A STUDY OF FATAL PEDESTRIAN CRASHES IN FLORIDA

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Introduction...

In his book *Relations in Public: Microstudies of the Public Order*, Goffman offers a thought-provoking observation that motorized vehicles are distinguished from pedestrians by their hard exterior shells or skins. He contrasts, "Viewed in this perspective, the individual himself, moving across roads and down streets—the individual as pedestrian—can be considered a pilot encased in a soft and exposing shell, namely his clothes and skin." *(1)* With only his skin and clothes to protect him, the pedestrian is extremely vulnerable to fatal and nonfatal injury from the "hard" motorized vehicles that it is often forced to apportion the road.

The National Highway Traffic Safety Administration (NHTSA) reported that, between 1990 and 1994, a total of 28,970 pedestrian fatalities and 465,000 pedestrian injuries occurred in the United States. *(2)* Pedestrian crash data compiled by the Florida Department of Highway Safety and Motor Vehicles (DHSMV) indicates that a total 2,625 pedestrian fatalities (includes cases in which pedestrian age was unknown), or about 9 percent of the U.S. total, and 41,916 pedestrian injuries, again, about 9 percent of the U.S. total, occurred in Florida between the same years. *(3)* Also, in Florida during this same period, pedestrian fatalities accounted for nearly 20 percent of all traffic-crash fatalities and approximately 14 percent of all traffic-crash injuries. Table 1 shows a comparison of the pedestrian fatality statistics as a percentage of all traffic crashes for the U.S. and Florida, respectively.

The literature indicates that particular groups of pedestrians are more likely to be involved in traffic crashes than other groups and that certain age groups are more likely to be fatally injured once they are involved in a crash. *(4, 5, 6, & 7)* Other studies have found that women, pedestrians in groups, and the elderly tend to cross streets more slowly than men, pedestrians walking alone, and the young. *(8)* In addition, it has been suggested that women and older pedestrians also tend to engage in less jaywalking than do men and younger pedestrians. *(8)*

Table 1 Comparison of Pedestrian Fatalities as a Percent of all Traffic Crashes

Year	United States	Florida
1990	14.5 %	20.2 %
1991	14.0 %	20.1 %
1992	14.1 %	19.8 %
1993	14.1 %	18.5 %
1994	13.5 %	19.4 %

Source: FARS (1990) and STAMIS (1990)

Mackie and Older conducted observations at 11 intersections in London's inner suburbs to determine the risk to pedestrians when crossing busy roads. *(9)* They found that men ages 16 to 60 were more likely to cross at more dangerous places other than marked crosswalks (usually within 50 meters of the marked/signalized crosswalks) than women of the same age, making their overall risk of injury greater than that of women. In addition, they also found that, regardless of gender, the risk to elderly persons (60+) was four times greater than the risk to individuals in the 16 to 60 age group.

In addition to certain gender- and age-based characteristics of the population affecting pedestrian injury severity and crash involvement, the literature also points out that pedestrian crash involvement is also impacted by factors framed in a social context, such as trust and cooperation between perfect strangers, conformity, social status, and the rules of normative behavior. *(8, 10)*

Katz et al. conducted a controlled field study that investigated the interactions between pedestrians

and motorists. *(11)* In this study, trained researchers assumed roles as pedestrians in which they began bravely crossing just prior to motorists approaching the intersection. Katz et al. found that motorists were more likely to reduce their speed or stop for pedestrians more often when the motorist's approach speed was low; the crossing took place at a marked crosswalk; there was a relatively long distance between the motorist and the pedestrian's point of entry into the crosswalk; a group of pedestrians, rather than a lone pedestrian, attempted to cross; the pedestrian did not look at the approaching vehicle; and female or older motorists were most likely behind the wheel.

Method...

Fatal crashes involving pedestrians in Florida for the five-year period were identified from the DHSMV computerized Statewide Traffic Accident Management Information System (STAMIS) database. Examination was descriptive in nature, including simple frequency distributions and cross-tabulations for human, vehicle, and environmental crash variables, including the pedestrian's relationship to the intersection, light level, weather conditions, time of day, day of week, roadway system, and pedestrian age and gender.

Population statistics from the 1990 U.S. Census (only for Florida) *(12)* and data related to kilometers walked from the 1990 Nationwide Personal Transportation Survey (NPTS) (only for Florida) *(13)* were used to develop fatal and nonfatal injury crash rates per 100,000 population and 1.61 million kilometers (1 million miles) walked for pedestrians in different age groups in Florida. (The NPTS does not collect travel information for persons age 4 or less.)

Last, to supplement the computerized STAMIS data, a small sample consisting of 86 Florida Traffic Accidents Reports (FTAR) involving both fatal and nonfatal pedestrian crashes during the same years was reviewed. The attending law enforcement officer's narrative of the events surrounding the crashes and the diagrams of the crash scenes were examined to discern any patterns that may not have otherwise been identifiable from the computerized crash information. From the review of the FTAR, crash patterns were identified and general crash types were developed.

Findings...

Pedestrian Characteristics

Table 2 summarizes the demographic characteristics of the fatally injured pedestrians. Fatal pedestrian injuries in crashes were more likely to involve elderly pedestrians than younger pedestrians. Of the 2,484 crashes in which the pedestrian's age was known, 31.4 percent were age 60 or older and only 11.7 percent were age 15 or less. The median age for all fatal pedestrian crashes was 45.2 years. The youngest pedestrian was less than 1 year of age and the oldest pedestrian was 99.

Table 2 Demographic Characteristics of Pedestrian Fatality Crashes

Characteristic	Percentage
Age	
0-19	15.5 %
20-29	12.4 %
30-39	17.9 %
40-49	13.8 %
50-59	9.0 %
60+	31.4 %
Gender	
Male	69.0 %
Female	31.0 %
Ethnicity	
White	71.8 %

Regardless of age, men were over two times more likely to be fatally injured in a pedestrian crash than women. The data show that 69 percent of the fatally injured pedestrians in the sample were men and 31 percent were women.

White pedestrians are more likely to be fatally injured in a crash than other ethnicities. Whites accounted for almost 72 percent of the pedestrian

fatalities, while blacks accounted for 17.4 percent, Hispanics accounted for 9.7 percent, and Other (including Asians) accounted for approximately 1.0 percent.

Fatality Crash Rates

Determining the percentage of pedestrians fatally injured in a particular age, ethnic, or gender group is useful but insufficient for determining whether a specific group is more or less prone to be in a crash. In order to make more meaningful comparisons, it is necessary to consider differences in per capita and per-kilometer walked by a specific group. One way for measuring such differences is to calculate per-capita and per-kilometer-walked rates using the number of pedestrians fatally and nonfatally injured by age group.

To recapitulate, the data used in calculating the rates for population was obtained from the 1990 Census *(12)* and the number of kilometers walked was obtained from the 1990 NPTS. *(13)* For reasons of data continuity, only data for 1990 were used to derive the various per-capita and per-kilometer-walked rates. While only showing rates for a single year (1990), these findings do shed some light on the fatal and nonfatal crash involvement trend of particular age groups in Florida. Table 3 summarizes the pedestrian per-capita and per-kilometer-walked fatality and nonfatality rates by specific age group.

Pedestrians ages 65 to 74 had the highest per-kilometer-walked fatality rate of any age group, with 5.12 fatalities per 1.61 million kilometers walked (1 million miles). In comparison, the same age group was also the most likely to suffer a nonfatal injury per-kilometer-walked, with 38.91 nonfatal injuries per 1.61 million kilometers walked.

Table 3 Per Kilometer Walked and Per Capita Pedestrian Fatality and Nonfatality Rates (1990)

Age Group	Fatalities		Nonfatalities	
	1.61M Km Walked	Per 100k Pop.	1.61M Km Walked	Per 100k Pop.
5-18	0.20	2.98	6.33	96.33
19-24	1.03	3.42	23.74	78.77
25-34	0.53	4.35	7.81	64.08
45-44	1.76	4.42	20.09	50.41
45-54	0.84	5.34	6.35	40.57
55-64	1.09	4.10	10.33	39.05
65-74	5.12	4.38	38.91	33.29
75+	2.39	9.00	14.11	53.21

Source: 1990 STAMIS, NPTS, U.S. Census (for FL only)

Pedestrians age 5 to 18 had the lowest per-kilometer-walked fatality rate of any age group with 0.2 fatalities per 1.61 million kilometers walked. However, this same age group was the most likely to suffer a nonfatal injury per capita, with 96.33 per 100,000 population. Further, the 5 to 18 age group is also the least likely to suffer a fatal injury in crashes per capita, with only 2.98 fatalities per 100,000 population. Conversely, individuals in the oldest age group (75+) are the most likely to suffer a fatality per capita with 9 fatalities per 100,000 population.

Crash Environment

Environmental factors relating to the fatal pedestrian crashes are summarized in Table 4. Pedestrian fatalities were more likely to occur at some point other than at an intersection, such as at an uncontrolled mid-point between intersections or just prior to a controlled intersection where the pedestrians had to judge the “gaps” in traffic and assess the associated risk prior to crossing. Slightly more than 45 percent of all pedestrian fatalities were the result of this type of pedestrian crossing. Thirteen percent of the pedestrian fatalities occurred when the pedestrians were crossing at an intersection, both signalized and unsignalized. Almost 87 percent of all pedestrian fatalities were nonintersection-related.

Pedestrian fatalities were most likely to occur during non-daylight hours. About 30 percent of the fatalities occurred during non-daylight hours with some street light and about 37 percent occurred during non-daylight hours without street light (between 6 p.m. and midnight). The remaining pedestrian fatalities occurred during daylight hours (29.3 percent), dusk (2.1 percent), and dawn (1.8 percent).

Weather conditions were generally favorable at the time the crashes occurred. About 70 percent of the fatal crashes happened during clear weather conditions. The remaining 30 percent of the pedestrian fatalities occurred when it was either cloudy (22.6 percent), raining (5.6 percent), or foggy (1.7 percent), or during other weather conditions such as snow (less than 1 percent).

The majority of the crashes that resulted in a pedestrian fatality took place in an environment defined as rural by the attending law enforcement officers. Fifty-three percent of the fatalities occurred in this type of environment. The remaining crashes that resulted in fatalities occurred in an environment defined as urban.

During the moment of the pedestrian fatality crashes, the roadway conditions were most likely to be dry (88.3 percent). About 11 percent of the crashes occurred during a moment when the roadway was wet, and about 1 percent of the crashes occurred when the roadway was indicated to be icy/slippery.

State roads accounted for the most crashes, with 37.5 percent of all pedestrian fatality crashes followed in order by local roads (21.5 percent), county roads (18.5 percent), U.S. roads (13.9 percent), interstates (5.8 percent), turnpikes/toll roads (less than 1 percent), and all other roads (2 percent).

Pedestrian fatality crashes were fairly spread out among the seven days of the week. However, the data show that fatal crashes were most likely to occur on either a Friday or Saturday. These two days accounted for 36.4 (18.2 percent each) of all pedestrian fatality crashes.

The roadway surface at point of the crashes was most likely to be asphalt. Almost 93 percent of the fatalities occurred on this type of roadway surface. The remaining percentage of crashes occurred on roadways with surfaces made of either slag/gravel/stone, brick/block, concrete, or dirt.

Other Contributing Factors

Other contributing factors that led to the occurrence of the pedestrian fatality crashes are examined in this section. For example, the STAMIS data indicate whether the fatally injured pedestrians might have been alcohol- or drug-impaired, failed to yield the right-of-way, were struck by a backing vehicle, or made no improper action that contributed to the crash.

In almost 40 percent of the crashes, an action by the pedestrian resulted in his/her being fatally injured. More than 28 percent of the fatally injured pedestrians were noted as failing to yield the right-of-way to oncoming traffic, 7 percent were alcohol- and/or drug-impaired, about 1 percent disregarded a traffic signal, and 2.4 percent were obstructing traffic.

Several of these pedestrian behaviors are associated with specific pedestrian actions that led to the crashes, such as walking along a roadway with or against the flow of traffic. Pedestrian fatalities were 4 times more likely to occur when the pedestrian was walking along the roadway with traffic (wrong way) as opposed to against traffic; 222 fatalities occurred when pedestrians were walking along the roadway with traffic, and 55 occurred when pedestrians were walking along the roadway against traffic. These two pedestrian actions account for 8.9 and 2.2 percent of all pedestrian fatalities, respectively.

Using the small sample of FTAR, crash types involving pedestrians and motorists were developed based on the narratives and diagrams from the

Table 4 Crash Environment Surrounding the Pedestrian Fatality Crashes

Characteristic	Percentage
Location	
At intersection	13.0 %
Nonintersection	87.0 %
Lighting Condition	
Daylight	29.3 %
Non-daylight (street light)	29.3 %
Non-daylight (no street light)	36.9 %
Dusk/Dawn	3.9 %
Unknown	0.6 %
Roadway Surface Condition	
Dry	88.3 %
Wet	10.7 %
Icy/slippery	0.5 %
Other/unknown	0.5 %
Area	
Rural	46.9 %
Urban	53.1 %
Weather Condition	
Clear	69.6 %
Wet	5.6 %
Other (includes fog & clouds)	24.8 %
Road Identifier	
Interstate	5.8 %
U.S.	13.9 %
State	37.5 %
County	18.8 %
Local	21.5 %
Other	2.5 %

reports. A total of 12 crash types were developed. The crash types are listed and described in Table 5.

Overall, almost three quarters of the pedestrian crashes were the result of an action by a pedestrian (crash types 1, 2, 4, 6, and 11). These actions included darting out into traffic between parked cars or other obstructions, failure to yield the right-of-way to traffic, walking against “DON’T WALK” signal, crossing prior to an intersection between queued and moving traffic, and walking along the roadway either with or against traffic.

Crash Type 8 cases reveal motorists not exercising due care. In this crash type, motorists’ actions that influenced a conflict with a pedestrian were careless driving including speeding through an intersection, failure to yield right-of-way to pedestrians in crosswalk during turning movement, and improperly changing lanes.

Table 5 Pedestrian Crash Types

Crash Type	Description
1	Walking along roadway against traffic
2	Walking along roadway with traffic
3	Motorist view obscured (examples include shrubbery, bushes, parked cars, utility poles, sun’s glare, etc.)
4	Pedestrian not exercising due care (examples include failure to yield r-o-w, not heeding crossing signal, darting out between parked cars and other roadside obstructions, pedestrian playing/standing in roadway etc.)
5	Unique (not likely to occur again)
6	Intersection dash
7	Backing vehicle
8	Motorist not exercising due care (examples include careless driving, failure to yield r- o-w during turn movement, improper lane changes, etc.)
9	Motorist misinterprets pedestrian’s action
10	Inclement weather (obscured vision)
11	Pedestrian not crossing at intersection
12	No improper action by any involved parties

The remaining crash types involve inclement weather (driving rain); motorists' vision being obscured by bushes, hedges, fences, utility poles, etc.; and motorists misinterpreting the pedestrian's action.

Discussion...

Analysis of the STAMIS data suggests that certain characteristics of and actions by pedestrians and motorists and the crash environment may be associated with fatal crashes involving pedestrians. These include the age of the pedestrians, crash location, and pedestrian actions such as failure to yield right-of-way to oncoming turning or through traffic at an intersection, walking along the roadway with traffic, and crossing a roadway at a point other than at an intersection.

The results also show that the oldest and youngest pedestrians in Florida are at the greatest risk of being fatally injured in a crash per 1.61 million kilometers walked. Pedestrians 65 to 74 years of age have the highest fatality crash rates per 1.61 million kilometers walked. Direct comparison of younger and elder pedestrians showed that younger pedestrians are significantly more likely than elder pedestrians to suffer a fatality per 100,000 population. Evidence suggests that the crash involvement of these groups will continue to grow with the increasing number and longevity of persons living in and moving to Florida.

Overall, the findings suggest that greater emphasis should be placed on educating pedestrians and motorists and, to a lesser degree, the enforcement of applicable traffic laws for such offenses as speeding, careless driving, running stop signs and stop lights, and failure to yield the right-of-way in areas with a heavy concentration of pedestrians. The findings also suggest that engineering countermeasures such as increased "WALK" signal times, channelization of pedestrians for safe crossings, and restricting vehicle turning movements be emphasized.

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