Pedestrian-Related Injuries

Two seven year old boys are playing ball in their front yard. The ball rolls into the street and one of the boys darts out into the street to retrieve it. He is struck by an oncoming car and immediately killed. This scenario happens all too commonly in the United States.

Defining The Problem

Pedestrian (struck by or against a vehicle): Injury to a person involved in a collision, where the person was not at the time of the collision riding in or on a motor vehicle, railway train, motorcycle, bicycle, airplane, streetcar, animal-drawn vehicle, or other vehicle. This Category includes persons struck by cars pickup trucks, vans, heavy transport vehicles, buses, and SUVs. This category does not include persons struck by other vehicles such as motorcycles, trains, or bicycles. (NHTSA: Resource Guide on Laws Related to Pedestrian and Bicycle Safety).

Goals

Reduce nonfatal pedestrian injuries on public roads.

HP 2010 Goal	*26 per 100,00*
OH 1988	identify baseline
US 1998	19 (28% improvement)

Reduce pedestrian deaths on public roads.

HP 2010 Goal	*1.9 per 100,000*
OH 2000	0.9
US 1998	1.0 (50% improvement)

Data Source: General Estimates System (GES), DOT, NHTSA, Fatality Analysis Reporting

Data

State Perspective

Out 1,422 Ohio traffic fatalities in 1998, 134 were pedestrian related or 9.4 % of total. Pedestrian fatalities occurred at a rate of 1.2 per 100,000 persons, according to NHTSA, Fatality Analysis Reporting System. States with like rates included Indiana, Minnesota and Wisconsin. This compares to 1.5 fatalities per 100,000 persons.

According to Ohio Crash Facts in 2001, 2,922 Ohio residents were injured and an additional 96 killed by motor vehicles. Of those pedestrians killed, the *roadway* was the most frequent location with *improper crossing* sited as the greatest contributing circumstance when assessing for pedestrian blame. Centers for Disease Control (2000) data finds Ohio with 106 pedestrian deaths.

Of the Ohio pedestrians killed in 2000, children 0-14 years represented the greatest number (N=20). Pedestrian ages 15-19 represented the next highest level of pedestrian fatalities (N=11). Pedestrian ages 50-54 and 70-74 (N=9). Additional age categories represented fewer than 9 pedestrian fatalities for 2000.

Data Sources:

National Safety Council Injury Facts
CDC/NCIPC/WISQARS
NHTSA
Fatality Analysis Reporting Systems (FARS)
Healthy People 2010
Resource Guide on Laws Related to Pedestrian and Bicycle Safety, 2000.
Ohio Traffic Crash Facts 2001

Costs & Consequences

National

Years of Potential Life Lost (YPLL) due to pedestrian-related injury before Age 65: 145,282 (CDC WISQARS).

The total annual cost of traffic related pedestrian death and injury among children 0-14 years is more than 7.6 billion (*National Safe Kids Campaign, 2002*).

State

YPLL due to pedestrian- for Ohio Residents (1999): 4,030 (*CDC WISQARS*).

In 1999 nearly 5,000 pedestrians died from traffic-related injuries and another 85,000 sustained nonfatal injuries.

Risk Factors

In 1999 nearly 5,000 pedestrians died from traffic-related injuries and another 85,000 sustained nonfatal injuries (National Safety Council Injury Facts, 1999). Children 15 and younger accounted for 12% of fatalities with people 65 years and older accounting for 22%. Of the nonfatal injuries, children 15 years and younger account for 32% with the 65 and older population accounting for 8%. The fatality rate is more than twice as high for men as for women. In 1997 the pedestrian fatality rate for blacks was nearly twice that for whites.

The Centers for Disease Control (CDC) finds the fatality rates for the American Indian and Native Alaskan populations to be three times the rate for whites. These results are surmised to be due to differences in walking patterns. (CDC fact book NIPC, 2000). The Nationwide Personal Transportation Survey (1995) found that blacks walk 82% more than whites**.** In 1998, more pedestrian injuries occurred on Friday and Saturdays, with deaths occurring between 6:00 PM and midnight. Among children 16 years and younger, 44% of the pedestrian fatalities occurred between 4:00 and 8:00 PM. Of pedestrian deaths, 69% occurred in urban areas. Fatality rates however, increase in rural areas for all age groups related to higher driving speeds and potential for delayed access to emergency medical care. Intersection locations accounted for the most frequent site for pedestrian death with 65 and older representing 38% and for those 4 years and younger, 14%. (CDC fact book NIPC, 2000).

Vehicle size and design are major factors in severity of pedestrian injuries: large vehicles cause more severe injuries. Speed is also a major factor; faster speeds result in great injury severity. Other risk factor for injuries include amount of walking by people in a community, patterns of walking, and for children, level of parental supervision. On average, a pedestrian is killed every 101 minutes in the U.S. in a traffic crash (NHTSA Traffic Safety Facts, 1998: Pedestrians, 1999).

Children

Pedestrian injuries are the second leading cause of unintentional injury death in children 5-14 years of age; children aged 5-9 are at the highest risk. In 1998, children < 16 years of age accounted for 23% of the US population and 30% of all non-fatal pedestrian injuries, 11% of fatalities, and 18% of all non-traffic fatalities (NCICP website: Pedestrian Injury Prevention).

According to CDC NCIPC children are at increased risk for pedestrian injuries for several reasons. A child's smaller size makes them difficult for drivers to see. Young children can easily err when determining if it is safe to cross a street due to their lack of experience in judging distance and speed. Some parents may overestimate their child's ability to cross a street not recognizing that many children do not understand traffic signals or have the ability to anticipate a driver's actions. In addition, parents do not always set good examples for their children. Drivers and children often assume that the other will yield the right of way.

Pedestrian injuries to children result in severe outcomes regardless of where the events occur. Off-road sites account for a significant number of injuries and disproportionately affect the youngest children (Di Scala, Sege and Li, 2001).

Recent studies also find urban children at particular risk due to the high level of traffic exposure during their day to day activities and should be a consideration when planning injury prevention programs (Posner, Liao Winston, Cnaan, Shaw, Durbin, 2002). DiMaggio and Durkin (2002) found child pedestrian injury rates in the urban setting to peak in the 6-14 year age group. The study also found younger children more likely to be struck mid-block and during daylight hours, with a peak during Summer months. Adolescent pedestrian injuries were associated with intersection locations at night. Road and weather conditions did not appear to factor in as risks for injuries in this particular study.

Laflamme and Diderichsen (2000) reviewed the scientific literature related to social differences in traffic injuries during childhood in an attempt to highlight current knowledge. The review found that for most types of traffic injuries, mortality and morbidity are often higher among children from lower socioeconomic areas. They also concluded that there exists evidence of an interaction effect between age and gender.

In all ages, traffic-related deaths are twice as common in urban areas; non-traffic deaths are twice as common in rural areas. Children from areas with high population densities, poor supervision, and no safe places to play are at higher risk for pedestrian injuries. Young children are at increased risk of injury and death in driveways.

Elders

In 1998, 9% of the population was 70 years of age and older, but this group accounted for 18% of pedestrian fatalities. This age group has the highest death rate, 4.57/100,000 annually. (NCICPA website: Pedestrian Injury Prevention).

Peng and Bongard (1999) set out to examine the demographics and injury profiles of pedestrian versus motor vehicle crashes within a large trauma system. Through a county data base over a 3 year period they were able to enroll 5000 participants. Patients were grouped by age and main outcome measures. Patients were 38% pediatric, 54% adult (15-65 years) and 8% elderly. Mortality was highest amongst the elderly (27.8%). At the time of discharge 78% of patients had a temporary disability, 4% a permanent handicap and only 16% were functioning at pre-admission capacity (2% of participants were *not reported*). Payor sources found 45% state or federal, 25% cash/self pay, 18% HMO/group carrier, and 12% other. This retrospective study concluded pedestrian injuries are common in large urban trauma systems and found patient outcomes to worsen with advanced age.

Alcohol

Alcohol is a major factor in adult pedestrian deaths. In 1998, approximately one third of pedestrians 16 years of age or older who were killed by motor vehicles were legally intoxicated. When looking at only night time crashes, the number jumps to 52%. In 46% of traffic crashes that resulted in a pedestrian fatality during 1998, either the driver or the pedestrian had a measurable blood alcohol level. (CDC Fact Sheet, NCIPC, 2000). LaScala, Johnson and Gruenewald (2001) found alcohol- involved pedestrian collisions occurred more often in areas with greater populations and with greater bar density. Collisions not involving alcohol occurred more frequently in low income areas with greater populations and in areas with an increased number of cross streets.

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Existing Resources

Ohio

Ohio Department of Transportation
Ohio Department of Public Safety
Ohio SAFE KIDS Coalition
Ohio Motorists Safety Foundation

National

National Highway Traffic Safety Administration
National Safe Kids Campaign
US Department of Transportation/Federal Highway Administration
National Safety Council
CDC/NIPC
American Academy of Pediatrics
Emergency Nurses Association

Funding Sources: State/Federal

Federal Highway Administration
National Highway System
Surface Transportation Program
Transportation Enhancements
Safety Setaside
Congestion Mitigation and Air Quality Improvement Program
Recreational Trials Program
National Scenic Byways Program
National Highway Traffic Safety Administration
State and Community Highway Safety Grant Program
Federal Transit Administration
Urbanized Area Formula Grants
Transit Enhancement Grants
Formula Program for Other than Urbanized Areas
Capital Program Grants and Loans
Miscellaneous Other Sources
Transportation and Community and System Preservation Pilot Program
Capital Improvement Program
Developer Dedications
Ohio Department of Transportation
Ohio Department of Public Safety

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Policy Issues

Legislation

UVC §§ 1-156 [§§ 1-168, 2000 version number] Pedestrian
UVC §§ 11- 203 Pedestrian-control signals
UVC §§ 11- 501(a) Pedestrian obedience to traffic-control devices and traffic regulations
UVC §§ 11- 502(a) Pedestrians' right of way in crosswalks [Yield to pedestrian in crosswalk]
UVC §§ 11- 502(b) Pedestrians' right of way in crosswalks [Pedestrian can't suddenly leave curb]
UVC §§ 11- 502(c) Pedestrians' right of way in crosswalks [§§ 11-502(a) does not apply where there is a tunnel or bridge]
UVC §§ 11- 502(d) Pedestrians' right of way in crosswalks [Vehicle from rear does not pass stopped vehicle]
UVC §§ 11- 503(a) Crossing at other than crosswalks
UVC §§ 11- 503(b) Crossing at other than crosswalks [Tunnel or bridge available]
UVC §§ 11- 503(c) Crossing at other than crosswalks [Crossing between adjacent intersections]
UVC §§ 11- 503(d) Crossing at other than crosswalks [Diagonal crossing]
UVC §§ 11- 505 Pedestrians to use right half of crosswalks
UVC §§ 11- 506(a) Pedestrians on highways [Sidewalk available]
UVC §§ 11- 506(b) Pedestrians on highways [No sidewalk available]
UVC §§ 11- 506(c) Pedestrians on highways [No sidewalk or shoulder available]
UVC §§ 11- 506(d) Pedestrians on highways [Pedestrian in roadway]
UVC §§ 11- 507(a) Pedestrians soliciting rides or business [Soliciting ride]
UVC §§ 11- 507(b) Pedestrians soliciting rides or business [Soliciting work, business, contributions]
UVC §§ 11- 507(c) Pedestrians soliciting rides or business [Soliciting watching/guarding vehicle]
UVC §§ 11- 509 Pedestrians' right of way on sidewalks
UVC §§ 11- 510(a) Pedestrians yield to authorized emergency vehicles
UVC §§ 11- 510(b) Pedestrians yield to authorized emergency vehicles [Emergency vehicle driver to exercise due care]
UVC §§ 11- 511 Blind pedestrian right of way
UVC §§ 11- 512 Pedestrians under influence of alcohol or drugs
UVC §§ 11-1116 Rights and duties—motorized wheelchairs

Ohio Revised Code

4511.14 Pedestrian control signals.
4511.46 Pedestrian on crosswalk has right-of-way.
4511.50 Pedestrian walking along highway.
4511.441 Pedestrian on sidewalk has right-of-way.
4511.452 Pedestrians yield right-of-way to public safety vehicle.
4511.511 Pedestrian on bridge or railroad crossing.
4511.48 Right of way yielded by pedestrian.
4511.481 Intoxicated or drugged pedestrian hazard on highway.
4511.12 Obeying traffic control devices.
4511.47 Right of way yielded to blind person.
4511.051 Prohibitions on use of freeways.
4511.491 Motorized wheelchair operators.
729.12 Ramped curbing for handicapped.
4511.13 Signal lights.
737.022 Authority of director to promulgate certain traffic regulations.
4907.474 Closing of municipal crossings; court action.
4907.475 Closing of rural crossings not on state highway; court action.
4511.451 Funeral procession has right of way.
4511.512 Electric personal assistive mobility devices.
4511.21 Speed limits.
723.012 Flagpole along right-of-way.
4511.432 Stop signs on private residential road or driveway.
4703.30 Definitions.
727.01 Power to levy and collect special assessments; method.
349.01 Definitions.
709.023 Special annexation procedure where land is not excluded from township.
3318.01 Definitions.
4511.01 Definitions.

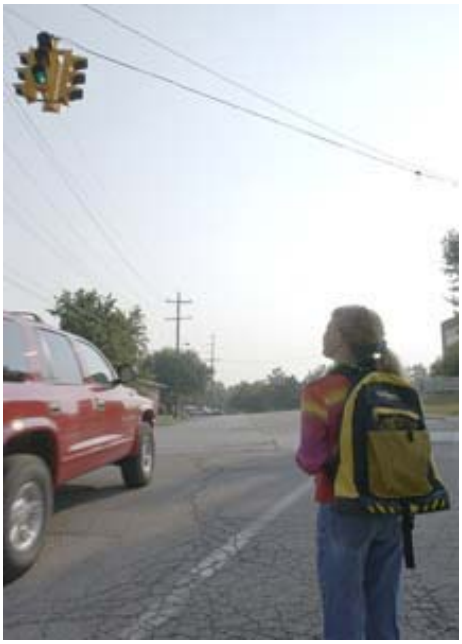
Review of Strategies to Reduce Pedestrian-Related Injury

According to current literature, multiple sources of **data** have been recommended to provide a more complete picture of the problem of pedestrian injury. According to Dhillon, Lightstone, Peek-Asa and Kraus (2001) only 37% of police reported pedestrian cases were captured by the local hospital data base in their study suggesting a universal gap in data surveillance. Lascala, Gerber and Gruenewald (2000) used a geographic mapping system to map locations of pedestrian injury and **environmental and demographic characteristics** of the city of San Francisco across census tract units. The authors found pedestrian injury rates to be related to traffic flow, population density, age, unemployment, gender and education. Availability of alcohol through bars was directly related to pedestrian injury collisions in which the pedestrian had been drinking alcohol.

The literature also suggests that **engineering modifications** are the most effective means of reducing pedestrian injury. Additional key elements in prevention include safety task forces, the compilation of local injury statistics and publicizing the stories of injury victims. Studies also call for modest goals and a dedicated constituency to assure success in pedestrian injury prevention. (Bergman, Gray, Moffat, Simpson, Rivara, 2002).

Pedestrian friendly environments with sidewalks crosswalks, on-street parking and posted speed limits promote safe walking. The probability of a crash is twice as likely at sites without sidewalks (Ossenbruggen, Pendharkar & Ivan, 2001). **Crosswalk sites without signals or stop signs** are associated with an increased risk (3.6-fold) of pedestrian injury to the elderly. (Koepsell, McCloskey, Wolf, Moudon, Buchner, Kraus, Patterson, 2002). Such sites may place all persons at risk by creating an environment where there is no attention toward pedestrians resulting in failure of motorists to yield. Retting, Chapline, and Williams (2002) reveals there is no universal practice for setting the duration of **signal light change intervals** and found a 37% decrease in injuries associated with re-timing traffic signals to longer durations. The authors suggest this as a low cost intervention to protect pedestrians and motor vehicle operators alike.

Safety education for children & parents can improve knowledge but without regular repetition safe behavior practices decline (Duperres, Roberts & Bunn, 2002). Lightstone et al. suggest pedestrian injury prevention education should be targeted to parents of younger children based upon current data trends. Cross, Stevenson, Hall, Burns, Laughlin, Officer and Howat (2000) followed a cohort of children from age 6-9 years after providing a **multicomponent** project with an educational intervention for students, their parents, teachers and the local community. The goal was to improve children's road related behaviors. The authors conclude the intervention reduced the natural increase in children's pedestrian related risk behaviors.



Recommendations to Prevent Pedestrian-Related Injury

Improve surveillance

1. Create an environment and stable funding mechanism for data sharing amongst institutions and disciplines to provide a centralized database on pedestrian injuries. Merge Ohio traffic crash, EMS and hospital data to obtain information on long-term outcomes and costs of pedestrian-related injuries. Improve the data collection system to include more specific data elements such as circumstances of events leading up to pedestrian-related injury.

Target resources toward high-risk groups & evaluate programs

2. Support implementation of multifaceted programs that utilize a variety of prevention strategies such as: creating pedestrian safety task forces, compiling local injury statistics, utilizing the mass media and engineering safer pedestrian routes. Prevention initiatives should be targeted to populations at risk including the very young and elders living in lower socioeconomic conditions.

3. Implement a statewide awareness and education program to improve adult supervision of young children crossing streets, and evaluate its effectiveness. The program should also encourage the use of community crossing guards along school routes.

4. Implement a statewide awareness campaign to encourage improved pedestrian visibility with reflective clothing, and evaluate its effectiveness.

5. Increase safety measures for rural roads by addressing speed limits and access to EMS.

9. Continue to fund and support education initiatives addressing safe driving and the consequences of alcohol use.

Empower Communities

6. Promote pedestrian friendly environments through the following measures:
   - Encourage the development of communities that favor pedestrian access thereby reducing reliance of motor vehicles for daily activities and errands.
   - Create sidewalks, crosswalks, and on-street parking.
   - Implement traffic calming measures such as speed bumps/roundabouts, crossing guards in school zones and red light cameras in high-risk areas.
   - Physically separate pedestrians from motor vehicle traffic by putting up physical barriers, using pedestrian bridges, overpasses, underpasses, traffic islands, and other similar measures.
   - Increase pedestrian crossing time at intersection signals.
   - Improve signage and signals at intersections and crosswalks, particularly in areas that pose a high-risk to young and elder pedestrians and in those areas that have a high traffic flow. Clearly post speed limits. Enforce jaywalking laws.
   - Improve visibility of pedestrians through better street lighting.

7. Lower posted speed limits on streets with heavy pedestrian traffic.

8. Support increased enforcement of motor vehicle traffic violations throughout the state.

Expand training

8. Incorporate age-appropriate pedestrian skills training into school health education curricula.

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Total Population, 1998	Nonfatal Pedestrian Injuries
	Rate per 100,000
TOTAL	26
Race and ethnicity	
American Indian or Alaska Native	DNC
Asian or Pacific Islander	DNC
Asian	DNC
Native Hawaiian and other Pacific Islander	DNC
Black or African American	DNC
White	DNC
Hispanic or Latino	DNC
Not Hispanic or Latino	DNC
Black or African American	DNC
White	DNC
Gender	
Female	DNA
Male	DNA
Select populations	
Persons aged 5 to 9 years	42
Persons aged 10 to 15 years	44
Persons aged 16 to 20 years	38

Total Population, 1998	Pedestrian Deaths
	Rate per 100,000
TOTAL	1.9
Race and ethnicity	
American Indian or Alaska Native	DNC
Asian or Pacific Islander	DNC
Asian	DNA
Black or African American	DNA
White	DNA
Gender	
Female	1.2
Male	2.7
Select populations	
Persons aged 70 years and older	3.9
70-74	
75-79	
80-84	
>85	

DNA = Data have not been analyzed. DNC = Data are not collected. DSU = Data are statistically unreliable.

OHIO Pedestrian Death Data (CDC) 2000	Rate/ 100,000
Total:	0.9
Race/Ethnicity	
White	DNC
Black	DNC
Gender	
Female	DNC
Male	DNC
Age	
15-19	1.3
70-74	2.3
80-84	1.5
85+	1.6