW 47th St., 5th Street and Collins Ave 5th St. to 24th St.

16. Pedestrian Refuge Islands. Do not require out reach and awareness.

1.3.3 Develop Measures of Effectiveness

The best way to assess the effectiveness of how outreach and awareness strategies influence the efficacy of the device would be to compare a large number of treated corridors, half of which were randomly assigned to receive outreach and awareness interventions and half that did not. This would allow firm conclusions to be drawn in respect to how much the outreach and awareness contributed to the effectiveness of the device in producing improved compliance, reduced crashes, or improvements in surrogate measures. Unfortunately, this approach is beyond the scope of this study. An alternative tactic would involve surveying pedestrians to determine how well they understand the devices and whether they have seen outreach material about the device. Unfortunately such surveys can also be deceptive. For example, most drivers respond to a wide array of traffic engineering devices but when surveyed do not provide clear evidenced that they are understood in an intellectual sense. One reason for this discrepancy may be that the devices are understood at an intuitive level, and that non-engineers do not have the vocabulary to clearly indicate their understanding of the device. For example, studies show that members of the general public do not understand the meaning of the flashing hand. Yet most people have crossed many times and have never noted having to dodge through vehicles during this condition. How can it be that the average person is so insensitive to correlations in their environment? The most likely answer is that most are not insensitive. They know that vehicles have not been released but they also know that they will be at some time in the future. Hence most pedestrians hurry during the clearance phase. There behavior indicates they do have a certain intuitive understanding, however when you survey them they say they don't understand what the flashing hand means. With this caveat in mind, the following MOE are recommended:

- ITS Pedestrian Signals. Survey of 200 pedestrians indicating to determine their understanding of the animated eyes and countdown components. It is important to be mindful of the fact that the results will depend on the questions asked.

- Leading Pedestrian Phase. Survey 200 pedestrians to determine whether they understand the leading pedestrian phase. They may not even report noticing it, but data indicate they get further across the street the during the LPI interval the longer it is in effect.

- TURNING VEHICLES YIELD TO PEDESTRIANS Sign. Survey drivers to determine if they understand that pedestrians crossing in compliance with pedestrian signals are have right of away over turning vehicles. The symbol sign would be evaluated with a human factors study to see if it is reasonable well understood. We would evaluate several possible designs using human factors testing after discussing options with the FHWA MUTCD team. We would again collect data with a small n because to double precision with most statistical tests you need to square the n. This leads to diminishing returns. I would accept a 5% error rate to detect a difference of 10% or more.

- ITS NRTOR Signs. A human factors study should be conducted to determine the best symbol sign. We would evaluate several alternatives after discussing the options with the FHWA MUTCD team.

- ITS LED Transponder for Blind Pedestrians. Blind pedestrians should evaluate how useful the device is. A survey would be used to determine the devices effectiveness. The survey will be prepared after consulting with mobility specialists.

LIST OF APPEINDICES

Appendix A. Appendix A is the book listing all crashes by corridor at each specific location. This material includes the location, time, lighting conditions, severity of pedestrian injury, pedestrian age, offset from intersection, direction of vehicle, the year, whether classified as intersection or non-intersection location, and the PBCAT category for each crash. Summary data for each corridor are also provided along with a GIS map of crashes in the corridor.