

Analysis of Elderly Pedestrian Accidents and Recommended Countermeasures

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A study was carried out to create a better understanding of the causes and characteristics of motor vehicle crashes involving older pedestrians and to present information on appropriate interventions to reduce the problem. Detailed analyses by pedestrian age were carried out on more than 26,000 pedestrian crashes occurring in North Carolina over 11 years. A parallel analysis was also conducted on more than 70,000 fatal pedestrian crashes nationwide from the *Fatal Accident Reporting System*. Results showed that on a population basis, older pedestrians (65 or older) are slightly less likely than younger pedestrians to be struck by a motor vehicle; however, this statistic does not take into account the amount of walking, accident location, and so forth. Once struck, older pedestrians have a much higher likelihood of being killed—20 percent, compared with 5 to 10 percent for younger age groups. Pedestrians 65 or older are overrepresented in crashes during daylight hours, on weekdays, and in winter. Older pedestrians are also overrepresented in intersection crashes (particularly involving turning vehicles) and in crashes involving wide street crossings. Alcohol involvement, however, was less likely for older pedestrians than for most younger age groups. Results of the analysis were used to target specific countermeasures. A variety of educational, enforcement, and roadway improvements were recommended to reduce the annual toll of injuries and fatalities to older pedestrians.

Pedestrian-motor vehicle crashes are a serious problem in the United States and many other industrialized countries. A total of 6,468 pedestrians were reported killed in motor vehicle crashes in the United States in 1990 (1). These deaths accounted for 14.5 percent of the 44,529 motor vehicle deaths nationwide. An estimated 109,000 pedestrians were injured or killed in motor vehicle collisions, representing 3.2 percent of the 3.4 million total persons injured in traffic crashes (2).

Of the pedestrians injured or killed in 1990, approximately 10,000, or 9 percent, were 65 or older. This is lower than their 13 percent representation in the overall population. However, adults 65 or older made up 23 percent of pedestrians killed in 1990. Thus, the elderly are less likely than other pedestrians to be involved in a crash, but once in a crash they are more likely to be killed. Pedestrians 65 or older have a fatality rate of 4.8 per 100,000 population, nearly twice the rate of 2.6 per 100,000 found in the overall population.

The percentage of Americans who are 65 or older has tripled from 4 percent in 1900 to an estimated 13 percent in 1990 and is projected to increase to 17 percent by 2020 (3), which

translates into a 62 percent increase in the absolute number of older Americans between 1990 and 2020. If the injury rate remains the same, the number of older pedestrians killed and injured will also increase by 62 percent, and the current annual count of 10,000 elderly pedestrian injuries and fatalities will grow to more than 16,000. Serious efforts are needed to better understand the causes and characteristics of elderly pedestrian-motor vehicle crashes and to develop appropriate interventions to address this problem.

As a group, older persons show declines in health, vision, hearing, and speed of reaction (3). Perceptual and cognitive problems facing many of the elderly include a reduced ability to maintain general attention, difficulty in separating important from unimportant information, decreases in the speed and accuracy of information processing, diminished problem-solving ability, and declines in short-term memory (4).

This study presents the results of an analysis of more than 26,000 pedestrian-motor vehicle crashes occurring in North Carolina during an 11-year period (January 1980 through December 1990). Included in the total are nearly 1,800 pedestrian victims 65 or older. Similar findings are reported from an analysis of 71,000 fatal pedestrian-motor vehicle crashes occurring nationwide during 1980–1989 and identified from the *Fatal Accident Reporting System* (FARS) data base. During the 10 years spanned by this data base, about 15,000 pedestrians 65 or older were killed. In addition to the results of the data analysis, recommendations are given for a number of interventions to reduce the frequency and severity of elderly pedestrian crashes and injuries.

METHOD

To obtain a better understanding of the causes and characteristics of motor vehicle crashes involving older pedestrians, analyses were carried out on two computerized data bases:

- The North Carolina motor vehicle crash file, containing information on all police-reported motor vehicle crashes in the state. For the current study, all crashes involving one or more pedestrians during the period 1980–1990 were extracted for analysis.

- FARS data, a computer file of all fatal police-reported motor vehicle crashes nationwide. For the current analysis, all fatal motor vehicle crashes involving a pedestrian were extracted during the 10-year period 1980–1989.

One of the primary objectives of the analysis was to determine what roadway and environmental factors are associated to a larger degree with accidents involving older pedestrians (i.e., those 65 or older) as compared with those involving younger age groups. For example, are older persons more likely to be struck at intersections, during conditions of darkness, or on weekdays than younger persons? Answering such questions involved analyzing the distribution of crashes by pedestrian age categories for these and other factors. The age categories selected for the analysis included 0 through 4, 5 through 9, 10 through 14, 15 through 24, 25 through 44, 45 through 64, 65 through 74, and 75 and above. These age groups were chosen on the basis of what is known about age-related differences in pedestrian behavior and crash experience. For example, 5- to 9-year-old boys are particularly at risk for crashes resulting from darting out into the street, whereas persons 25 to 44 years old have a high incidence of alcohol-related injuries and deaths.

The data analysis first involved computing pedestrian crash rates and fatality rates (per 100,000 population) by age, gender, and race. Next, the percentage of pedestrian crashes was determined within each age group as a function of each accident variable of interest. These included time factors (i.e., season, month, day of week, time of day), light condition (dark, light, dawn or dusk), crash location (intersection, midblock), area type (urban, rural), number of traffic lanes, roadway class, road surface condition (dry or wet), crash type, alcohol involvement, and others.

RESULTS

Description of Data

A total of 26,260 pedestrian-motor vehicle crashes were identified from the 1980-1990 North Carolina motor vehicle crash files. This averages nearly 2,400 crashes a year over the 11-year period (Table 1). The number of crashes has been higher in recent years, averaging more than 2,500 crashes a year during 1986-1990 compared with fewer than 2,300 a year during 1980-1985. The slight increase in accidents in the most recent 5 years could be the direct result of increased population and motor vehicle travel in the state, as well as increased urbanization. The number of elderly pedestrians in North Carolina crashes has also increased, reflecting the statewide trend.

Nationwide, pedestrian fatalities have shown a decline, dropping from 8,070 in 1980 to 6,468 in 1990. The reason for this decline is not clear. Possible factors may include some combination of improved pedestrian safety programs now under way in many states along with improved medical care and treatment. The death rate within the older pedestrian population, however, has not declined as much as that for the overall population.

Crash and Injury Rates

A general issue of concern involved determining whether older adults are overrepresented in pedestrian crashes. Crash in-

TABLE 1 Summary of Pedestrian Crashes in North Carolina and Pedestrian Fatalities Nationwide by Year

Year	North Carolina Pedestrian Crashes		U.S. Fatal Pedestrian Crashes	
	65 and Older	All Ages	65 and Older	All Ages
1980	152	2,338	1,728	8,070
1981	151	2,189	1,628	7,837
1982	145	2,413	1,449	7,331
1983	132	2,227	1,388	6,826
1984	175	2,324	1,460	7,022
1985	150	2,095	1,448	6,799
1986	157	2,512	1,422	6,772
1987	179	2,530	1,482	6,746
1988	177	2,521	1,596	6,870
1989	176	2,618	1,466	6,552
1990	164	2,493	1,501	6,468
Total	1,758	26,260	16,568	77,293

volvement rates (crashes per 100,000 population) by age category and gender are given for North Carolina in Figure 1. Five- to 9-year-old boys clearly have the highest involvement rates (85.3 per 100,000 population), followed by 15- to 24-year-old men (61.2). At all age levels, men have a higher crash involvement rate than women. Rates for older persons (65 through 74 and 75 or older) are lower than for most other age groups (although it is interesting to note the upswing for those 75 or up). This finding agrees with much of the literature and may reflect greater caution on the part of older persons (e.g., fewer darting out in midblock, less walking at night), as well as reduced exposure.

Although older pedestrians are generally less likely than younger persons to be struck by motor vehicles, they are more likely to be killed if they are struck. As shown in Figure 2, 10 percent or fewer of the crashes for each of the age groups under 45 years result in death, compared with 18.6 percent of the crashes to pedestrians 65 through 74 and 25.1 percent of crashes involving those 75 or older. These percentages support the view that older adults are more vulnerable to injury and do not recover as easily as younger people.

Pedestrian Crash Factors

Dozens of specific crash factors were analyzed by age group to identify abnormally high trends among those 65 or older. This included analyses of both the North Carolina files and the nationwide FARS data on fatal pedestrian crashes. As will be discussed, the factors of greatest significance were those related to time, light condition, location (urban versus rural), road surface condition, relation to intersection, vehicle maneuver, and alcohol use.

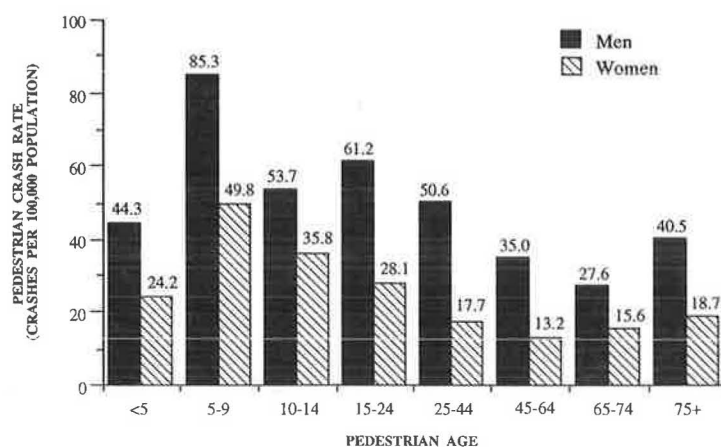


FIGURE 1 Pedestrian crash rate per 100,000 population by age and gender, 1980-1990 North Carolina data.

Time Factors

Examination of seasonal crash characteristics on the FARS data base revealed that deaths to older pedestrians are more likely to occur during fall and winter than spring and summer (Figure 3). According to the national data, persons 65 or older experience 60 percent of their fatalities from September through February. North Carolina crash data also revealed higher overall crash frequencies among persons 65 or older during the fall and winter months than among younger pedestrians. Younger pedestrians (particularly 9 years or younger) experienced a greater percentage of injuries and deaths during spring and summer months.

The trend of overinvolvement among older pedestrians in winter crashes agrees with an earlier U.S. Department of Transportation study (5). One of the theories cited for this trend is that elderly pedestrians often wear dark clothing in winter. On dark cloudy days, they may be difficult to distinguish against a dark background such as the shadow of a tall building. Also, many of these wintertime accidents to older adults involve left-turning drivers, who are paying attention to oncoming through traffic. When an adequate gap in the traffic is found, these motorists accelerate into their left turn,

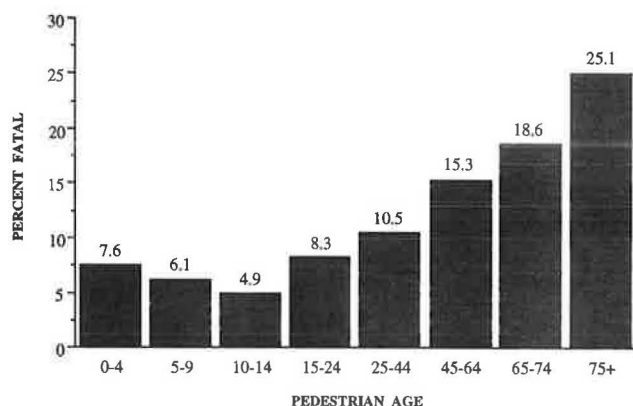


FIGURE 2 Percentage of pedestrian-motor vehicle crashes resulting in death, by pedestrian age, 1980-1990 North Carolina data.

striking the poorly visible elderly pedestrian, who also may not be able to react or move out of the way quickly enough.

Another time factor involves the day of the week when older adults are struck. North Carolina data revealed that persons 65 or older had a lower percentage of their accidents on weekends (Saturday and Sunday) than other age groups (Figure 4). In fact, weekend accidents accounted for only 21.3 percent of accidents to pedestrians 65 through 74 and 19.6 percent for pedestrians 75 or older. This compares with between 23 and 34 percent for other age groups.

FARS data showed that persons 5 through 9 and 75 or over had the lowest percentages of fatal accidents on weekends (24.1 and 22.7 percent, respectively). By contrast, nearly 45 percent of fatal accidents involving pedestrians between 15 and 24 years occurred on weekends.

The lower involvement of the elderly in weekend than other age groups is most likely due to different lifestyles and walking patterns. Older adults, particularly those who are retired, tend to walk for exercise and for shopping trips and other errands on weekdays, whereas people 15 through 44 are at work or in school. Thus, the crashes of the elderly may be more uniformly distributed throughout the week than the crashes of younger people, who may be most active on weekends.

The time-of-day factor was reviewed primarily on the basis of light condition. Results for the nationwide FARS data are presented in Figure 5. They show that next to young children, older adults have the highest percentage of fatal crashes occurring during daylight hours. Forty percent of fatalities to 65- to 74-year-old adults and 54 percent of fatalities to those 75 or older occurred during daylight, which compares with only 33 percent for all ages combined.

The North Carolina data show a similar trend. Overall, 54.3 percent of the state's reported pedestrian crashes occur during daylight, but this percentage increases to 62.4 percent for persons 65 through 74 and to 72.9 percent for those 75 or older. The only age groups with higher daytime percentages are those 14 and younger.

These results reflect to a large extent the walking habits for the various age groups. Children 14 and younger engage in much outdoor activity and thus experience a greater proportion of their crashes during daylight conditions. Young and middle-age pedestrians (ages 15 through 64) tend to walk

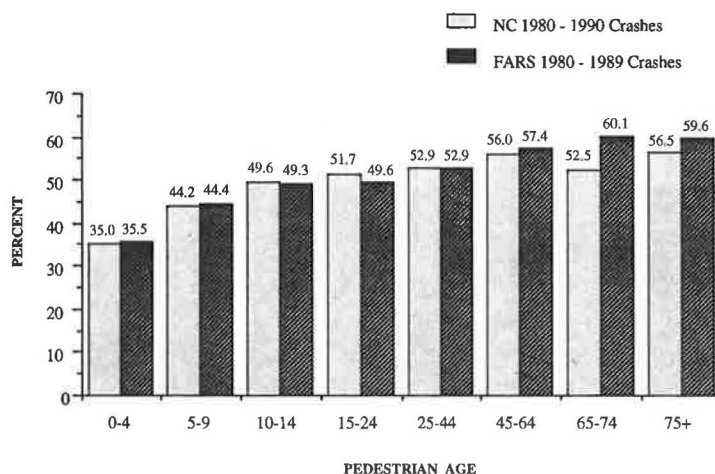


FIGURE 3 Percentage of pedestrian crashes occurring in fall or winter months (September–February).

more at night and therefore experience more of their crashes—particularly fatal crashes—at night. Older adults may walk more often at night than children, but less often than younger adults. And their slower reaction times, wearing of dark clothing, and reduced nighttime vision may make their nighttime walking particularly hazardous.

Roadway and Location Factors

The analyses revealed that, as expected, pedestrian crashes occur more often in urban than in rural areas. Overall, 65.9 percent of fatal pedestrian crashes on the FARS data base occurred in urban areas. Compared with other age groups in the national FARS data, older adults have the highest percentage of fatalities occurring in urban areas: 75.1 percent for those 65 or older, which compares with 57 to 69 percent for the other age groups.

Urban Areas In North Carolina, 60.3 percent of all pedestrian crashes occur in developed urban areas, 21.2 percent in rural areas, and 18.5 percent in areas of mixed development. The North Carolina data did not show older pedestrians to be overinvolved in urban accidents when compared with the other age groups. This is probably because a slightly lower percentage of North Carolina's elderly population lives in cities than the percentage in other states.

Wet Roads The analyses revealed problems for older pedestrians on wet roads. In particular, pedestrians 65 or older experienced 17.2 percent of their fatalities on wet roads, which is higher than the percentages of persons 15 through 44 (13.9 percent) or 14 years or younger (7.5 percent). However, in terms of all pedestrian crashes (fatal and nonfatal) on North Carolina roads, older adult crashes were not overrepresented on wet roads.

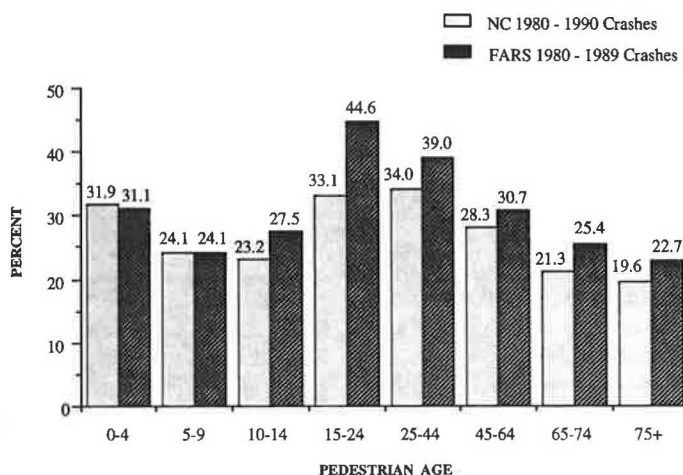


FIGURE 4 Percentage of pedestrian crashes occurring on weekends (Saturday or Sunday).

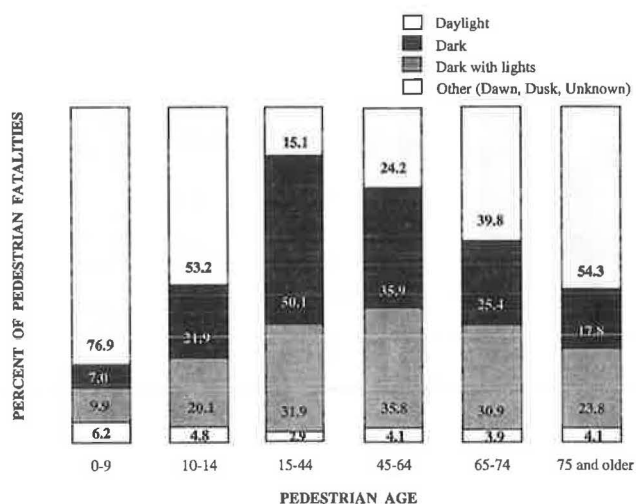


FIGURE 5 Distribution of pedestrian crashes by light condition, 1980-1989 FARS data.

Although these trends are not totally clear, the results could indicate that older adults are less likely to venture out into the rain to walk than other groups. However, when they do walk in the rain, they may be more at risk of getting into a serious crash because of their reduced maneuverability and the limited visibility associated with rainy days. Also, some older adults may direct more of their attention to their footing (and the fear of slipping and falling on wet roads) than to motor vehicle traffic.

Location The location where pedestrian crashes occur is important for identifying the specific roadway characteristics that cause problems for older adults and situations in which roadway improvements are needed. There is evidence from the literature that older adults are overinvolved in crashes while crossing streets at intersections when compared with younger pedestrians. This was, in fact, supported in the authors' analysis of the national FARS data, where intersections accounted for 32.2 and 35.3 percent of deaths for the age groups 65 through 74 and 75 and above, respectively, compared with 22 percent or less for the younger age groups (Figure 6).

Figure 6 also shows higher intersection involvement rates for older pedestrians from the North Carolina crash file, although percentages for this sample of combined fatal and nonfatal crashes are not as great as from the FARS data. These trends could result from an increased incidence of intersection crossings by older adults, but they might also indicate problems in understanding or reacting to the more complex traffic movement and signalization at intersections.

A final locational feature of interest involves the number of traffic lanes. Older persons may be less able to safely negotiate wide streets because of their slower walking speeds and diminished abilities to handle complex traffic conditions. In fact, North Carolina pedestrians 45 and older had high percentages of accidents on roadways with four or more lanes (26.6 to 29.0 percent). This compares with 6.9 to 22.2 percent for those 24 years or younger. The higher trends among older

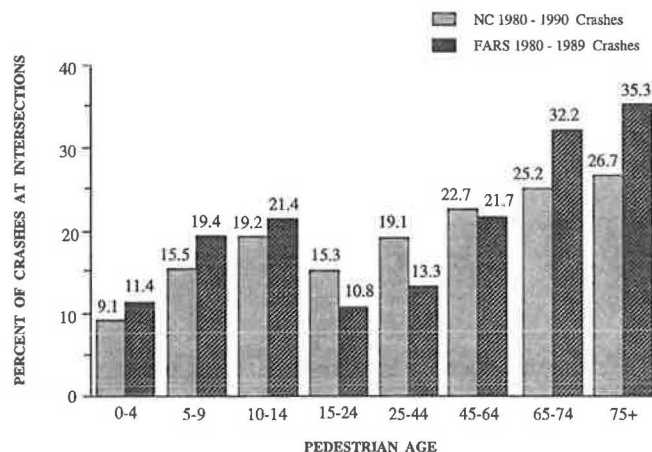


FIGURE 6 Percentage of pedestrian crashes related to intersections.

pedestrians at intersections and wide streets suggest the need for specific interventions that will be discussed later.

Vehicle Maneuvers

The 65 or older age groups were overrepresented in fatal crashes in which a left-turning vehicle struck a pedestrian. This type of crash occurred in 5.4 percent of fatal crashes in the United States involving pedestrians 65 or older but in only 0.7 percent of cases involving pedestrians under 45. The corresponding percentages in the North Carolina file for fatal plus nonfatal crashes are 6.5 percent (ages 65 or up) and 2.5 percent (younger than 65).

Older pedestrians are also overrepresented in right-turn crashes, including right turns on red. Right-turn crashes accounted for 2.2 percent of fatal crashes in the United States involving pedestrians 65 or older but only for 0.6 percent of those involving pedestrians under 45. In the North Carolina file, this type of crash accounted for 5.0 percent of crashes to pedestrians 65 or older, compared with 2.0 percent for pedestrians under 45.

A surprisingly high 9.5 percent of North Carolina's older pedestrian crash victims were struck by a backing vehicle, compared with only 3.9 percent for younger age groups (under 45). Thus, older pedestrians are more likely to be involved in crashes involving turning and backing vehicles than are other age groups.

Alcohol Involvement

Alcohol has been shown to be a contributing factor in pedestrian fatalities. From the North Carolina data base, crashes were classified as involving drinking on the basis of the police officer's judgment at the time of the crash. Overall, 20.5 percent of North Carolina pedestrian crashes involved drinking. However, the percentage was considerably lower for older pedestrians: 15.4 percent for those 65 to 74 and only 3.2 percent for those 75 or older (Figure 7). Pedestrians 25 through 44 years old had the highest alcohol involvement rate at 36.4

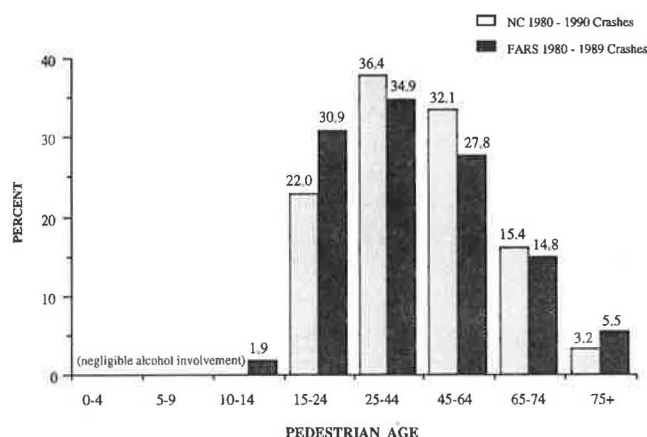


FIGURE 7 Percentage of crashes involving alcohol.

percent and were followed closely by those 45 through 64, at 32.1 percent.

Alcohol use among fatally injured pedestrians nationwide was reasonably close to the North Carolina numbers, as also shown in the figure. Of all U.S. pedestrian deaths, 22.1 percent involved drinking by the pedestrian. Again, those 25 through 44 had the highest rate of use (34.9 percent), followed by those 15 through 24 (30.9 percent) and 45 through 64 (27.8 percent). Alcohol involvement was similar between the FARS and North Carolina data for those 65 through 74 (14.8 percent versus 15.4 percent) and for those 75 or older (5.5 percent versus 3.2 percent).

These percentages confirm alcohol use as a major contributing factor in crashes involving pedestrians 15 years and older. Since alcohol can affect judgment and reaction time, its use may be particularly hazardous to older pedestrians already experiencing age-related limitations in some of their physical abilities. And even relatively small amounts of alcohol can have exaggerated effects when used with some prescription medicines commonly taken by older adults.

Although there has been considerable effort directed in recent years to reduce drunk driving, there has not been a comparable effort put forth to reduce the occurrence of drinking and walking. In fact, efforts to reduce drunk driving, such as revoking one's driver's license, may convert a drunk driver to a drunk pedestrian. It may not be as great a problem for the older age groups, but alcohol use nevertheless constitutes a serious pedestrian safety problem for which effective and immediate interventions are needed.

INTERVENTIONS FOR REDUCING ELDERLY PEDESTRIAN CRASHES AND INJURIES

The data and a review of the literature suggest a number of interventions that health care practitioners, law enforcement personnel, city planners, state and local traffic engineers, and others could implement to help reduce the annual toll of injury and death to elderly pedestrians. The rest of the paper will highlight some of the most promising interventions, focusing on education, enforcement and regulation, and roadway improvement countermeasures and program activities.

Educational Interventions

Most pedestrian-motor vehicle crashes are caused by unsafe pedestrian actions, and older adults (along with young children) are among the most common violators (6). Educational measures can help to correct unsafe behavior and thereby reduce the likelihood of being struck by a motor vehicle. Measures directed at the older pedestrian most often rely on printed materials, presentations at senior centers, public service announcements, and other media outlets to convey key safety messages. The Walk Alert Pedestrian Safety Program, developed by the National Safety Council and the U.S. Department of Transportation, suggests the following messages (7):

- Proper search behavior: always stop at the curb and look left, then right, then left again before starting to cross, continuing to search while crossing.
- Being seen: wear bright clothing during the day and carry a flashlight and wear retroreflective materials that outline the body at night.
- Traffic signals, signs, and markings: search for traffic, even if crossing with a walk signal or in a marked crosswalk; understand the meaning of the flashing Don't Walk signal.
- Disabled vehicle: pull off the roadway as far as possible, activate emergency flashers, walk facing traffic, and be seen.
- Intersection crossing: check for turning vehicles.
- Visual screens: move out beyond the parked or stopped vehicle far enough to again stop and search for traffic before crossing.

The analyses of crash data reinforce the importance of many of these measures for the elderly pedestrian—particularly the need to follow proper search behavior at intersections and to wear bright clothing to increase conspicuity. In educating older adults about pedestrian safety, it is important to remember the concerns that they themselves might have about their safety on the roadway. Many older adults, for example, are concerned that they will not be able to complete their crossing of an intersection before the signal changes. As a result, they may be too quick to step off the curb and begin their crossing. The first few steps are often the most critical, though, since it is when just entering an intersection that the pedestrian is most vulnerable to being struck. Older adults (and pedestrians of any age) should always search left-right-left before entering a roadway, even if they have been given a Walk signal. This is particularly important when crossing multilane roadways, where research indicates older pedestrians are at particularly high risk.

Enforcement and Regulation

Regulations and enforcement programs are additional tools for modifying unsafe pedestrian behaviors. Because their impact is generally short lived, long-term sustained efforts are needed. Successful enforcement programs target both pedestrians and motorists and incorporate public information and education.

When the ingredients are not in place for a full-scale pedestrian law enforcement program, police can sometimes be encouraged to implement selective enforcement strategies.

Selective law enforcement targets particular actions, locations, or times associated with greatest risk. For example, a particularly dangerous intersection near a senior center or shopping area might be targeted. Such tailored programs have been applied successfully in many areas of traffic law enforcement and could benefit elderly pedestrians as well.

The elderly can also benefit from local laws and ordinances designed to protect pedestrians. For example, the bus stop ordinance requires that bus stops be relocated from the near side to the far side of an intersection so that alighting passengers will more likely cross the street behind the bus where they can be seen by passing motorists (6). The model parking ordinance bans parking within 50 ft of a marked crosswalk or 60 ft of an unmarked crosswalk, thereby eliminating a visual screen (6). Given their greater likelihood of being struck at intersections, elderly pedestrians may be particularly helped by such countermeasures.

Roadway Improvements

Besides educational and enforcement measures, traffic and roadway improvements can also be made to increase the level of safety for all ages of pedestrians. Some of these improvements are discussed in the following.

Sign-Related Measures

A variety of roadway signs may be used that relate to pedestrians, as specified in the *Manual on Uniform Traffic Control Devices* (8). For example, Walk on Left Facing Traffic signs can reduce the likelihood that a pedestrian will be struck while walking along the road. The relatively high incidence of crashes to older pedestrians involving right- and left-turning vehicles may be reduced at certain locations with No Left Turn or No Turn on Red signs, where appropriate. Guide signs may be helpful to direct pedestrians to sidewalks, walkways, bus stops, trails, overpasses, or other facilities.

Sidewalks

The installation of sidewalks or walkways in residential and suburban areas can be highly beneficial to pedestrians of all ages, and particularly to older pedestrians, since these areas provide a space in which to walk separate from traffic. Older persons with reduced vision and limited mobility especially need sidewalks to offer protection from motor vehicle traffic. Sidewalk curb ramps at street crossing locations can facilitate movement for wheelchair users. Many elderly or handicapped people who do not use wheelchairs have difficulty in traversing curbs of any height and therefore rely on curb cuts. With curb cuts, however, visually impaired pedestrians may not notice the ramp and may walk unknowingly into the street (9).

Street Furniture

The safe and efficient movement of pedestrians on sidewalks requires the proper placement of street furniture (e.g., news-

paper racks, telephone booths, benches). Signs, signal poles, and telephone poles should be located so as not to obstruct pedestrian movement or block the view of pedestrians and motorists. Such obstacles not only create hazards for visually impaired pedestrians, but also provide unnecessary barriers for pedestrians with mobility problems. When possible, an area at each street corner should be set aside for the placement of street furniture and for pedestrians waiting to cross the street.

Signalization

One of the key factors found to be associated with crashes to pedestrians 65 or older was the existence of an intersection-related crossing. The addition of traffic signals can be helpful to pedestrians, especially older or handicapped individuals, at intersections with an insufficient number of adequate gaps in traffic for pedestrians to cross safely. Traffic signals create artificial gaps in traffic flow that allow pedestrians to cross. In addition, a protected left-turn phase reduces conflicts between pedestrians and left-turning vehicles. Since many older and handicapped people have slower walking speeds, signals must be timed to provide adequate crossing time. Proper timing is particularly important on wide, high-speed roadways where elderly pedestrians were found to be at particularly high risk.

When used in conjunction with traffic signals, pedestrian signals (i.e., Walk/Don't Walk signals) may be beneficial to pedestrians. Many elderly and handicapped pedestrians could also be assisted by the use of pedestrian push-button devices. When pushed, these devices extend the crossing period or stop traffic so that pedestrians may cross the street (10).

For visually impaired pedestrians, signals that use a voice, buzzer, or other sound may be helpful to indicate when the Walk signal is actuated. Audible signals have been installed in many U.S. cities. In San Diego audible signals installed at intersections frequented by blind and visually impaired people use different sounds depending on the direction of travel (north-south or east-west) (11).

However, the audible signal only indicates when the Walk interval is activated; it does not guarantee that motorists will not run red lights or turn across a pedestrian's path from a side street. Some organizations providing services to the blind are opposed to audible signals, since such signals may cause pedestrians to pay less attention to other traffic cues (11).

Pedestrian Refuge Islands

In the current analysis, older pedestrians were found to be overrepresented in crashes when crossing wide streets of four or more lanes. One possible solution is to install pedestrian refuge islands (or safety islands), which are areas between opposing traffic lanes within an intersection that may consist of pavement markings only or a raised island. They are particularly helpful to those who have difficulty crossing a wide street without stopping. The use of channelized right-turn lanes (with a pedestrian refuge island separating the right-turn lane from the other travel lanes) can reduce right-turn-on-red crashes with pedestrians; it also shortens crossing distances.

Roadway Lighting

Although older pedestrians are generally underrepresented in nighttime crashes, one-fourth of deaths to pedestrians 65 through 74 do occur under dark conditions. The installation of adequate street lighting has been found to reduce pedestrian crashes by as much as 43 percent. Many cities such as Seattle, Washington, currently install lighting at midblock locations and at pedestrian activity centers to improve safety (12,13).

Overpasses and Underpasses

Overpasses and underpasses are facilities that allow for the free-flowing movement of vehicles and pedestrians and can greatly reduce the crash risk to older pedestrians crossing wide streets with high speeds and heavy volumes of traffic. In such facilities, a passageway for pedestrians is located one or more levels above or below the vehicle level (6). The effectiveness of grade-separated crossings, however, depends on how much they are used. Thus, the selection and proper placement of overpasses is essential. In addition, however, the facilities must be designed with gradual ramps leading onto and off of them to be of practical use to people with mobility limitations.

Pedestrian Malls

As found in the analysis, pedestrian crashes in general are primarily an urban problem, particularly for older pedestrians. The closing of streets to motor vehicles to provide for environments partially or totally for pedestrians is an ideal solution for improving pedestrian safety and movement. Although the development of pedestrian malls and other automobile-free zones in downtown areas is usually the result of efforts to revitalize the area, it can have the added benefit of substantially increasing safety for younger and older pedestrians alike.

CONCLUSIONS

Motor vehicle crashes represent a serious threat to the elderly pedestrian. Older pedestrians generally limit their exposure to the extent that, on a per-person basis, they are no more likely than other age groups to be involved in a pedestrian collision. However, once in a collision, the elderly are much

more vulnerable to injury, so that they have the highest pedestrian fatality rate of any age group.

Much can be learned through the analysis of motor vehicle crash data about the particular factors involved in elderly pedestrian crashes. This information can, in turn, be used for more effective targeting of intervention strategies toward this vulnerable age group. Drawing from the literature and from a decade of North Carolina and U.S. pedestrian crash data, the present study has recommended a number of educational, enforcement, legislative, and roadway countermeasures for preventing motor vehicle crash injuries to elderly pedestrians.

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