U.S. Department of Transportation
Federal Highway Administration

FHWA-SA-04-007
Technical Report

September 2004

Pedestrian Safety in Native America

Technical Report Documentation Page

1. Report No.	2. Government Accession No.	3. Recipient's Catalog No.
FHWA-SA-04-007		

4. Title and Subtitle	5. Report Date
Pedestrian Safety in Indian Country	September 2004
	6. Performing Organization Code

7. Written By	8. Performing Organization Report No.
J. LaValley, C.S. Crandall, D. P. Sklar and L. Banks	

9. Performing Organization Name and Address	10. Work Unit No.
Department of Emergency Medicine MSC10 5560 University of New Mexico School of Medicine Albuquerque, NM 87131-0001.	11. Contract or Grant No.

12. Sponsoring Agency Name and Address	13. Type of Report and Period Covered
Federal Highway Administration Office of Safety 400 Seventh Street SW Washington, DC 20590	Research:
	14. Sponsoring Agency Code

15. Supplementary Notes
AOTR: D. Smith (HSA-30); T. Redmon (HSA-20);

16. Abstract

American Indians have the highest rates of pedestrian injury and death per capita of any racial or ethnic group in the United States. Data from the National Highway Traffic Safety Administration, Fatality Analysis and Reporting System and the National Center for Health Statistics, Web-Based Injury Surveillance and Reporting System were analyzed to typify crashes among American Indians in the United States. Contributing factors such as alcohol involvement on the part of the pedestrian or driver, rurality, poverty and lack visibility and traffic control devices were identified. Relative rates of pedestrian injury were calculated as a measure of risk disparity between the American Indian population in each state and all other races. States with elevated disparity between comparison groups also had large percentages of American Indians living below the poverty level. Additionally, gaps in injury surveillance data among American Indians were identified.

American Indian communities require community specific injury prevention intervention activities for community specific pedestrian safety problems. Focus groups conducted during the study period identified successful strategies for addressing pedestrian injury among American Indian communities. Successful strategies identified included education and media based interventions, law enforcement interventions, child education, and pedestrian facility improvements.

17. Key Word	18. Distribution Statement
Crashes, FARS, American Indians, pedestrian, highways, safety	No restriction. This document is available from the research sponsor. .

19. Security Classif. (of this report)	20. Security Classif. (of this page)	21. No. of Pages	22. Price
Unclassified	Unclassified	41	

Form DOT F 1700.7 (8-72) **Reproduction of completed page authorized**

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Executive Summary

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Introduction

In the United States motor-vehicle crashes are a major public health concern for American Indian/Alaskan Natives (AI/AN). The leading cause of death for AI/AN between 10 and 64 years is a motor vehicle crash; the fourth leading cause of death for AI/AN is a pedestrian crash. In 2001, the age adjusted-pedestrian crash mortality rate as reported by CDC WISQARS (latest data entry) was 3.9 per 100,000 population for AI/AN, significantly higher than the national age-adjusted mortality rate of 1.68.

States which have the highest percentages of American Indians also have the highest rates of pedestrian death. The most rural American Indian communities have the highest rates of pedestrian death in the United States. As compared to crashes between motor vehicles, crashes involving a pedestrian are more likely to lead to death or severe disability due to the huge disparity in mass between a pedestrian and motor vehicle and the high speeds of the motor vehicles. While less than 3% of motor vehicle crashes result in death for American Indians, nearly 30% of pedestrian crashes are fatal. Unlike motor vehicle crashes, where protection of occupants with seat belts and airbags may reduce the effect of the crash, pedestrians can not be easily protected as they are struck by a motor vehicle.

National strategies for reducing both the disproportionate risk among AI/AN pedestrians and at preventing pedestrian crashes have focused on three primary activities: 1) performing basic injury research and surveillance; 2) creating community partnerships to address local pedestrian problems, and 3) increasing the public awareness surrounding this important public health issue. Many of the major improvements to the nation's health have been accomplished using a public health approach. This approach involves identifying risk factors and developing appropriate measures that address the risks. Measures may include institutional changes, education, engineering, and environmental redesign, or legal changes. Examples include the construction of sewers, required immunizations, development of food service regulations, and passive restraint systems in automobiles.

The trend in the United States is moving toward preventing health problems, including injury, rather than simply treating them. As the understanding of injuries and their prevention is clarified, it becomes known that injuries can be studied just as diseases are. Hence, by charting their occurrence, identifying those at-risk and developing interventions to prevent injury, we can reduce death and disability from many types of injuries, including pedestrian crashes.

Through the course of this document, we describe the epidemiology of American Indian pedestrian injury and then identify possible prevention options and implementation strategies. Finally, we describe known successes and recommend next steps for prevention of pedestrian injuries for American Indian communities.

Quantitative Results:
The Epidemiology of AI/AN Pedestrian Crashes

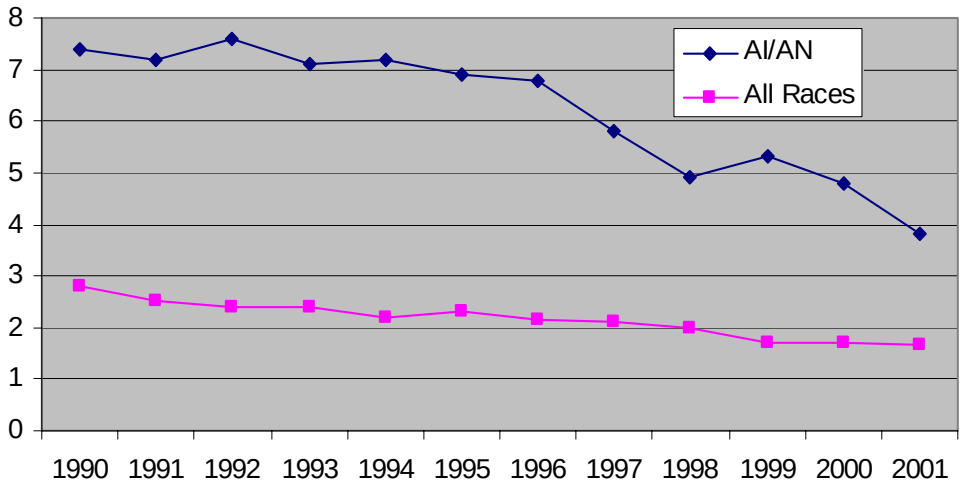
Introduction

Understanding the details and characteristics surrounding pedestrian crashes is key to planning effective prevention strategies. Many factors are associated with the risk of being involved in a pedestrian crash. Pedestrian and motorist demographics, pedestrian and motorist behavior, and roadway characteristics all impact the risk to a pedestrian. Increased pedestrian crash risk has been associated with rural areas, areas of low income, reduced levels of education, proximity to bars, alcohol intoxication, roadway speed, self-reported alcohol abuse, and other roadway characteristics such as road design, traffic controls, and lighting (Campos-Outcalt, 1997). Other factors that play a contributory role include roadway type and characteristics, motorist and pedestrian behavior, and protective ordinances and laws pertaining to the pedestrian. Understanding the 'who, what, when, where and why' of pedestrian crashes which involve American Indians should help to target activities and identify at-risk populations for educational and other prevention strategies.

For this report, factors contributing to fatal pedestrian crashes obtained from the national injury surveillance data were examined to determine the contributing factors associated with these elevated rates of pedestrian fatalities. These contributing factors can be divided into three principle categories: 1) human behavior, on part of the driver or pedestrian; 2) demographic characteristics, such as alcohol usage patterns and poverty; and 3) roadway design and functionality.

Although AI/AN pedestrian fatality rates remain consistently higher than those for all other race and ethnic groups, they have been decreasing over the last decade. Figure 1 illustrates the changes in the age-adjusted fatality rate over time from 1990 to the present (CDC, WISQARS – latest data entry). States which have high rates of pedestrian injury and death tend to have AI/AN populations that have elevated rates of injury and death. Nationally, there is a disparity between the age-adjusted pedestrian fatality rates among AI/AN when compared to other races. Table 1 compares the relative rates of AI/AN pedestrian fatality per 100,000 population to all other races by state for 2003. States with a high level of racial disparity (elevated relative rates) for pedestrian injury also have elevated measures of poverty (% AI/AN living below poverty) and increased rurality (persons per square mile).

Figure 1. Age Adjusted Fatality Rate per 100,000 Population, 2001.
Source: WISQARS – Latest Data Entry.



There are many factors that influence pedestrian crash risk. There are issues of roadway design, pedestrian behavior, driver behavior, and environmental conditions that combine to result in a crash. In addition, there are issues of availability of medical care that may impact injury severity and lethality of pedestrian crashes. These factors are both predictable and preventable but also require the investment of resources. Alcohol affects pedestrian behavior and driver behavior and is a co-factor in as many as 56.3% of adult pedestrian deaths of Native Americans. Rurality and low income levels are commonly associated with increased risk of pedestrian injury. Lower income groups tend to drive less and walk more, thus increasing exposure and increasing relative risk.

Table 1. U.S. AI/AN Pedestrian Fatality Rate, 2003. Source: FARS

State	Rate/100,000 Population
Alaska	4.62
Arizona	9.98
Colorado	5.13
Florida	1.42
Georgia	3.51
Michigan	2.72
Minnesota	4.74
Nebraska	5.80
Nevada	5.94
New Mexico	4.84
North Carolina	6.39
Oklahoma	1.92
Oregon	1.75
South Dakota	7.61
Tennessee	10.94
Washington	7.04
Wyoming	16.49
Average	**5.37**

Methods

Demographic data were obtained from a number of national organizations and institutions to illustrate important characteristics of the AI/AN population in the United States. Data sources included the United States Census Bureau, the Bureau of Indian Affairs, Indian Health Service, and the Substance Abuse and Mental Health Administration. Data elements related to population characteristics were acquired from these agencies for each of the 585 United States American Indian / Alaskan Native Tribes and all 50 states. These data elements included tribal registry, tribal population by both age and gender, poverty rates, unemployment rates, and self-reported rates of alcohol use and abuse.

Pedestrian crash data involving AI/ANs that resulted in fatalities were also obtained from a number of sources. AI/AN pedestrian fatalities were obtained from the National Highway Traffic Safety Administration Fatality Analysis and Reporting System (FARS), the Centers for Disease Control National Center for Injury Prevention and Control (WISQARS), and vital statistics death record data which were collected from all 50 states. Data elements collected included crash characteristics, roadway characteristics, and demographic information.

Finally, crash data involving AI/AN pedestrian fatalities were obtained from state Departments of Transportation for fatal pedestrian crashes which occurred in the eleven states targeted for investigation by project staff. States for which fatal crash characteristics were collected included: Arizona, New Mexico, Utah, Minnesota, Mississippi, Montana, Oregon, South Dakota, and Wyoming. Data elements included crash characteristics, roadway characteristics, and demographic information.

Data Limitations

The NHTSA FARS database has limited reporting with regards to pedestrian race. Although the reporting of race has improved phenomenally within the past few years, almost 12% of records still lack information regarding race and ethnic background. For these analyses, these records were removed. In addition, counts of American Indian fatalities by state differ between the FARS records and records retrieved from state vital records. FARS counts and the associated CDC WISQARS counts ranged from 2% - 32% fewer than those counts reported by state vital records. States for which the aforementioned was true included those states which used a centrally-based Office of the Medical Investigator (State Coroner) to produce death certificates. Within the majority of these states, the centralized Office of the Medical Investigator performs autopsies and physical examinations for tribal entities on contract. Sometimes these death investigations are reported and included in national fatality counts, sometimes they are not. Hence, data regarding AI/AN pedestrian fatality is limited and probably undercounts to some degree the incidence of fatality.

The Typical AI/AN Pedestrian Fatality

The typical AI/AN pedestrian fatality in the United States in 2003 occurred in a rural area, in the months of summer on a Saturday between 9:00 PM and 6:00 AM. The road was an undivided two lane major rural collector, at a non-intersection location, without a crosswalk, with no traffic controls (82%) present, no street lights (50%) and vehicle speeds over 50 mph (74%). This incident most frequently involved males 35 to 39 years of age. The top contributing factors in these crashes were 'pedestrian in roadway' (84%) and 'pedestrian not visible' (19%). The pedestrian had consumed alcohol in 56.3% of these crashes. The mean blood alcohol concentration (BAC) of these pedestrian fatalities was 0.23 mg/dL.

The Who, What, When, Where, and Why of AI/AN Pedestrian Crashes

Who

In the United States, the main at-risk group for pedestrian fatalities among American Indians is male adults between the ages of 35 and 49 years (61% of all fatal AI/AN crashes). Figure 2 illustrates the AI/AN pedestrian fatality distribution by age and sex in 2003. Differences in age and sex distribution among AI/AN fatalities emerge when comparing these distributions among roadway classifications and among rural and urban locations. AI/AN pedestrian fatalities that occur on an interstate or state highway segment characteristically involve more males with peaks at the 15 – 24 and 35-49 age groups. AI/AN pedestrian fatalities occurring on municipal or county roads tend to follow the national age and sex distribution for pedestrian injury, highlighting the 'at-risk' group. Additionally, Figure 3 illustrates the age and sex distribution of the driver or drivers that were involved in fatal AI/AN pedestrian crashes. Younger drivers tend to be more involved in AI/AN pedestrian crashes than older drivers.

Figure 2. AI/AN Pedestrian Fatality Distribution by Age and Sex, 2003. Source: FARS .

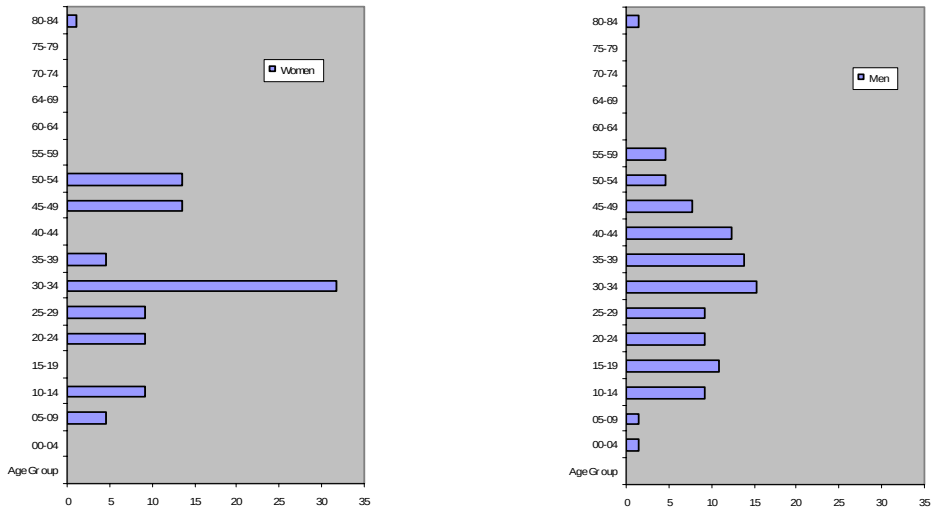
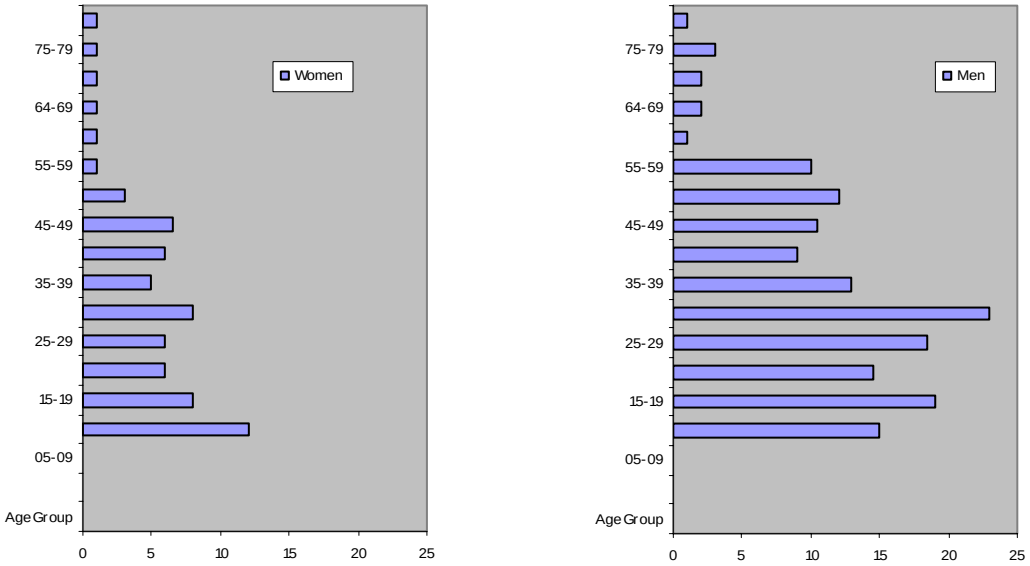


Figure 3. Driver Characteristics of AI/AN Fatal Pedestrian Crashes. Source: FARS.



What

Environmental factors such as roadway characteristics also are associated with increased risk. Rural communities are at higher risk and tend to have fewer traffic control devices, fewer lights, higher vehicle speeds, higher vehicle traffic flows, lowered pedestrian traffic flows, and limited pedestrian facilities. These factors all contribute to increased danger for the American Indian pedestrian. Lack of sidewalks or other pedestrian facilities reduce the separation of pedestrians from traffic, putting pedestrians at significant risk both within villages and towns and along rural highways where high speeds guarantee a fatal outcome when a crash occurs. Table 2 shows pedestrian fatalities by roadway characteristics for AI/AN pedestrian, for 2003.

The urban principal is the roadway class where many fatal AI/AN pedestrian crashes occur, followed by the rural arterial roadway, the rural collector and local rural roads and streets arterial. The urban principal arterial is a roadway designed for the high volumes of people at high speeds for long travel distances which is minimally interrupted. At higher speeds the probability of an AI/AN being killed in a vehicle collision is significantly greater than on local roads. This is reflected in the data which shows that over 50% of all AI/AN pedestrian fatalities occur on roads with speeds limits greater than 50 mph.

The route variable depicts who is responsible for the up-keep and functionality of the road. For AI/AN, the most often fatal roadway type (route variable) is a State Highway (for non-AI/AN, the most deadly is municipality).

Table 2. Roadway Characteristics for AI/AN Fatal Pedestrian Crashes (FPC), 2003. Source: FARS.

	AI/AN FPC (%)
Traffic Control Devices	
No Controls	81.0
Traffic Control Signal	7.2
STOP Sign	5.0
YIELD Sign	1.5
Other Regulatory or Warning Sign	5.6
Roadway Profile	
Level	67.8
Grade	17.2
Hillcrest/Sag	6.9
Lanes of Travel	
1-2 Lanes	64.4
3.-4 Lanes	25.3
5 or More Lanes	10.3
Traffic Way Flow	
Undivided (Two way Traffic)	47.6
Median – No Barrier (Divided Highway)	32.5
Median – With Barrier (Divided Highway)	15.0
Reservation Jurisdiction	
Yes	16.3
No	83.7
Artificial Lighting (Relating to Nighttime Crashes)	
Present	32.8
No	67.2

Traffic controls are devices used to control traffic flow and improve roadway safety. These devices can include posted speed limit signs, stop lights, pedestrian warning signs, and other signs with safety information. Most AI/AN and all other ethnic group pedestrian fatalities occur at locations in which there were no traffic controls (81%). This perhaps underscores the importance of such devices in the prevention of pedestrian fatalities.

Other roadway characteristics such as the width of the road, or number of lanes, traffic-way flow, and lighting are physical components that make the crash location more or less dangerous for pedestrians. During the analyses of FARS data, it was found that undivided, unlit, two lane roads are the most dangerous for AI/AN pedestrians, representing 76% of all AI/AN fatalities. It should be noted that both AI/AN and all other races fatal pedestrian crashes seldom occur in road construction or maintenance zones.

Human behaviors which have been previously associated with elevated rates of pedestrian fatality have included alcohol consumption, pedestrian and motorist interactions, risk taking behaviors associated with young adult males, and the inability of children under the age of 10 to make safe and accurate decisions about crossing traffic

alone. Inter-community transportation choices represent a unique behavior that might also contribute to elevated injury and fatality rates for AI/AN. Patterns associated with drinking such as proximity of pedestrian crashes to bars have also been identified.

Alcohol consumption is a variable associated with pedestrian crashes whether it is on the part of the pedestrian or the driver of the motor vehicle. Alcohol-involved pedestrian fatalities occur more frequently among AI/AN than all other races. FARS data suggests that alcohol was involved in 56.3% of AI/AN pedestrian fatalities, while non-AI/AN pedestrian fatalities involved alcohol only 31% of the time. More urban AI/AN pedestrian fatalities involved alcohol than rural pedestrian fatalities (75% vs. 68%). In addition, the mean BAC of intoxicated AI/AN pedestrian fatalities remains significantly higher than the mean BAC of intoxication among all other pedestrian fatalities, (0.23 vs. 0.128). Certain age- and sex-related groups that emerge as important groups for alcohol related pedestrian crash prevention activities are illustrated in the following figures, which outline the age and sex distribution for those crashes which indicated some level of pedestrian and driver alcohol involvement. These groups include males aged 10-14 and 25-49 and females aged 25 – 39 years.

Figure 4. BAC Levels for Alcohol Involved AI/AN Pedestrian Fatalities, 2003. Source: FARS.

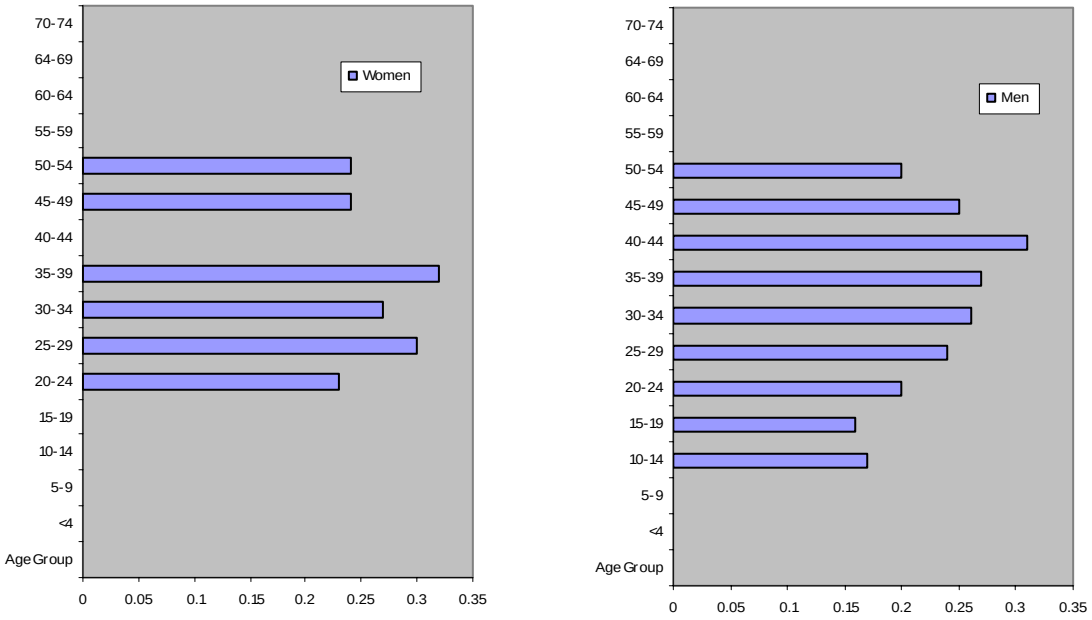
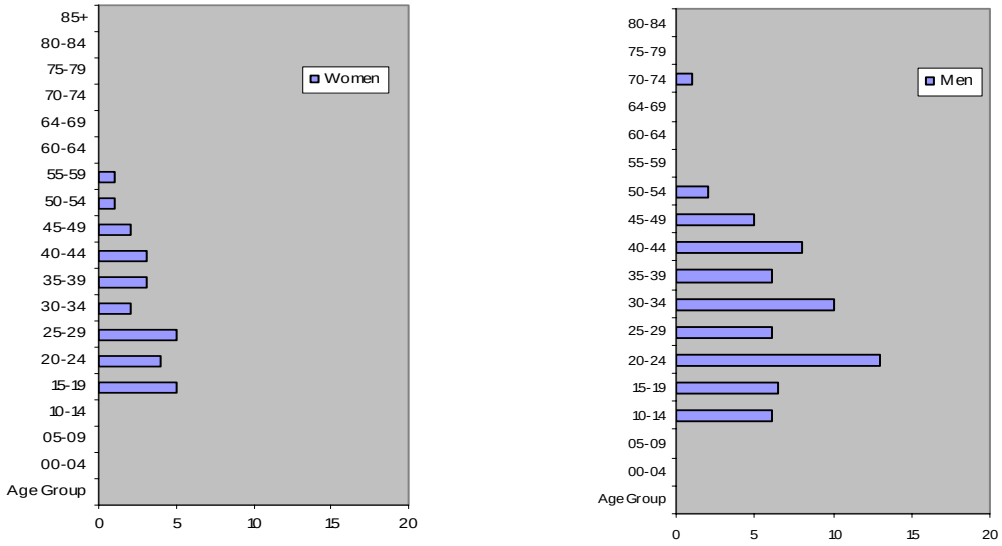


Figure 5. Drinking Driver Characteristics of AI/AN Fatal Pedestrian Crashes.
Source: FARS



Other factors that contribute to pedestrian injury in Native America include motorist and pedestrian behavior. Motorist behaviors that can contribute to a fatal pedestrian crash include motorist speeding and lack of compliance with traffic laws. Pedestrian behaviors that contribute to pedestrian injury among AI/AN include pedestrian lack of visibility, alcohol use, inattention, and walking within the roadway. Such behaviors contribute to elevated American Indian pedestrian crash rates. Inattention in young children and improper crossing behavior often result in pedestrian injury. Children under the age of eight, who cross streets alone, are more often involved in crashes. Children at this age are unlikely to cross streets safely and correctly. Other pedestrian behaviors that increase the risk of injury include the use of state and federal highways as corridors for intercommunity pedestrian travel, often combined with hitchhiking both on and off reservation.

Finally, drinking behavior among American Indian males contributes significantly both to the occurrence and lethality of pedestrian crashes. Large proportions of American Indian males involved in fatal pedestrian crashes were drinking prior to their crash (58.5%). An even larger population of AI/AN females involved in fatal pedestrian crashes were also drinking prior to their crash (72.7%). This appears to be an emerging trend and have significant consequences even outside of the pedestrian safety area. Many fatalities occur near bars in cities and towns, as well as bars located along highways near reservations because of liquor sale restrictions on reservation. Blood Alcohol Concentrations (BAC) of American Indians involved in fatal crashes are quite high. Compared to the national standard BAC for a legally intoxicated driver of 0.08 mg/dL, American Indian pedestrian fatalities in 2003 had a mean BAC of 0.23 mg/dL, suggesting a high level of impairment associated with the pedestrian.

When

Pedestrian crashes among American Indians occur most commonly at night. Early evening and late night pedestrian crashes are usually associated with drinking behaviors and pedestrian visibility, though daytime pedestrian injuries are common among children and the elderly. Table 3 compares the time of day AI/AN pedestrian crashes occurred. Most rural pedestrian fatalities occurred in the dark (73.5%), while the majority of urban pedestrian crashes occurred in the daylight (41%). Lack of visibility of pedestrians often contributes to both frequency and severity of pedestrian injury. The effect of visibility on pedestrian crash risk is compounded in rural areas and along higher speed rural highways. Pedestrian fatalities occur more frequently during the weekends (Friday and Saturday – 44.7%) than the normal work week.

Table 3. Time of Day, AI/AN Fatal Pedestrian Crashes, 2003.

	AI/AN Crashes (%)
Time of Day	
Dark	49.4
Dark but Lighted	24.1
Daylight	21.8
Dusk/Dawn	4.7

Where

Nationally, American Indian pedestrian crashes occur most frequently in rural areas both on and off tribal lands. States with larger populations of American Indians and Alaskan Natives are also the states which have higher rates of AI/AN pedestrian fatality. These states as shown in Table 4 include: South Dakota, Arizona, North Carolina and Washington. In every comparison, AI/AN crude and age-adjusted fatality rates were higher for AI/AN than other ethnic groups. Rural states with larger AI/AN populations emerged as having higher rates of AI/AN pedestrian fatality.

Table 4 U.S. AI/AN Pedestrian Fatality Rate, 2003. Source: FARS

State	Rate/100,000 Population
Arizona	9.98
North Carolina	6.39
South Dakota	7.61
Tennessee	10.94
Washington	7.04
Wyoming	16.49

Figure 6. Typical High Speed Rural Highways
(No signing or other pedestrian facilities)

Crash locations within states were analyzed using FARS data. Perhaps most numerous and lethal are the AI/AN pedestrian crashes which occur along one to two lane segments of undivided high-speed urban and rural highways. These urban highway pedestrian crashes account for 35.6% of the American Indian pedestrian fatalities in 2003. These crashes often cluster around rural towns and tribal communities that are bisected by these high-speed highways. Similar to pedestrian crashes in urban areas, American Indian pedestrian crashes occur more frequently near bars, in areas that lack pedestrian facilities. The rural highway pedestrian crashes account for 27.5% of the AI/AN pedestrian fatalities in 2003. Sidewalks are often absent on the largely rural roadways that are between villages or cities yet lead to important reservation areas. Finally, the locations of these crashes are often distant from medical care leading to delays in emergency treatment.

Table 5. Location of Fatal AI/AN Fatal Pedestrian Crashes in US, 2003. Source: FARS.

	AI/AN Crashes (%)
Roadway Class	
Rural Arterial	17.2
Rural Collector	13.8
Urban Arterial	28.7
Rural Local Road/Street	13.8
Rural Interstate	10.3
Urban Interstate	6.9
Urban Collector	6.9
Urban Local Road/Street	2.4

Motorist and pedestrian interaction is another important contributing factor in fatal pedestrian crashes. Pedestrian behavioral elements were investigated by analyzing 'relationship to roadway' information found in the FARS data. For AI/AN fatal pedestrian crashes, the location of the vehicle (motorist) involved in the pedestrian crash was most often the roadway - 94% of all fatalities. Similarly, non-AI/AN motorists are also primarily on the roadway when they collide with pedestrians (89.8%). The significance of these statistics is that motorists seldom strike AI/ANs who are on the median or sidewalks. It should be noted however that 2.5% of AI/AN pedestrian fatalities occurred on the shoulder or the roadside of a highway.

Pedestrian location with respect to roadway describes the location where the pedestrian was struck. The most common location in an AI/AN pedestrian fatality is in the roadway, at a non-intersection (67.8%) - a significantly higher percentage than all other pedestrian fatalities. Table 6 compares non-motorist location for AI/AN pedestrian fatalities in relation to roadway and functions.

Table 6. Relation to Roadway for AI/AN Fatal Pedestrian Crashes, 2003. Source: FARS.

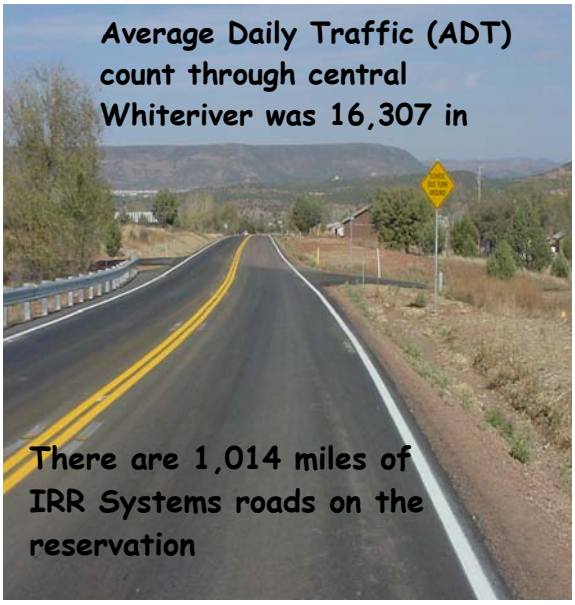
	AI/AN Crashes (%)
Relation to Roadway	
On Roadway	94.4
On Shoulder	1.2
Roadside	1.2
Other	3.2
Relation to Junction	
Non–Intersection	67.8
Intersection Related	18.4
Interchange Related	8.1
Unknown	5.7

Rural and Urban Pedestrian Fatalities

Nationally, rural pedestrian crashes are more often fatal than urban crashes. This is often due to higher vehicle speeds associated with rural areas as well as longer travel distances to medical care for those pedestrians who survive their crash. There are more rural pedestrian fatalities among AI/AN than all other race and ethnic groups. Because AI/AN pedestrian fatalities occur in both urban and rural settings at rates that exceed those of other races/ethnicities, it is possible that the high overall AI/AN pedestrian death rates mask important differences in mortality between urban and rural settings, and there might be unique issues in each setting that need to be addressed as possible preventive strategies.

Again, FARS data was collected on single and multiple pedestrian crashes for 2003 for which ethnic and race information was available. Analyses were conducted to elicit characteristics of the individuals involved in the crash, driver and pedestrian, as well as characteristics of the environment surrounding the crash. Analyses compared rural to urban crash groups using the FARS definition of rurality. Data collected from the CDC WISQARS system was used to compare urban and rural fatality rates using the Census 2000 definition of rurality. Using data collected from the CDC WISQARS system, the AI/AN pedestrian fatality rate per 100,000 population was calculated for rural and urban groups. Rural locations were found to have a higher AI/AN pedestrian fatality rate per 100,000 population than urban areas (5.9 deaths vs. 3.75 deaths per 100,000 population).

Figure 7. Typical high speed State route through Reservations.



Demographics of fatal pedestrian crash victims were compared among rural and urban crash types. Males are equally killed in urban and rural pedestrian crashes, while slightly more females are killed in rural areas than urban areas (16% vs. 10%). Rural AI/AN killed in pedestrian crashes are distributed across age categories from 15 - 44 years. In urban areas, primarily males aged 30 – 49 are involved in fatal pedestrian crashes. In rural areas, the principal at-risk group for AI/AN pedestrian deaths is males between 15 – 24 and 35-39 years. Figure 8 and 9, compare the pedestrian fatality for AI/AN by age and sex for urban and rural locations. Furthermore, the mean age of an AI/AN pedestrian fatality was lower among rural crashes than urban crashes (32.4 years vs. 41.3 years).

Figure 8. Rural AI/AN Pedestrian Fatalities, 2003. Source: FARS.

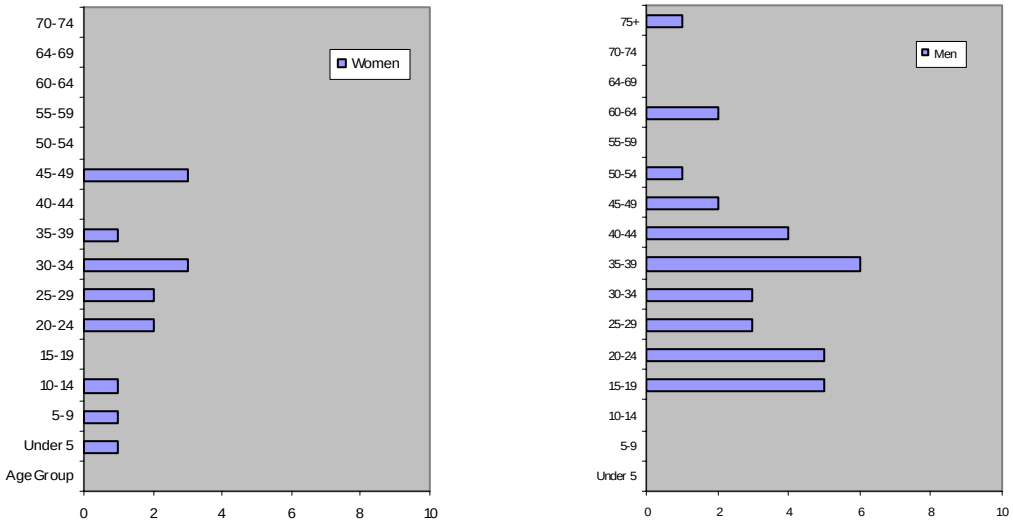
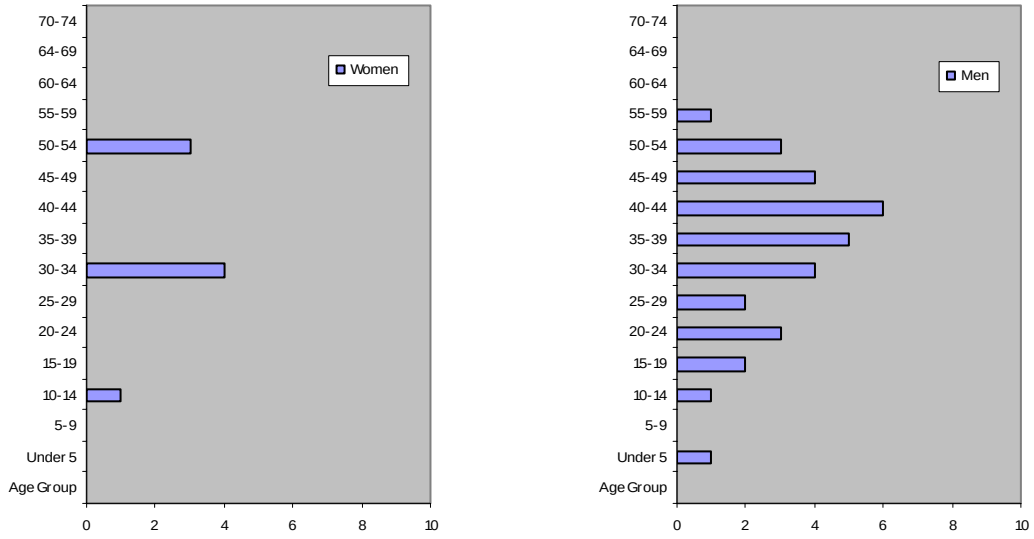


Figure 9. Urban AI/AN Pedestrian Fatalities, 2003. Source: CDC WISQARS.



Characteristics surrounding the environment of the pedestrian crash were analyzed. Differences in crash characteristics associated with fatal AI/AN pedestrian crashes in the United States during 2003 are represented in Table 7. Crash characteristics common among urban AI/AN fatalities included their occurrence within the roadway, on municipal roads and major arterials. Urban crashes were also more likely associated with a level roadway profile (85.7%), two lanes of traffic, and a clearly marked median with no barrier. Urban crashes occurred most often outside of reservation jurisdictions, in the dark, with greater alcohol involvement. Urban crashes occurred most frequently on the weekend. Rural AI/AN fatal pedestrian crashes occurred on segments of state highways and interstates, within the roadway. Rural crashes were most likely to be associated with a level roadway profile (64.4%), two lanes of traffic, and an undivided highway segment. Rural crashes tended to occur in the dark, with noted alcohol involvement on the part of either the driver or the pedestrian. Rural crashes also tended to occur most frequently on the week day.

A comparison of urban to rural crash characteristics showed qualitative similarities in many categories. However, statistically significant differences in magnitude were observed between rural and urban groups in all crash characteristics except time of day, hit and run designation, and day of the week. Higher percentages of rural deaths occurred on the roadway compared to urban crashes. A higher percentage of urban pedestrian deaths showed alcohol involvement on the part of the either the driver or pedestrian.

In addition to comparisons found in Table 2, presence or absence of traffic control devices between urban and rural crash sites was explored. Urban crashes more often involved artificial lighting than rural crashes (46% vs. 5.2%). Traffic control devices related to intersections were also more common among urban AI/AN pedestrian fatalities. Rural AI/AN pedestrian crash locations more often lacked crosswalks, signals, and other pedestrian facilities.

Table 7. Selected crash characteristics of AI/AN fatal pedestrian crashes, United States, 2003. Source: FARS

	URBAN CRASHES (%)	RURAL CRASHES (%)
Crash Characteristics		
Reservation Jurisdiction		
Yes	0	28.9
No	100	71.1
Time of Day (Crash)		
Dark	24.3	72.3
Daylight	24.3	21.3
Dawn/Dusk	2.8	0.0
Dark/Lighted	48.6	6.4
Alcohol Involvement (BAC>0.8)		
Yes	69.2	54.2
No	30.8	45.8
Day Of Crashes		
Weekday (M-TH)	38.5	60.8
Weekend (F-S)	61.5	39.2
Roadway Profile		
Level	87.5	64.4
Grade	14.3	22.2
Hillcrest/Sag	0.0	13.4

Table 8 describes pedestrian characteristics associated with fatal crashes. Male pedestrians are overrepresented in each group (urban 80%, rural 70.4%). There was no significant difference between urban and rural groups with regards to pedestrian alcohol involvement as indicated by blood alcohol content analysis post-mortem. The top contributing factors in the crash attributed to the pedestrian for urban crashes were walking in roadway and improper crossing. The top contributing factors in the crash attributed to the pedestrian for rural pedestrian fatalities were walking in the roadway and not visible to the driver.

There were significantly more male drivers involved in rural pedestrian crashes than urban crashes (70% vs.15%). The age distribution of the drivers, the state of residence of the driver, and the frequency of issued citations for the crash were not significantly different between urban and rural groups. No difference in mean age was observed among rural and urban drivers. A top contributing factor in the crash attributed to the driver in both urban and rural crashes was hit-and-run.

Table 8. Selected AI/AN pedestrian characteristics associated with fatal AI/AN pedestrian crashes, United States, 2003. Source: FARS.

	URBAN CRASHES (%)	RURAL CRASHES (%)
Pedestrian Characteristics		
Males	80	70.4
Pedestrian Drinking (Males)		
Yes	54.3	58.6
Top Contributing Factor		
Walking in Road	28.2	54.1
Improper Crossing	20.5	6.2
Not Visible to Driver	7.7	18.8
Dart/Run into Road	23.1	2.1
Failure to Yield	5.1	0.0
Other	15.4	8.8

Table 9 indicates the mean BAC for the driver and pedestrian involved in fatal AI/AN pedestrian crashes. Mean BAC was calculated using imputed BAC information. Many different BAC tests are administered to drivers, although not all drivers receive the test. Drivers sometimes refuse a BAC test, the test is not administered, or the information is missing from the data. Similarly, pedestrian crash victim BAC is also obtained, often more frequently because of coroner protocol. No significant differences between urban and rural BAC for the driver and pedestrian were observed.

In 74% of rural AI/AN fatal pedestrian crashes, the vehicle speed exceeded 50 mph, compared to 22.8% of urban crashes.

Table 9. Comparison of mean driver and pedestrian blood alcohol concentration for fatal AI/AN pedestrian crashes, United States, 2003. Source: FARS

Blood Alcohol Concentration (BAC)	**URBAN CRASHES (mean)**	**RURAL CRASHES (mean)**
Pedestrian	0.23	0.23
Driver	0.16	0.19

Table 10. Selected statistics for Rural and Urban AI/AN Pedestrian Fatal Crashes, 2003. Source: FARS.

	URBAN CRASHES (%)	RURAL CRASHES (%)
Artificial Lighting		
Yes	46.0	5.2
No (Dark)	23.0	70.8
Crosswalk Present	20.0	<1.0
Intersection Related Crash	28.2	6.3
Signalized Intersection	12.2	<1.0
No Controls	87.7	65.8
Speed		
Mean Speed (mph)	44.4	53.8
> 50 mph	22.8	74.0

Cross-Cutting Issues

Risk factor analyses were performed to identify those environmental characteristics that were commonly associated with fatal AI/AN pedestrian crashes. Risk factors determined as positively correlated with increased risk included population density and poverty. States with the lowest population density (rural states) and with greater than 25% of AI/AN residents reporting living below the poverty level had the highest rates of pedestrian injury. These states included New Mexico, Arizona, South Dakota, North Carolina, Wyoming, Washington, and Tennessee.

Increased pedestrian injury risk associated with rurality may be attributed to the emphasis of rural state transportation enhancements on the maintenance and expansion of highways instead of pedestrian travel. Among many communities in rural states, smaller communities and area hubs are often both connected and bisected by state highway. These highways often serve as the main road through these communities hence serve as both a higher speed connection to other communities, and the center of community activities. In addition, AI/AN communities may lack coherent inter- and intra-community transit which leaves only two choices for transportation, walking/cycling along higher traffic volume highways, or driving in an automobile. Adding alcohol consumption to walking or cycling as a means of inter-community travel compounds the danger to the pedestrian.

Increased pedestrian risk associated with poverty may be attributed to increased exposure. Individuals who earn lower monthly incomes spend higher percentages of their gross monthly income on transportation. Individuals living below poverty mitigate high transportation costs by using public transit, walking, or cycling. Often, the high cost of automobiles, automobile insurance, and automobile maintenance prohibits individuals from purchasing automobiles. Hence, these same individuals may walk more frequently than individuals who can afford other means of transportation. Increased walking translated into increased exposure to pedestrian crashes. In rural areas, this problem is

compounded by the lack of organized inter- and intercommunity transit. AI/AN pedestrians frequently walk along state highways as a means of intercommunity transportation both on and off the reservation.

Finally, low income populations are at greater risk for all types of unintentional injury (Baker, 1992). In addition, low income populations are also at greater risk for substance abuse (Denny, 2003). As demonstrated in the review of FARS and WISQARS data, alcohol involvement is more prevalent among AI/AN pedestrian fatalities than other races. This high prevalence of alcohol involvement and the associated increased risk to the pedestrian is consistent with the extremely high percentages of AI/AN individuals living below poverty.

Figure 10. U.S. Population Density Per Square Mile, 2000.

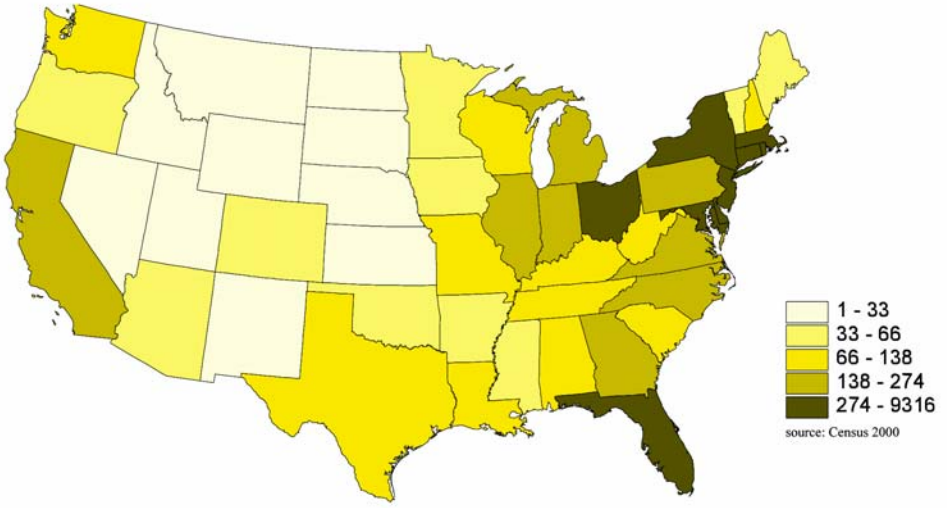
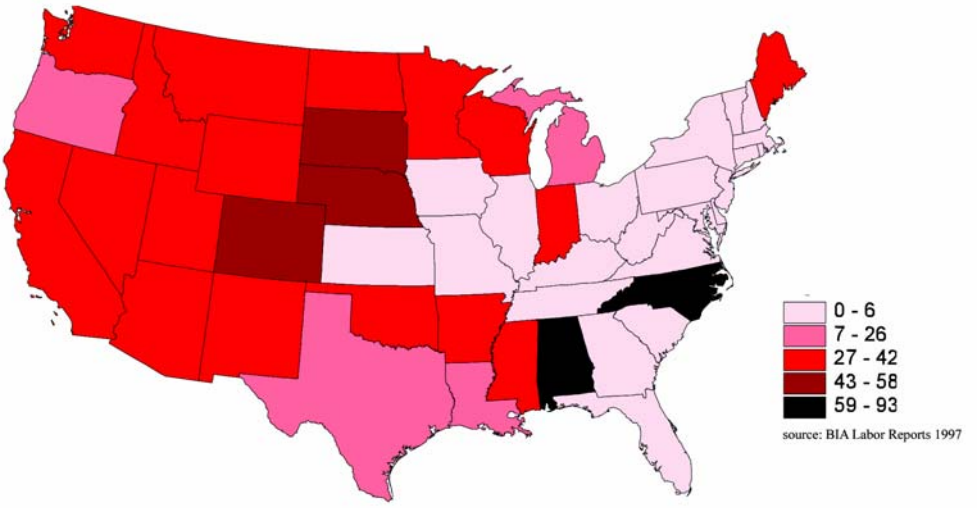


Figure 11. Percentage of AI/AN Individuals Living Below Poverty, 1997



Conclusion

AI/AN have the highest rates of pedestrian injury among all other races in the United States. These high rates of pedestrian injury have been modestly decreasing from the 1990s, but remain over two times the rate of injury for pedestrians of all other races. States with elevated rates of AI/AN pedestrian fatality include Arizona, South Dakota and Wyoming. These states have AI/AN pedestrian fatality rates between 7 and 17 per 100,000 population. These states have certain population characteristics in common. These states are intensely rural, ranking among the lower 25th percentile for persons per square mile, and are also increasingly poor. Bureau of Indian Affairs poverty measures indicated that states with high AI/AN pedestrian fatality rates also had between 35% and 58% of AI/AN residents living below the poverty level. Extreme poverty and rurality contribute greatly to the disparity between AI/AN pedestrian injury rates and all other races. In addition to the negative effects of poverty and rurality, substance abuse and more frequent exposure to potential injury compound the danger to AI/AN.

Common crash characteristics involving AI/AN pedestrians were described. Common characteristics included the crash occurring at night, in an unlit area, on a two-lane, undivided, level roadway, and off the reservation. AI/AN pedestrian crashes involved alcohol in 56.3% of fatal crashes, with a mean pedestrian BAC much higher than all other crashes.

AI/AN pedestrian injury risk groups were described. Pedestrian crashes occurring among these adult males generally involve alcohol, often with high BACs. Additionally, the site of these crashes is generally along segments of state highway or interstate, at night, often occurring within the roadway. In New Mexico and Arizona, these crashes often occur off-reservation in close proximity to the reservation or off-reservation communities that serve as local centers. Often these crashes are associated with on-foot inter-community travel which occurs frequently between reservations and non-reservation communities. Sometimes, this inter-community foot travel has to do with drinking behaviors because many tribes do not sell alcohol on the reservation. Characteristics of these crashes include lack of pedestrian visibility on the roadway, alcohol involvement on part of the pedestrian or motorist, a near-reservation location, an undivided, unlit two lane high speed highway or interstate.

Other identified ‘at-risk’ groups included primarily male children under 13 and the elderly. Among all risk groups, males 15 – 44 in age had the highest pedestrian fatality rates per 100,000 population. Pedestrian crashes among children and the elderly generally occur in on-reservation communities or in off-reservation municipalities. In rural communities and on-reservation communities, these crashes are associated with a lack of pedestrian facilities and other traffic control devices.

AI/AN fatal pedestrian crashes which occurred at urban and rural locations were compared using CDC WISAQARS and FARS data for analysis. Using CDC WISQARS data the AI/AN pedestrian fatality rate was calculated among rural and urban groups. Rural locations had higher fatality rates per 100,000 population than urban areas (5.9 deaths vs. 3.75 deaths). At risk groups were compared by age and sex among urban and

rural AI/AN populations. Rural at risk groups included males 15 – 39 years and females 25 – 39 years. Urban at-risk groups were slightly older including males from 35 – 49 years and females from 35 – 39 years. Mean age of rural AI/AN pedestrian fatalities was younger than urban fatalities (32.4 years vs. 41.3 years).

Differences in AI/AN pedestrian crash characteristics were observed between urban and rural groups. Rural crashes tended to occur in on rural segments of state highway and interstate, involve alcohol, and had higher incidence of hit-and-run involvement. Urban crashes more frequently occurred on municipal roads, involved less alcohol on part of the driver or pedestrian, had lower hit and run frequency, and more often had a clearly marked division of traffic flow such as a painted line or concrete median. Urban crash locations also more often had artificial lighting (46.2%) than rural crash locations (5.2%) as well as other traffic control devices such as signals and crosswalks. Although differences were observed in the percentage of alcohol involvement between rural and urban groups, no significant difference in rural versus urban BAC for drivers or pedestrians was observed. The top contributing factors of AI/AN fatal pedestrian crashes were compared among rural and urban groups. The top contributing factors of rural crashes were ‘walking in the roadway’ and ‘pedestrian not being visible’ to driver. The top contributing factors for urban crashes were ‘improper crossing’, ‘walking in the roadway and darting into the road’. Among rural crashes, the driver was more often cited as responsible for the crash than among urban crashes. Urban drivers were more likely to have had a previous citation than rural drivers.

Factors such as lack of inter-community transit in rural or on-reservation areas, the presence of high speed highways which double as main community roads and alcohol associated behaviors of pedestrians in these areas contribute to the increased risk of rural AI/AN pedestrians compared to their urban counterparts. Furthermore, the impact of rurality on lethality in terms of increased response times for EMS may increase the rift between rural and urban fatal pedestrian crash rates. Finally, poverty, rurality, and poverty-related substance abuse patterns may contribute to the increased pedestrian fatality rates among AI/AN in the United States.

Qualitative Results:
American Indian Community Attitudes on Pedestrian Safety

Introduction

Community attitudes impact the safe interactions between pedestrian and motorist as well as guide the development and implementation of pedestrian safety intervention activities. An assessment of these attitudes is useful for individuals planning to affect behavior change within communities or for groups wanting community participation and input on pedestrian safety activities.

Methods

In order to conduct a preliminary assessment for change and of strategies that might be most effective in addressing the high rates of pedestrian injury among AI/AN communities, two series of focus groups were conducted (2002) in nine AI/AN communities distributed across the United States. The first focus group series targeted individuals who worked as service professionals somewhat related to pedestrian injury. The second series of focus groups targeted individuals who were currently engaged in or had completed some kind of pedestrian safety intervention ranging from coordinated enforcement, engineering, and education activities, to holding an annual Walk Our Kids to School Day event. The goal of recruitment of focus group participants was to include an ethnically representative group of people from a variety of occupations. Participants that were identified included state and tribal law enforcement, community health workers, fire department and EMS representatives, safety technicians, safety engineers, city planners, community members, business owners, tribal elders, and educators.

Each series of focus groups lasted approximately one and one half hour. Participants were asked to write responses and then discuss questions designed to elicit feedback on topics including: community beliefs and philosophical orientation as to who is responsible for pedestrian safety, strategies to develop public support for pedestrian safety, appropriate safety interventions, and the appropriate functions of key players. The second series of focus groups which targeted AI/AN community members already active in pedestrian safety efforts focused on the reasons behind creating such efforts, the key players involved, details about group dynamics, safety intervention activities, and information needed to complete such interventions. In addition, the second series of focus group participants were asked to evaluate the success of their intervention experience, as well as to identify successes and barriers associated with their intervention efforts.

Results

The first series of focus groups identified community attitudes with regard to pedestrian safety and preferred methods of increasing public awareness and safety interventions. There were 187 respondents from nine communities. During the course of this first series of focus groups, participants were asked to answer the question “In your opinion, what is the division of responsibility for pedestrian safety between the individual and the community?” As illustrated in Table 10, the majority of participants indicated that individual responsibility for pedestrian safety was equal to community responsibility for pedestrian safety. However, when the question was rephrased to address the safety of the elderly and children, larger percentages of respondents indicated that the community possessed a greater responsibility for pedestrian safety than the individual.

Table 10. Focus Group Responses to 'Who Is Responsible for Pedestrian Safety?’.

% Individual	% Community	Responses	% Responses
50	50	126	67.4%
40	60	29	15.5%
80	20	10	5.3%
70	30	9	4.8%
60	40	6	3.2%
90	10	3	1.6%
30	70	2	1.1%
20	80	1	0.5%
10	90	1	0.5%
100	0	0	0.0%
0	100	0	0.0%

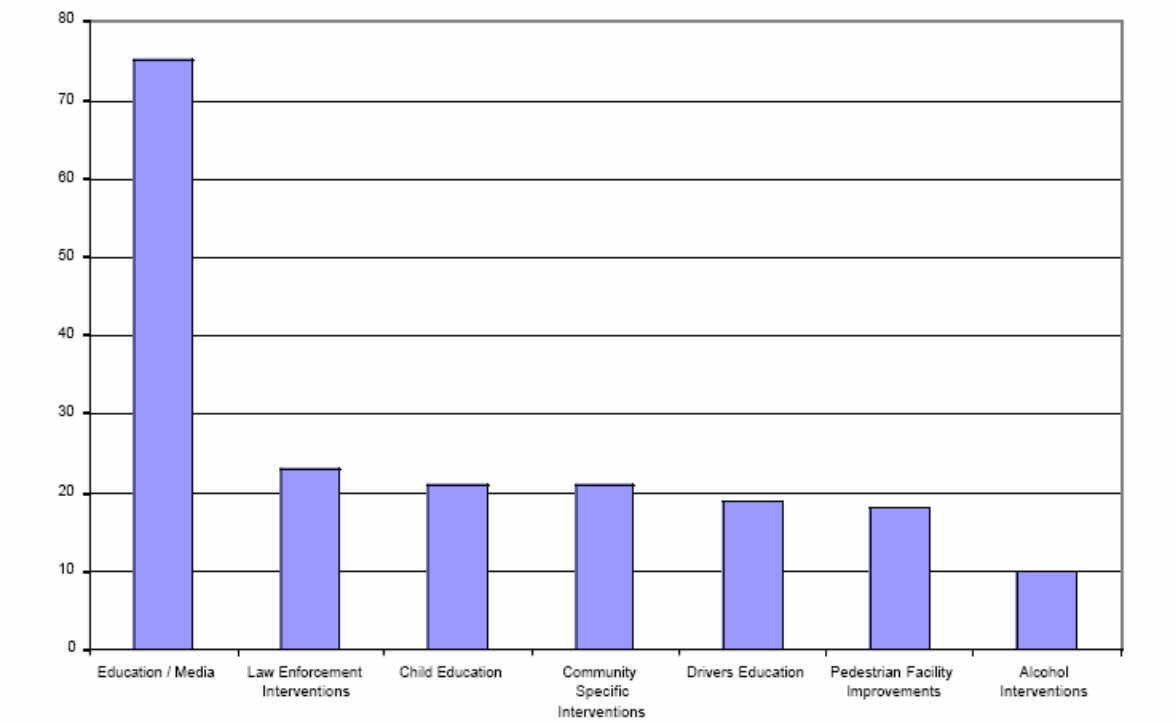
Table 11. Focus Group Responses to 'Who Is Responsible for Pedestrian Safety?’.

% Individual	% Community	Responses	% Responses
50	50	70	37.4%
70	30	33	17.6%
60	40	27	14.4%
30	70	18	9.6%
20	80	13	7.0%
40	60	12	6.4%
80	20	10	5.3%
90	10	3	1.6%
10	90	1	0.5%
100	0	0	0.0%
0	100	0	0.0%

Focus group participants were also asked how they could best develop support for pedestrian safety efforts. Respondents indicated that the best methods for increasing

public awareness surrounding pedestrian issues included: a pedestrian safety media campaign (38%), meetings with stake holders (14%), and meetings with community leaders (14%). Respondents least frequently indicated driver's education (6%) and meetings with community members (7%) as the best methods for increasing support for pedestrian safety efforts. Focus group participants favored educational and media-based interventions and law enforcement solutions as potential safety interventions. Very few participants were interested in interventions that targeted alcohol-related pedestrian injury. Figure 12 illustrates the number of participants who favored each potential intervention.

Figure 12. Interventions Favored by Focus Group Participants.



In addition to identifying interventions that might positively impact pedestrian safety among AI/AN communities, participants were asked to comment on roles for community members who work on pedestrian safety issues. Highly recommended solutions from the focus group participants are in bold.

Roles for State and Tribal Government

- Identify pedestrian injury as a health priority with appropriate funding allocations for community interventions and educational efforts.
- Support the work of a regional pedestrian injury advisory committee and local advocacy groups that support the reduction of pedestrian injury and death.
- **Allocate funding to address safety problems.**
- Fund shelters for intoxicated individuals.
- **Initiate and facilitate the enforcement of applicable laws (e.g. speeding, jay walking, liquor establishment service restrictions)**
- Promote alcohol abuse prevention.

- Provide funds to develop safe pedestrian walkways, lighting, and other needed changes to the physical environment.

Roles for Community

- **Develop awareness and education.**
- Identify high risk groups in the community, develop interventions for each group, and evaluate results of these interventions.
- **Create links with appropriate agencies who can offer technical assistance.**
- **Involve the community, specifically business, churches, and health promotion groups.**
- Support enforcement of pedestrian laws geared toward both drivers and pedestrians.
- **Promote collaborative work between communities, traffic engineering agencies, and law enforcement.**

Roles for Medical Service Professionals

- **Give presentations to the community and other sites to increase awareness of pedestrian issues.**
- Provide expedient medical services to rural areas.
- **Teach basic and advanced life support in rural communities to improve level of training of first-responders.**
- Assist with injury surveillance surrounding pedestrian injury.
- Give patient guidance regarding pedestrian safety and issues of alcohol use.

Roles for Educators

- **Train students how to handle pedestrian situations in real-life traffic settings.**
- **Driver education with pedestrian safety focus.**
- Train crossing guards.
- Increase awareness of where young children are when cars are backing out of driveways.
- Become more involved in pedestrian safety efforts particularly through school.
- Participate in Walk Our Kids to School Day.
- Discuss pedestrian safety issues with classes of school children.

Roles for Parents

- Gain awareness regarding pedestrian injury through parenting programs, community meetings.
- **Discuss pedestrian safety issues with their children.**
- Become more involved in safety campaigns (especially in school).

Roles for Law Enforcement

- **Enforce current drunk driving, public intoxication, alcohol server training, and speed limit/aggressive driving laws.**
- Teach children the importance of pedestrian safety.
- Patrol high risk areas for drunken pedestrians.
- **Coordinate collection of pedestrian crash information.**

- Enforce community speed limits principally along rural interstate and state highway.

Roles for Business

- **Enhance and enforce server training.**
- **Stop serving patrons who are seriously impaired in their ability to walk or think clearly.**
- Distribute reflective strips for clothing to intoxicated pedestrians.
- Close liquor establishments earlier.
- Provide lighting and safe walkways around business.

Roles for Planners and Engineers

- Work with community groups to evaluate high risk areas for poor road design and to develop positive roadway design changes, including increasing the time allowed for pedestrians to cross the street, painting and improving curbs and curb ramps, installing large signs to alert pedestrians and motorists of high risk areas, installing traffic control devices.
- Work with community groups to assess areas with high pedestrian flow or areas with multiple mid-block crossings and suggest appropriate engineering countermeasures.
- **Add or enhance lighting along dangerous roads or highway segments.**
- **Consider bicycles and pedestrians when making improvements to roadways.**

Focus groups participants who had been or were currently engaged in pedestrian safety efforts were asked to characterize their efforts, the organization of their pedestrian safety advisory group, and assess the effectiveness of their efforts. Focus group participants cited high rates of pedestrian injury (54%) and community concerns about pedestrian safety (26%) as key reasons why their community had chosen to engage in pedestrian safety efforts. Furthermore, participants noted that law enforcement (29%), private citizens (26%), and medical professionals (15%) were the groups most concerned with pedestrian safety initially. The majority of participant's had an advisory board or group which met primarily on a monthly basis (61%), which was chaired by someone (had a lead person or facilitator – 79%) and kept and distributed minutes regularly (84%). Although most groups had a designated leader, the groups made decisions through majority vote (60%) or via consensus (16%). Respondents felt that it was important for the advisory group to have the same ethnic mix as the community in which they were working (74%) and consequently most groups had a similar ethnic mix (65%).

Education, public awareness, and community outreach activities were the main activities of safety efforts conducted by focus group respondents (67%). These groups generally collected, analyzed, and reviewed local data on pedestrian injury (84%). The majority of these data was obtained either through local law enforcement (45%) or Indian Health Service (37%). Few participants noted receiving pedestrian safety expertise from outside sources (27%). Focus group participants were then asked to indicate what other information or resources their group might need from outside sources. Participants were asked to indicate whether the assistance would most effectively be conveyed via personal communication or written materials. Figure 14 illustrated focus group participants

responses about what types of resources and information they might need and how these materials should be presented.

Figure 13. Key Players Involved in Pedestrian Safety Efforts, 2002.

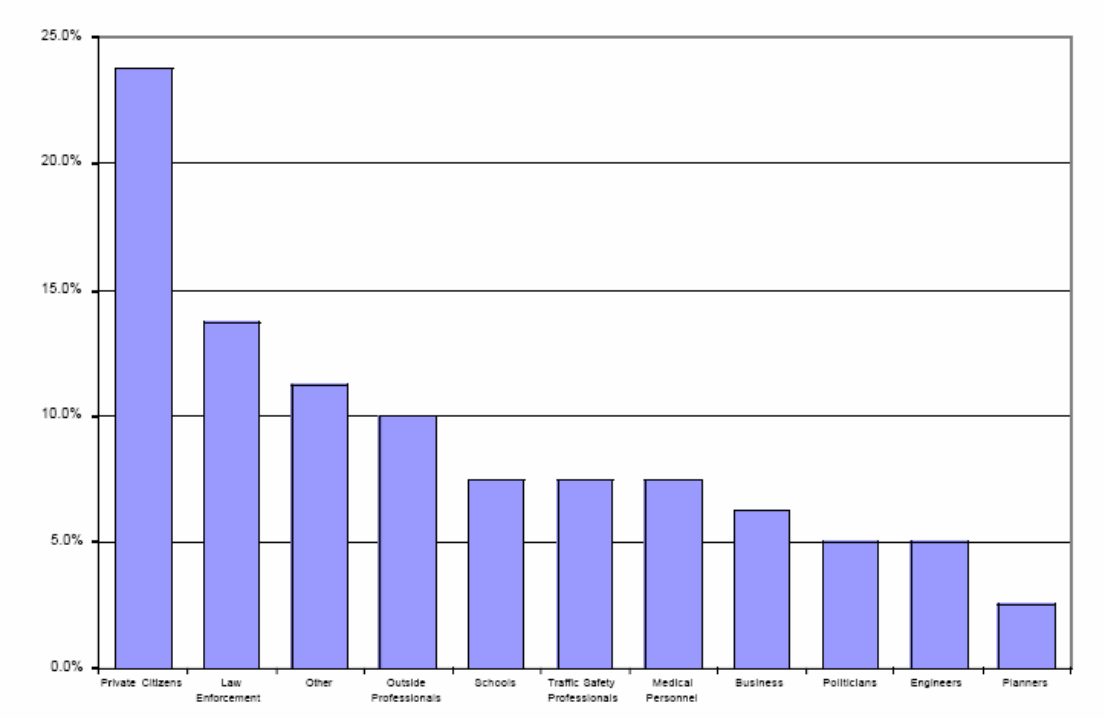
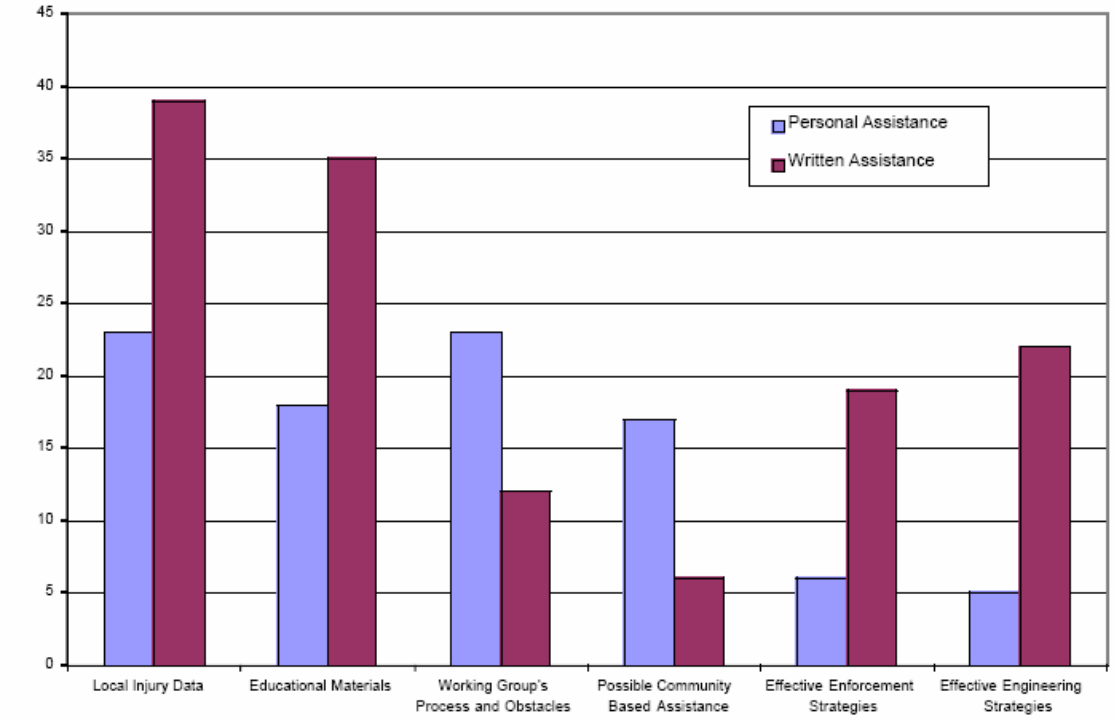
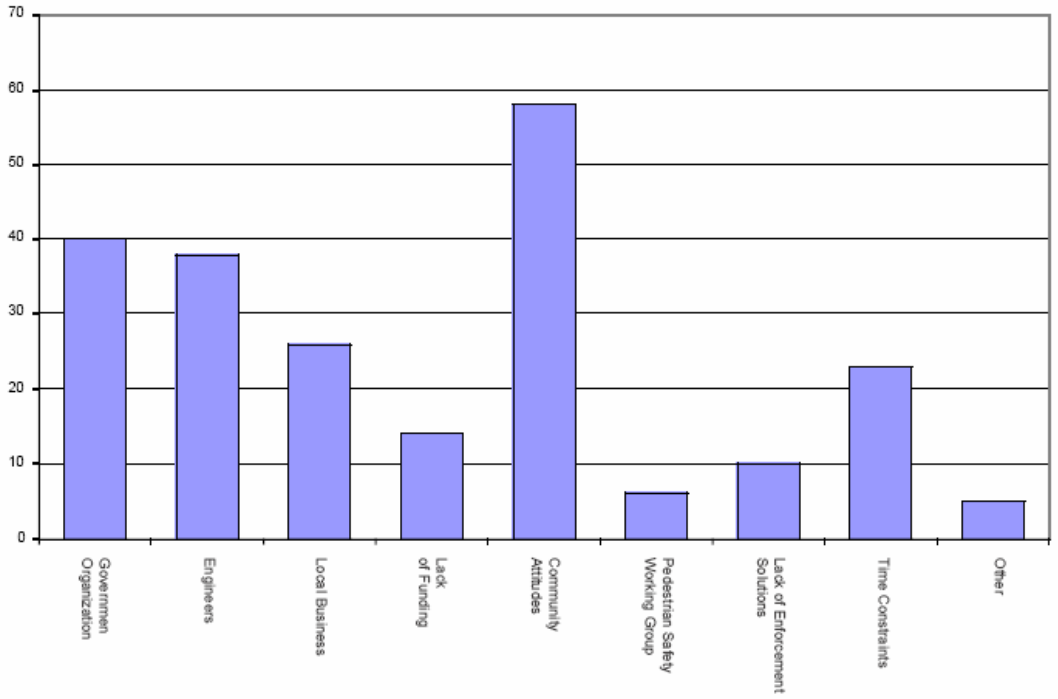


Figure 14. Assistance Needs of Communities for Pedestrian Safety Projects, 2002.



Finally, focus group participants who had been or currently were engaged in pedestrian safety efforts were asked to evaluate the success of their intervention activities. Many groups indicated some level of success in advancing pedestrian safety in their community (51%). When asked the particulars of their group's success, respondents indicated stronger sense of community (33%), more people walking (18%), and injury reduction (14%) as their group's major accomplishments. Few respondents indicated that the targeted population was now at reduced risk for pedestrian injury (12%) or that unexpected groups were positively affected (7%). Groups were asked to identify major barriers to the progress of their pedestrian safety efforts. Figure 15 displays focus group participant responses with regard to barriers they encountered during their efforts. Participants were asked to indicate how strong a system is now in place in their community to handle future pedestrian safety problems. Most participants indicated their community's system was moderately strong (44%), fairly weak (26%), strong (16%), or very strong (14%).

Figure 15. Barriers to Pedestrian Safety Endeavors, 2002.



Conclusion

The overall results of the focus groups suggest that American Indian communities, once informed, may be ready to develop pedestrian safety interventions that are tailored specifically to their community. The results suggest that community beliefs about individual versus community responsibility for protecting intoxicated pedestrians may be a barrier to promoting community action to address this problem. Similarly, the lack of interest in engineering modification and the focus on education to change behavior, which often has limited impact may indicate a need to focus on education or public awareness efforts regarding the relative success of various interventions.

The development of a broad-based community coalition concerned about pedestrian crashes is critical to the success of programs designed to reduce pedestrian injury in American Indian areas. Every community should assess its own pedestrian crash problem and develop solutions based on activities which have been demonstrated previously as successful. This community coalition should have a diverse membership which reflects the same ethnic make up of the community and have representatives from multiple disciplines related to medical services, traffic safety, law enforcement, and community planning. Successful groups generally have a lead person or facilitator who keeps and distributes minutes on a monthly basis.

Groups whose aim it is to help foster the activities of these community coalitions need to support safety efforts via personal technical assistance as well as the dissemination of written materials. Focus group respondents felt that they needed personal assistance with the working group's process and finding solutions to the working group's obstacles. Personal assistance was also needed to collect and analyze local pedestrian injury data. Written assistance should be provided to such community-based coalitions and should include local injury data, educational materials, and effective engineering and enforcement strategies. Finally, renewed emphasis on directly reducing pedestrian risk is an important point of focus for any pedestrian safety intervention.

Successful Approaches to Coordinated Pedestrian Safety Programs

Introduction

Research conducted during the last 20 years on the successful implementation of coordinated pedestrian safety programs has concluded that a multi-faceted approach to pedestrian injury reduction is most successful. This multi-faceted approach combines the ideas and personnel from three distinct disciplines to create a comprehensive strategy for reducing pedestrian injury. Traffic safety professionals refer to this multi-faceted approach as the 'Three E Approach" which includes education, enforcement, and engineering. Each of these components needs to be incorporated into a comprehensive strategy for reducing pedestrian injury within American Indian communities.

Education

Education of pedestrians and drivers to the risk of injury can affect behavior if the drivers and pedestrians use the information to protect themselves, avoid dangerous situations or drive more carefully. Among American Indian pedestrian safety interventions, education has been one of the least successful strategies to reduce injury because it often does not reach those most at risk, and the effects may not become sustained unless community awareness, behaviors, and priorities change. Education is most effective when combined with other changes, such as legal procedural changes, law enforcement or engineering changes. However, education is usually well accepted by the public because it recognizes the individual rights of pedestrians and drivers and puts responsibility of injury avoidance on the shoulders of individuals rather than the community. Education works best when used in combination with enforcement and engineering strategies.

Many education efforts have been focused on increasing the pedestrian's knowledge of safe crossing behavior. However, education campaigns should also focus on specific groups identified as impacting the safety of AI/AN pedestrians. These campaigns would target AI/AN children and the elderly particularly in rural settings. In addition, these campaigns would focus on driver interaction with pedestrians either through driver's education and graduated driver's licensing programs or via media campaigns. Finally, education activities should address alcohol-related pedestrian safety issues. Increased training of liquor outlet owners and alcohol servers should be provided, particularly near reservations that have alcohol serving restrictions. Educational outreach that is focused on excessive drinking behavior should be included as an educational strategy.

Enforcement

The use of laws concerning seatbelts, motorcycle helmets, and vehicle speeds have been a very effective means to reduce injury from motor vehicle and motorcycle crashes. However, some have argued that it has come at the cost of reducing individual rights and freedoms as well as incurring certain economic costs, such as longer travel times and increased vehicle costs. The trade off of costs and benefits for new laws is often a complex social and financial decision that requires broad community input. Enforcement is meaningless without laws to enforce and laws are useless if they can not be enforced. Laws that can reduce injury include speed reduction in areas of high pedestrian use, prevention of driving while intoxicated, monitoring and enforcement of safe alcohol server laws, and removal of individuals who exhibit public drunkenness to a safe venue. In Gallup, New Mexico a van that identified and put individuals in protective custody and transported them to an alcohol detoxification program reduced public intoxication and pedestrian injury, but also infringed upon the perceived rights of individuals who wanted to drink. Broad community support for the policy and enforcement by police resulted in improved safety to the pedestrians.

Law Enforcement is an important component of any traffic safety intervention. A number of successful law enforcement activities have been identified nationally and locally as being successful in reducing pedestrian crashes. The first law enforcement strategy involves the “pedestrian sting” law enforcement operation. This operation is carried out by local law enforcement officers in a very visible way, incorporating both media campaign and safety education into a comprehensive tool for reducing pedestrian injury. During a pedestrian sting operation, law enforcements posing as pedestrians have positive contact with motorists that violate laws relating to pedestrians who include yielding behavior, speeding, aggressive driving, and red light running. Pedestrian behavior, too, is modified by enforcing laws pertaining to pedestrians. Positive contact with violators is maintained by providing written feedback to identify which behavior was in violation of the law, the importance of the law in terms of protecting pedestrians, safety tips for motorists and pedestrians, and local pedestrian injury data. Other successful law enforcement strategies for preventing pedestrian injury include the enforcement of alcohol server laws. In most states, it is unlawful to continue to serve an individual that is already intoxicated. Since frequently AI/AN pedestrian fatalities that occur in rural areas are associated with very high BACs, targeted enforcement of alcohol server laws may impact pedestrian injury. Similarly the enforcement of public drunkenness laws may also reduce pedestrian injury, primarily if violators are given a safe ride to a sobering facility.

Engineering

The design of safe roadways that recognize pedestrian needs as well as motor vehicle needs continues to be a challenge that is rarely met in rural American Indian communities. The needs of motor vehicle drivers have usually taken precedence over the needs of pedestrians resulting in roadways that are often fast and dangerous to pedestrians. However, relatively simple, inexpensive engineering changes can be instituted that can markedly improve pedestrian safety. Improved lighting in areas of

high pedestrian use, particularly during evening hours, can give drivers an opportunity to avoid collisions when traveling at high speeds. Additionally, traffic lights, speed humps and bumps, pedestrian overpasses, sidewalks, and islands can all have a role in specific situations.

Engineering solutions may require an initial investment for a benefit that will be realized for years after. On one roadway in New Mexico, the installation of lighting between two bars reduced the pedestrian death toll from 7-8 per year to 1-2 per year. The cost of the lighting was $30,000 and the electricity for the lighting was $3,000 per year. Mapping can identify those communities and those roadways or intersections most commonly associated with pedestrian injury. Often by redesigning a roadway with better lighting, traffic and pedestrian separations, or reduced speed, pedestrian injuries can be reduced. Mapping has identified several roadways and roadway segments with extremely high and consistent pedestrian crash rates. Investigation of these sites has yielded rich information for prevention. Lighting is often inadequate and leads to nighttime crashes as pedestrians are not seen by drivers. Bars are often located nearby and intoxicated pedestrians are less able to protect themselves from injury on dark roadways with vehicles moving at high speeds. Because many reservations ban alcohol sales on the reservation, those who seek alcohol must travel to a bar at the border of the reservation and often become stranded after drinking and attempt to walk or hitchhike home. The phenomenon of travel to an off reservation location to drink followed by efforts of an impaired pedestrian to return home has created a predictable time and location associated with this type of pedestrian crash.

Another pedestrian safety issue faced by rural communities and American Indian reservations is the location of large interstate / state highways through small towns and reservation communities. This bisection of rural communities puts high volumes of higher speed traffic through town roads which often serve as town centers for these communities. Hence, the mixing of pedestrian traffic with heavier, out-of-town, motor-vehicle traffic results in increased risk for the pedestrian. Several engineering countermeasures have been suggested to decrease this risk. These countermeasures focus on clearly communicating to the driver that they have entered a community where vehicle travel speeds are lower and more people are walking as well as reducing the speed of the vehicle traffic as it enters the community. Engineering countermeasures which have been described as successful at addressing these issues include: clearly posting lowered speeds through communities, narrowing the lane width (under 10 feet) as the highway enters the community, using adequate signing and marking and creating a clear entryway gateway into the community.

Community-Based Interventions

Native American Communities present unique challenges for pedestrian safety. The culture, identification of leaders, at-risk populations and attitudes about prevention all differ from what is described in non-Native American communities. In Native American communities, appreciation of the importance of elders, the use of the native languages, the perception of time and space, the attitudes about alcohol and alcoholics all can lead to a resistance to working on the problem. In some Native American communities, it is

believed that if you discuss a crash that might occur in the future, you will bring the event about. The opposition of elders who may not see the importance of the problem could destroy momentum developed in other groups. Thus, elders must be shown respect, educated about the problem, and allowed to participate in possible solutions. The process for decision making must be sensitive to the cultural values of the Native population. This cultural sensitivity may result in more investment in time and resources while all appropriate tribal voices are heard, but will ultimately lead to the best chance for a successful project.

Focus group responses among American Indian tribes and pueblos have illustrated the importance of community-based solutions to community specific problems. Many successful pedestrian safety programs have been community-based representing coalition. Although pedestrian injuries are distributed throughout the states and nation and occur in each Native American reservation, the solutions must be applied locally and require community involvement and support. Pedestrian injury is an ideal problem to apply principles of local and state partnerships. The state may be able to provide analysis of data, analysis of previous research, and technical support and resources to apply to specific identified local areas. The local community can provide the political power and will to implement prevention strategies, the insight into acceptable and effective communications within the community and the access to community resources needed to address the problems. Leadership, diverse representation and continuity within community groups are important principles that can become difficulty to maintain in small communities because of the volume of serious issues for which a relatively small group of community advocates must be stretched. The nurturing, education, and maintenance of community advocacy groups by state and national organizations are a critical element of a local response to pedestrian injury. Because the magnitude and complexity of pedestrian problems can require enormous resources and time, smaller demonstration projects may initially assist the development of the community group as well as address an important problem. Even small amounts of money can often lead to additional donations and good will increasing the enthusiasm and support for a community-directed project.

Community focus groups from Native American communities have identified a variety of Interventions felt to be promising for pedestrian injury prevention. These include school based driving education and injury prevention curriculum, frequent transportation for pedestrians between common destinations, alcohol prevention education, detoxification centers, improved lighting for pedestrian at dangerous locations, server training and enforcement, expanded protocols to identify intoxicated pedestrians and take them to a safe place, increased law enforcement in dangerous areas, signage and walking paths, improved lighting, and traffic calming measures. All of these solutions depend upon the presence of a persistent and well organized community coalition. The building and nurturing of such a coalition was also recommended.

The approach to Native American Pedestrian Safety needs to have an urban, a rural, and a reservation element. It also needs to address the unique problems of each age group and the unique problems of alcohol intoxication. It needs to involve education, engineering, legal enforcement, and be culturally sensitive and culturally respectful. It must

incorporate the resources of the community, and the state, and be based upon local and national data.

One of the ways to achieve this is to take advantage of the long tradition of Native Americans walking and running in their communities by organizing a Walkable Community Advocacy group for each tribe. This group will not only be concerned with pedestrian safety, it will also extol the benefits of walking for health, weight loss, prevention of diabetes, and community safety. The group will identify ways of making the community a more walker-friendly, pedestrian-friendly place, and in the process will advocate for pedestrian safety. Since tourism is a significant source of income for many tribes, a walkable and safe community will augment the environment for tourists. Specific steps that should be considered are:

- Culturally appropriate signage that clearly identifies the community and welcomes the drivers while warning them of speed limits and penalties.
- Education in schools and driver education concerning pedestrian injury. Students can be the victim or the perpetrator of a motor vehicle versus pedestrian crash. They must understand their risks and responsibilities.
- Alcohol must be addressed as a significant co-factor in pedestrian injury. Alcoholics need reflective clothes. Vans need to take them from bars and streets to detoxification programs. Safe areas to drink and rest must be provided. Servers who continue to give drinkers more alcohol after they are severely intoxicated, must be punished and removed from bars or bars must close.
- Engineering changes including lighting, roadway separators, walking paths and speed bumps should be constructed in area where data has identified a high risk of pedestrian injury.
- Police need to monitor dangerous roadways to identify the presence of high-risk individuals (both pedestrians and drivers) and to remove intoxicated or speeding drivers from the highway.
- The long and positive tradition of Native American running and foot travel should be promoted to provide a focus for safe streets and safe walking paths for the young and old as a way to maintain the fabric of the Native American Society.

FHWA/NHTSA Pedestrian Roadmaps to Success

FHWA/NHTSA has identified a set of simple steps that can be applied successfully to pedestrian safety problems. These steps include organization, commitment, data review, problem identification, creation of a plan, and implementation of a plan, evaluation and adjustment of a plan.

Organization involves bringing together key individuals and groups to determine the importance and priority for the problem. In the case of a dangerous intersection, the groups might involve business owners in the area, parents of students attending the local school, police, EMT’s, survivors of a pedestrian injury, doctors and nurses.

Commitment occurs as the individuals in the group understand the significance of the problem to them, their families and friends and determine to solve it. Often it requires personal experience with the problem as well as philosophical agreement.

Data review and problem identification require analysis of deaths and injuries in the community associated with pedestrian crashes and may benefit by outside expert technical support. Public health, IHS, and university resources may be most beneficial at this stage. Data presentation to coalition members must be done in a way that illustrates and clarifies the problem rather than making it too technical and confusing for a non expert coalition. The use of simple graphs and tables can often help in the process of data presentation.

Creation of a plan often requires a meeting of the group, review of data, consideration of alternatives, financial analysis, and political analysis. A group facilitator and outside expert advice can often help a community group to focus on a practical appropriate plan. Often several meetings may be necessary before consensus is reached, and a plan prepared. Maintenance of the coalition at this point is critical and often challenging.

Implementation is the stage that is most difficult because it requires the identification and utilization of concrete resources, paint, lights, concrete, and money to pay for it, and deployment of people to use the resources. Up until this point, ideas and discussion have been all that was required. Identification of resources usually requires involvement and governmental agencies, businesses, and individual donors. If connections are made early in the coalition development with these sources of support, implementation will be facilitated.

Evaluation is the step that is often forgotten, because the lights are already in, the cross-walk painted, the sidewalk poured. Yet without evaluation neither the community group nor anyone else who could learn from the project will know if it was successful or if adjustments need to be made. Evaluation should be considered during development of the plan so that the plan will be created with evaluation built into it. Evaluations can focus on measuring behavior modification post-intervention such as counting the number of correct crossings before and after an educational campaign. Other methods of evaluation include the measurement of crash rates per pedestrian volume before and after an intervention.

Examples of Success

Descriptions of successful pedestrian safety interventions from AI/AN communities are provided below. Each was created and implemented by a community coalition representative of the community that was being served. Many of these interventions targeted a specific at-risk group identified by the review of pedestrian crash data and mapping of pedestrian crashes. Most of these activities were funded either through state traffic safety programs or the Indian Health Service.

Preventing Alcohol Involved Pedestrian Fatality

Laguna Pueblo and Navajo Nation

Date: 1992 - 1996

Contact: Na'Nizhoozhi Center, Gallup, NM (505) 722-2177

In Gallup, New Mexico, American Indians often use the shoulder of the interstate as an intercommunity pedestrian trail that connects reservations to other local communities. Often, intoxicated pedestrians who use this trail are victims of pedestrian crashes and overexposure to the elements. A coalition of local municipalities and tribal governments sponsored a van that identified severely intoxicated pedestrians and put these individuals in protective custody and transported them to an alcohol detoxification program. Within six months of the inception, the project reduced public intoxication and pedestrian injury. However, some groups in the communities felt that the van program infringed upon the perceived rights of individuals who wanted to drink. Broad community support for the policy and enforcement by police resulted in improved safety to the pedestrians.

Safer Inter-Community Pedestrian Travel Along the State Highway

Navajo Nation

Date: 1992 - 1993

Contact: Nancy Bill, Injury Prevention Specialist, Indian Health Service

In response to a 117% increase in pedestrian crashes in the Navajo nation border counties of San Juan and McKinley in New Mexico, a coalition consisting of Navajo tribal officials, New Mexico State Highway and Transportation Department, Indian Health Service, Law Enforcement, and area substance abuse treatment professionals convened to address pedestrian safety in the area. Through a review of police reports, medical examiner's investigation summaries, and the New Mexico State Highway and Transportation Department Traffic Safety Bureau records, pedestrian crash characteristics and locations were identified. Interviews were conducted with law enforcement officers, traffic engineers, and medical officials. Site-investigations were conducted to determine environmental factors and variables associated with the fatalities. Information collected allowed for a profile to be developed of the pedestrian, driver, vehicle, and environmental conditions involved in the accident. Crashes in the area primarily occurred on US Highway 666, a rural north/southbound highway located in the northern part of New Mexico. Pedestrian fatalities were scattered from mile marker 0.5 to mile marker 10. At

least 65% of all pedestrian fatalities occurred at mile markers 2.0 and 4.0. These crashes were occurring at night between two bars along the highway. Pedestrian intoxication was involved in the majority of the crashes. In order to reduce injury along this highway segment, the coalition recommended the installation of street lighting along the identified highway segment to assist drivers in avoiding pedestrians along the roadway. The cost of the lighting was $30,000 and the electricity for the lighting was $3,000 per year. The coalition recommended that law enforcement remove intoxicated pedestrians from the roadside when possible. These safety countermeasures reduced the pedestrian death toll from 7-8 per year to 1-2 per year. No highway associated pedestrian fatalities were observed for three years after the installation of the lighting.

Promoting Walkability for Community Health and Safety

Zuni Pueblo

Date: January 2001 – Present

Contact: Jerry Lee, Injury Prevention Specialist, Indian Health Service

In January of 2001 members of the Zuni community became increasingly aware and disturbed by the lack safe areas for walking and bicycling in their community. Members of the community came together to form the Zuni Walkability Advocacy Group (WAG), a group designed to research and resolve the issue of safety for pedestrians. According to crash statistics gathered from the Indian Health Service, members found that 74% of people struck by a motor vehicle were pedestrians, twenty-four percent were bicyclists, and two percent were rollerblades. It was also found that the majority of individuals involved in these accidents were between the ages of five and nine, and eighteen to twenty-nine. The locations of the problems were determined to be on New Mexico State Highways, or on roads within the Zuni reservation. Barriers to walking were also noted and determined to be: lack of sidewalks, lack of clearly marked crosswalks, and lack of clear safety signs.

Members of the Zuni WAG met once a month for a year as a working group, which identified the problems and developed specific solutions to address each problem. The first issue identified was lack of clear and visible crosswalks. Crosswalks on the reservation and on the state highway that were faded were re-painted. The next step was to identify areas where crosswalks would be beneficial. In those areas, cross-walks were painted, and safety signage was put into place. Other crosswalks were evaluated and repairs were made as needed.

The research conducted concluded that school age children were struck at higher rates than any other group; therefore an education curriculum was created and incorporated into the schools on the Zuni reservation and surrounding area. WAG members also felt that it was not enough to educate school children, but felt that the public as a whole needed to be educated on safe driving and safe walking behavior. An education campaign was then created which involved several public service announcements, a media partnership with the community access channel, radio stations, and the local newspaper. The WAG members also participated in a health fair, distributing safety information and incentives with safety tips and reminders printed on them.