

Driver and Pedestrian Comprehension of Pedestrian Law and Traffic Control Devices

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A nationwide survey was conducted to identify how well people understand pedestrian safety issues. The study focused on the respondents' assessment of pedestrian involvement in traffic accidents and knowledge of pedestrian-related traffic control devices and pedestrian-related laws. Responses from both pedestrians and motorists were included in the findings. Questionnaires were distributed at driver's license examination stations in each of the 48 contiguous United States. The American Association of Retired Persons (AARP) also distributed questionnaires to many of its members participating in a defensive driving course offered by the organization. From the examination stations, 3,595 completed questionnaires were returned, while 1,231 completed questionnaires were returned from the AARP. The surveys were disaggregated based on the personal experience and demographic characteristics of the respondents. These groups were tested using the chi-square method to identify statistically significant differences. The study found that a high percentage of the respondents are knowledgeable of proper pedestrian-vehicle interaction. Many of the respondents, however, appear to have a poor understanding of many of the pedestrian-related traffic control devices and issues related to safe pedestrian habits. While many of the disaggregated groups showed statistical differences, few showed practical differences that would justify the development of special programs to target specific groups, such as the elderly.

Pedestrian safety issues are particularly important to the transportation community because of the vulnerability of individuals using this mode of transportation. In 1992, the NHTSA reported that 5,546 pedestrian fatalities and an estimated 94,000 pedestrian injuries had occurred in the United States (1). The gravity of the results of pedestrian accidents can be seen in the disparity between pedestrian fatalities as a percentage of all traffic-related fatalities and pedestrian injuries as a percentage of all traffic-related injuries. In 1992 pedestrians accounted for 14.1 percent of all traffic fatalities, while pedestrian injuries accounted for only 2.8 percent of all traffic-related injuries (1).

Over the past two decades, several studies have analyzed pedestrian collision and conflict data. This research was conducted to study target groups for pedestrian safety, such as those by Knoblauch (2) and Reiss (3). Other researchers, such as Robertson (4) and Zegeer (5), have tried to determine the effectiveness of alternative pedestrian sign and signal messages. So far, little attention has focused on the comprehension of current pedestrian-related traffic control devices and laws. In 1980 and again in 1990, the Pedestrian Safety Committee of the Transportation Research Board identified "pedestrian comprehension of traffic control devices" as a priority issue (6). This study addresses this issue, as well as issues related to laws that involve pedestrian and vehicle interaction. If pedestrians and motorists do not understand the rights and obliga-

tions they have concerning their interaction, serious consequences may result.

Two government documents address the issues of traffic control devices and traffic laws. The FHWA periodically updates the *Manual on Uniform Traffic Control Devices* (MUTCD), which establishes guidelines for the installation of all traffic control devices throughout the United States. States are required to adopt this manual or develop and adopt one that closely conforms to it. The manual is the basis for the installation and use of all pedestrian-related control devices. The Highway Safety Act of 1966 made all states responsible for developing and implementing "a program to achieve uniformity of traffic codes and laws". The *Uniform Vehicle Code* (UVC), maintained by the National Committee on Uniform Traffic Laws and Ordinances, was selected to serve as the guide for the development of states' motor vehicle and traffic laws. For this study, the section of the code titled, "Rules of the Road," serves as the guide to issues related to pedestrian and motorist laws.

It is widely accepted that two pedestrian groups need special attention: the young and the old. While neither has received much attention with regard to traffic control devices, both groups demand consideration in the area of pedestrian safety. In 1992, pedestrians under the age of 16 had an estimated injury rate of more than 57 injuries for every 100,000 individuals. This rate is much higher than that of any other age group. For pedestrians over the age of 54, the fatality rate is 3.28 fatalities per 100,000 people and is nearly one percentage point higher than the next highest age group.

Unfortunately, the study and evaluation of younger pedestrians (15 years and under), is a complicated task, as indicated in a study conducted by Reiss (3). This study involved a series of detailed question-and-answer-sessions. While collecting information on the knowledge and level of understanding of pedestrian issues by the younger groups is important, the effort involved was deemed beyond the scope of this study. Instead, this study focuses on the driving population and places special emphasis on older Americans.

STUDY OBJECTIVES, METHODOLOGY, AND ANALYSIS

Two brief questionnaires were used to evaluate the respondents' understanding of safe pedestrian and motor vehicle interaction. The major objectives were (a) to identify specific traffic control devices that may be misunderstood by a number of respondents and (b) to evaluate the knowledge or awareness of various issues and traffic laws related to pedestrian safety. The methodology consisted of the development, distribution, and analysis of two questionnaires addressing these issues.

The research team was particularly interested in gathering the opinions of a diverse group of respondents. It was decided that the

investigation should be conducted in each of the 48 contiguous United States. To execute the study on a national level, two types of facilities were selected in each of the states as questionnaire distribution centers. The first of these involved the use of driver's license examination stations in cooperation with each state's department of motor vehicles (DMV). This type of facility was selected because it would ensure responses from both the driving and the walking public. The second type of location included 55 Alive training courses offered by the American Association of Retired Persons (AARP). This would provide the analysts with a set of responses from older citizens, who have been identified as a high-risk group for fatal pedestrian collisions.

Questionnaire Development

The questionnaire was designed to focus on a variety of pedestrian safety issues. The initial analysis involved an in-depth review of previous pedestrian studies, pedestrian-related traffic control devices addressed in the MUTCD, and pedestrian traffic laws provided in the UVC. Input also was sought from the following transportation safety groups: the American Automobile Association (AAA) Foundation for Traffic Safety, FHWA, and NHTSA. Using the information collected from those sources, a draft questionnaire was developed containing 25 questions. The questionnaires were then reviewed by the three safety groups, and contacts were established in each state's DMV. A large percentage of the comments received mentioned the length of the survey and the complexity of several of the questions. The safety groups agreed that a shorter questionnaire posed in simple language would assure a higher response rate. Based on these suggestions, a decision was made to use two survey forms. Respondents were neither asked nor expected to complete both forms. While some questions are identical on both the forms, most address unique pedestrian safety issues. The questionnaires are shown in Figures 1 and 2.

Each of the questions was carefully selected based on one of four types of information collected: (a) demographic characteristics, (b) problem assessment, (c) knowledge of pedestrian laws, and (d) knowledge of pedestrian traffic control devices. The first set of questions addresses the personal characteristics and experiences of each of the respondents. These questions are common to both Surveys I and II and ask for the respondent's gender, age, personal experience, and safety education. The responses were later evaluated to determine whether statistical differences exist between the various groups. The next set of questions is related to the respondents' assessment of various pedestrian safety issues. Topics include the use of alcohol by pedestrians, the significance of pedestrian fatalities, and the education of younger pedestrians. The third set of questions involves issues of pedestrian laws. State laws related to pedestrians, right-of-way at both midblock and intersection crossings and issues related to walking on or along roadways are addressed. The final set of questions deals with the respondents' knowledge and comprehension of various traffic control devices, including advance pedestrian crossing signs, pedestrian signals, and pedestrian signs in school zones.

After applying many of the changes suggested by the questionnaire reviewers, three pretests were conducted at two sites. These pretests included brief interviews with the respondents in order to evaluate any difficulty they may have understanding the questions. After each of the tests, observations and comments made by the respondents were weighed, and changes were made when deemed

appropriate. These tests, conducted to identify any complex or poorly worded questions, were considered important because the research team could not provide the staff to distribute the questionnaires and answer questions at the various sites around the country.

Data Collection

Because the purpose of this study was to collect information that could be applied on a national level for the development of safety planning and programming projects, data were collected from each of the forty-eight contiguous United States. The research team chose drivers license examination stations to distribute questionnaires to the public. The use of these facilities yielded a large volume of data without a large staff and provided a survey of both the driving and the walking public.

The DMV in each state was contacted before proceeding with the selection of the various sites. After contacts were established, each was asked to identify two examination stations in the state where the surveys could be distributed. The selection was based on criteria established by the research team. Because more than 75 percent of all pedestrian injuries and fatalities occur in urban areas, the contacts were asked to select at least one site within the state's largest metropolitan area (7). The remaining site was to be located in a separate city large enough to demand a need for pedestrian safety. The second criterion called for the selection of full-time examination stations. It was believed that full-time facilities would have a larger volume of customers, assuring a higher response rate and a more timely completion of the questionnaires for analysis.

The AARP was selected to assist in the distribution of questionnaires to the older group. Respondents were limited to participants in the AARP 55 Alive safety course. The task of selecting specific groups to be surveyed was given to the 55 Alive coordinators in each state. The coordinators were asked to apply the same criteria as was applied to the selection of the examination stations. Participants in the courses were asked to voluntarily complete the questionnaires.

Data Analysis

The questionnaires were sent to the examination stations and the AARP groups in late summer of 1992. The completed forms were returned over an eight-month period from September 1992 to April 1993. After the surveys were returned they were entered into a computer software program for analysis, Statistical Analysis Software (SAS). From the examination stations in the 48 contiguous states, 3,595 completed questionnaires were returned. From the AARP 55 Alive courses, 1,231 completed surveys were returned. There was a concern among the research team that the groups responding to the two questionnaires may be statistically different based on the demographic questions. Using SAS it was determined that no significant statistical differences exist between the groups responding to Surveys I and II.

After all the questionnaires were completed, summary statistics were calculated. The responses were disaggregated based on the responses to the demographic questions to create analysis groups. These analysis groups include the following:

- Experience or knowledge of a pedestrian collision,
- Pedestrian safety education,

Survey I

CITY _____
STATE _____



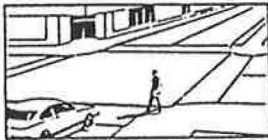

PEDESTRIAN SAFETY QUESTIONNAIRE

WE NEED YOUR HELP!

This questionnaire is part of an effort to reduce pedestrian injuries and deaths. The project is funded by the AAA Foundation for Traffic Safety. The Pedestrian Safety Institute of The University of Tennessee's Transportation Center is the research agency.

Please note that your participation is entirely voluntary. It will not in any way affect the outcome of your drivers license test. Please do not put your name on the questionnaire. Your completing and returning this questionnaire will be considered your informed consent.

If you are willing to help us improve pedestrian safety, please answer these questions to the best of your ability. Thanks for your help.

1. Have you or someone you know ever been involved in a pedestrian accident, either as a pedestrian or as a driver?
___ I have ___ A family member has ___ Someone else I know has ___ No one I know has
 2. Do you believe children are being taught about pedestrian safety in their school?
___ Yes ___ No
 3. Pedestrians account for about what percentage of all traffic related deaths?
___ 1% ___ 5% ___ 10% ___ 15% ___ 20%
 4. What do you believe is the single most likely reason why pedestrian accidents happen?
___ Driver error ___ Alcohol ___ Poor visibility
___ Pedestrian error ___ Other (specify) _____
 5. In the downtown area of a large city you may legally cross a street only at a traffic signal or where there is a painted crosswalk.
___ TRUE ___ FALSE ___ DON'T KNOW
 6. If a pedestrian is just beginning to cross the street in a crosswalk that does not have a pedestrian signal, you must slow down or stop to let the person finish crossing the road.
___ TRUE ___ FALSE ___ DON'T KNOW
 7. Assume you have just started crossing a street on a "WALK" signal, but the signal quickly begins flashing "DON'T WALK". This means there isn't enough time to cross, and you should return to the curb.
___ TRUE ___ FALSE ___ DON'T KNOW
- 
8. If sidewalks are provided, you may not legally jog on the road surface.
___ TRUE ___ FALSE ___ DON'T KNOW
 9. Assume you are at an intersection with a pedestrian signal that has a button labeled "Push Button for WALK Signal". The signal will immediately change to "WALK" when you push the button.
___ TRUE ___ FALSE ___ DON'T KNOW
- 
10. Assume you are at an intersection that lets you turn right on red after you stop. The pedestrian in the figure has just begun to cross at the crosswalk. He must wait and let you turn before he finishes crossing.
___ TRUE ___ FALSE ___ DON'T KNOW
- 
11. This sign is placed approximately 200 ft. in advance of a crosswalk.
___ TRUE ___ FALSE ___ DON'T KNOW
- 
12. Are you:
___ Male ___ Female
 13. Your age is:
___ Under 20 ___ 20-29 ___ 30-39
___ 40-49 ___ 50-64 ___ Over 64
 14. Have you reviewed your state's drivers license manual recently?
___ Yes ___ No

Please return this completed questionnaire to the person who gave it to you.
We appreciate your help very much.

FIGURE 1 Pedestrian safety questionnaire, Survey I.

Survey II

CITY _____
STATE _____


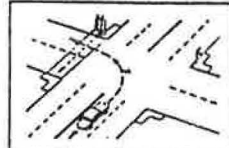


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Please note that your participation is entirely voluntary. It will not in any way affect the outcome of your drivers license test. Please do not put your name on the questionnaire. Your completing and returning this questionnaire will be considered your informed consent.

If you are willing to help us improve pedestrian safety, please answer these questions to the best of your ability. Thanks for your help.

1. Have you or someone you know ever been involved in a pedestrian accident, either as a pedestrian or as a driver?
____ I have ____ A family member has ____ Someone else I know has ____ No one I know has
2. Who do you feel should teach children about safe pedestrian habits?
____ School ____ Private Safety Organization
____ Home ____ Police
____ Church ____ Other (specify) _____
3. Have you ever received any advice about pedestrian safety either in school, on television or on the radio, in newspapers or in magazines, or in brochures or pamphlets?
____ Yes ____ No
4. About what percentage of all pedestrian deaths involve drunk pedestrians?
____ 5% ____ 10% ____ 20% ____ 40% ____ 50%
5. If there are no sidewalks, you should always walk on the right-hand side of the road with the traffic.
____ TRUE ____ FALSE ____ DON'T KNOW
6. If you are standing on the sidewalk at a painted crosswalk not at an intersection, traffic is not required to stop to let you cross the road.
____ TRUE ____ FALSE ____ DON'T KNOW
7. A "WALK" signal at an intersection means that you may cross the road safely because no cars will be driving through or turning into the crosswalk.
____ TRUE ____ FALSE ____ DON'T KNOW 
8. Assume you are a motorist waiting to turn left at an intersection that does not have a left-turn arrow. When the light turns green, the pedestrians in the figure step into the crosswalk as you are turning. You must let the pedestrians finish crossing before you finish your turn.
____ TRUE ____ FALSE ____ DON'T KNOW 
9. When you are driving in a school speed zone, you may resume your speed as soon as you can see the "END SCHOOL ZONE" sign.
____ TRUE ____ FALSE ____ DON'T KNOW 
10. This sign is placed approximately 200 ft. in advance of a pedestrian crossing used by children to go to and from a school.
____ TRUE ____ FALSE ____ DON'T KNOW 
11. Most pedestrian accidents in cities happen while a person is crossing the road at some place other than an intersection.
____ TRUE ____ FALSE ____ DON'T KNOW
12. If you wear white clothing while walking along a roadway at night, drivers will be able to see you from a safe distance.
____ TRUE ____ FALSE ____ DON'T KNOW
13. Are you:
____ Male ____ Female
14. Your age is:
____ Under 20 ____ 20-29 ____ 30-39
____ 40-49 ____ 50-64 ____ Over 64
15. Have you reviewed your state's drivers license manual recently?
____ Yes ____ No

Please return this completed questionnaire to the person who gave it to you.
We appreciate your help very much.

FIGURE 2 Pedestrian safety questionnaire, Survey II.

- Gender of respondent,
- Age of respondent, and
- Knowledge of the driver's manual.

The chi-square method was used to analyze the responses to these questions. It was deemed an appropriate statistical tool because of the categorical, non-normal nature of the questions. The statistic was used to determine whether significant differences exist between the groups. The SAS tests were conducted using a 95 percent level of confidence to assure that a Type I error did not occur. The correct answers to the questions, against which the responses were tested, were determined by surveying the state DMV contacts, and by reviewing each state's codes and statutes, the MUTCD, and the UVC.

SURVEY RESULTS

The research team received 4,826 completed pedestrian questionnaires. The distribution of these questionnaires by type and source is shown in Table 1. Seventy-seven examination stations in rural and urban areas participated in the study. These areas ranged in population from 3,500 to 8.8 million and included: New York City, Los Angeles, Chicago, Boston, Detroit, and Atlanta. Of the AARP groups, representatives from 20 states assisted in the study.

Based on the demographic information provided by the respondents, the surveys were disaggregated to determine target groups that may have a misunderstanding of pedestrian laws and traffic control devices. The summary of these responses is provided in Table 2. The remaining questions on the two surveys are subdivided into one of three groups. These groups include questions related to the respondents' perception and assessment of pedestrian issues and problems; the UVC; and the MUTCD.

Respondents' Assessment of Pedestrian Issues

Seven questions on each of the two questionnaires asked the respondent to provide an assessment or perception of the current condition related to specific pedestrian issues. These issues include the education of children on pedestrian safety, general pedestrian collision issues, drunk pedestrians, the location of pedestrian accidents, and walking at night. The total number of responses to each of these questions is shown in Table 3.

Safety Education of Children

Question 2 on Surveys I and II involves the education of children on pedestrian safety issues. On Survey I this question asked respon-

dents if they think schools are taking responsibility to inform children about safe pedestrian habits. A large percentage of respondents felt that schools are educating children about pedestrian safety. On Survey II the question asked respondents who they think should be responsible for providing pedestrian safety training to children. The majority indicated that children should be taught about this issue in the home and in school.

General Pedestrian Issues

The remaining questions deal with general pedestrian issues and include the assessment of all pedestrian collisions and fatalities and drunk pedestrian fatalities. An attempt was made to determine whether the respondents are aware of dangerous pedestrian locations and the dangers of walking at night. Question 3 on Survey I asked the respondents to estimate what percentage of all traffic fatalities are pedestrians. The research team was interested in finding out if the respondents would underestimate or correctly identify the percentage of 15 to 20 percent. Nearly one-third of all respondents believe that pedestrians account for 10 percent or less of all traffic fatalities. The female respondents had a higher statistically significant number of correct responses to this question. An effort also was made to determine the respondents' general perception of the pedestrian safety problem by asking their opinion of the typical causes of pedestrian collisions in Question 4. By an overwhelming margin, respondents in both groups believe that collisions occur because of simple driver or pedestrian error or because of the involvement of alcohol.

A report generated by NHTSA titled, *Traffic Safety Facts (1)*, indicates that over the past 10 years the percentage of pedestrian fatalities involving pedestrians with blood-alcohol concentration levels (BAC) of 0.10 or higher has ranged from 35 to 39 percent. The BAC scale is used in many states to determine if driver is legally intoxicated. Question 4 on Survey II was asked to determine whether the respondents recognize the danger of being a drunk pedestrian. The answers indicate that the respondents may not be aware of the extent of this problem.

Another important issue is whether most pedestrian collisions occur at intersections or away from intersections. The purpose of Question 11 was to determine whether the respondents perceive one location more hazardous than the other. According to 1992 injury and fatality statistics, the number of non-intersection pedestrian collisions exceeds those at intersections for all age groups with the exception of the 65 years and over group (1). The majority of the respondents correctly perceived non-intersection locations to be more hazardous. A significantly higher percentage of respondents 50 years and over and respondents having recently reviewed their state's driver's license manual answered this question correctly.

In 1992 more than 82 percent of all pedestrian fatalities occurred between 6 p.m. and 6 a.m., and more than 46 percent occurred between 9 p.m. and 3 a.m. Because a higher percentage of fatalities occur during hours of darkness, it is important to determine the respondents' perception of danger while walking at night. One study conducted for NHTSA by Blomberg (8) found that white clothing worn at night was detectable from a distance of only 68.3 m (224 ft). The average stopping distance for an automobile traveling 56.3 km/hr (34.9 mph) is 68.6 m (225 ft); for higher speeds this distance increases significantly. Other studies by Allen (9) and Hazlett and Allen (10) found that wearing white does have some benefit in low-speed conditions, but for higher speeds it may not

TABLE 1 Distribution of Questionnaires by Type and Source

	Driver License Examination Station	AARP	Combined Responses
Survey I	1,832	489	2,321
Survey II	1,763	742	2,505
Total Responses	3,595	1,231	4,826

TABLE 2 Summary of Responses: Demographic

	Examination Station (%)		AARP (%)	
	Survey I	Survey II	Survey I	Survey II
Have you or someone you know been in a pedestrian accident (Nos. 1.1 and 2.1)				
I have	8	10	9	11
Family member	9	11	9	9
Aquaintance	21	18	15	17
No one I know	62	61	67	63
Have you ever received pedestrian advice (No. 3)				
Yes		74		73
No		26		27
Your gender (Nos. 1.12 and 2.13)				
Male	50	39	48	44
Female	50	61	52	56
Your age (Nos. 1.13 and 2.14)				
Under 20	11		10	
20-29	25		26	
30-39	26		24	
40-49	20		21	
50-64	13	24	14	28
Over 64	5	76	5	72
Have you reviewed your state's driver's manual (Nos. 1.14 and 2.15)				
Yes	45	47	42	50
No	55	53	58	50

provide a motorist with adequate stopping distance. Blomberg's study found that retroreflective material worn at night is detectable from distances over 226.8 m (743.9 ft). The results of these studies were used to determine the correct response to Question 12, FALSE. Wearing white at night only provides a marginal increase in pedestrian safety and only in low-speed situations. A significantly higher percentage of respondents who had not reviewed their state's driver license manual responded correctly. In addition, a significantly higher proportion of respondents at the examination stations responded correctly when compared with the AARP responses.

Questions Related to the UVC

It is important that pedestrians and motorists be aware of their rights and responsibilities as road users, particularly for situations involving the interaction of these groups. In each of the two questionnaires, seven questions were asked related to issues addressed by the UVC. These issues include questions related to midblock crossings (MBCs), right-of-way at intersections, and walking along or on the roadway. The results of these questions are provided in Table 4.

Midblock Crossings

Question 5 of Survey I asked respondents about their obligation to cross at intersections or painted MBCs in the downtown area of a large city. The legal element of this question is addressed in Section 11-503(c) of the UVC and states that between adjacent operating signalized intersections, "pedestrians shall not cross at any place except in a marked crosswalk." Because most downtown intersec-

tions are signalized, the correct response is TRUE. The overwhelming majority of respondents answered this question correctly. It should be noted that the state codes in South Dakota and Wisconsin appear to allow midblock crossings at locations away from crosswalks while the Massachusetts and New York state codes do not address this issue. Statistical differences were detected between the responses from the AARP group and the examination station group.

The research team was also interested in determining who the respondents believe has the right-of-way when a pedestrian is standing on the curb at an MBC. Section 11-502(a) of the UVC states that motorists must yield the right-of-way to pedestrians crossing the road within a crosswalk. It does not state that motorists must stop or slow down to allow a pedestrian on the curb to cross. The correct response to Question 6 on Survey II therefore is TRUE. Based on the responses it appears that about 69 percent of the respondents do not understand their obligations in this situation, which could potentially be very dangerous. A significantly higher percentage of respondents having remembered receiving safety information responded correctly. This issue is also addressed in Question 6 of Survey I. Respondents appear to understand their obligations as motorists to grant the right-of-way to pedestrians crossing within a marked crosswalk. A significantly higher proportion of respondents who had recently reviewed their state's driver's license manual responded correctly.

Right-of-Way at Intersections

Question 8 on Survey II and Question 10 on Survey I asked to determine whether the respondents recognized the obligations of motorists making turns at intersections. The issues of turning left on

TABLE 3 Summary of Responses: Pedestrian Issues

	Examination Station (%)		AARP (%)	
	Survey I	Survey II	Survey I	Survey II
<u>Do you think children are being taught in school about safety (No. 2)</u>				
Yes	66		73	
No	34		27	
<u>Pedestrians are what % of traffic fatalities (No. 3)</u>				
1%	6		10	
5%	25		23	
10%	32		29	
15%	22		21	
20%	15		17	
<u>Why do pedestrian accidents happen (No. 4)</u>				
Driver error	27		23	
Alcohol	24		22	
Poor Visibility	9		15	
Pedestrian error	27		38	
Other/Combin.	13		2	
<u>Who should teach children on pedestrian safety (No. 2)</u>				
School		36		32
Pvt. Safety Group		6		6
Home		36		41
Police		16		16
Church		5		4
Other		1		0
<u>What percentage of fatally injured pedestrians are drunk (No. 4)</u>				
5%		18		20
10%		19		23
20%		23		25
40%		21		16
50%		19		16
<u>Most pedestrian accidents happen away from intersections (No. 11)</u>				
True		69		73
False		14		12
Don't Know		17		15
<u>White clothing is visible from safe distances (No. 12)</u>				
True		69		73
False		14		12
Don't Know		17		15

TABLE 4 Summary of Responses: Knowledge of Legal Requirements

	Examination Station (%)		AARP (%)	
	Survey I	Survey II	Survey I	Survey II
<u>In the city you must cross at a signal or crosswalk (No. 5)</u>				
True	86		94	
False	8		4	
Don't Know	6		2	
<u>You must let pedestrians in crosswalks finish crossing (No. 6)</u>				
True	92		97	
False	5		1	
Don't Know	3		2	
<u>If there are sidewalks, you may not jog in the road (No. 8)</u>				
True	54		61	
False	18		14	
Don't Know	28		25	
<u>When turning right on red, pedestrians must wait for vehicles (No. 10)</u>				
True	16		13	
False	79		82	
Don't Know	5		5	
<u>You should walk on the right with traffic (No. 5)</u>				
True		31		14
False		64		83
Don't Know		5		3
<u>Traffic is not required to stop if you are waiting at a crosswalk (No. 6)</u>				
True		31		31
False		61		59
Don't Know		8		10
<u>When turning left on green, vehicles must wait for pedestrians (No. 8)</u>				
True		92		95
False		4		3
Don't Know		4		2

green and turning right on red are addressed in Sections 202(a)(1) and 202(c)(3), respectively. These sections state that turning vehicles must give the right-of-way to pedestrians lawfully within a crosswalk. A high percentage of respondents to both questions selected the correct response, that the pedestrian has the right-of-way. A significantly higher percentage of correct responses come from the respondents who had been exposed to safety-related material and who had reviewed their state's driver's license manual.

Walking Along or on the Roadway

Two questions address the issue of walking along or on the roadway: Question 8 of Survey I and Question 5 of Survey II. The research team wanted to find out if the respondents recognized their

responsibilities while walking along the road. Question 8 concerned the growing use of the roadway by joggers even where sidewalks are provided. While the UVC does not specifically address jogging, it is assumed that the definition of a pedestrian in the UVC includes this group of individuals. Section 11-506(a) states that pedestrians shall not walk on or along the roadway when a sidewalk is provided and when its use is practicable. The only variation from this law found in the state responses came from Rhode Island. Section 31-18-10 of its law says that an individual may run or jog on the road surface even when sidewalks are available. However, if that person shall begin to walk, "he/she shall walk upon an available sidewalk" (11). The law does require the use of retroreflective materials by joggers and runners during hours of darkness. About 39 percent of the AARP respondents and 46 percent of the examination respondents did not select the correct response, that joggers may not use the road surface when sidewalks are provided. A statistically significant higher number of correct responses came from male respondents and older respondents.

Question 5 addresses the issue of walking along the roadway when sidewalks or shoulders are unavailable. The UVC states in Section 11-506(c) that if a pedestrian is walking on a roadway that has two-way traffic and no sidewalks or shoulders, that individual

shall walk on the left; thus, the correct response to this question is FALSE. The reason for this requirement concerns the importance of visual and audio cues pedestrians receive from approaching vehicles. Pedestrians with their backs to oncoming traffic are dependent solely on audio cues, which may or may not provide adequate warning. Using the UVC as the standard for correctness, it was found that 36 percent of the examination station respondents are not aware of this responsibility. Only 17 percent of the AARP respondents did not select the correct response. Both male respondents and those who had been exposed to pedestrian safety advice had a statistically higher percentage of correct responses, as did the older respondents.

Questions Related to the MUTCD

In addition to determining the comprehension of various pedestrian traffic laws, the research team wanted to evaluate respondents' knowledge of pedestrian traffic control devices. These devices aid in the safe interaction of pedestrians and motorists. If the meanings of these devices are misunderstood, traffic engineers are not properly serving the community. The remaining portion of the two questionnaires involved six questions related to pedestrian signals and signs. Both the MUTCD and the UVC were used as guides for

determining the correct responses to these questions. Because pedestrians are much more likely to sustain serious injuries when a collision occurs, it is important that they understand the meaning of the signals provided in the MUTCD. A summary of the responses to these questions is provided in Table 5.

Pedestrian Traffic Signals

Questions 7 and 9 on Survey I and Question 7 on Survey II concern pedestrian signals. Question 7 addresses the use of the flashing DON'T WALK symbol or message. Section 4D-7 of the MUTCD states that the pedestrian clearance interval should be designed such that a pedestrian who has just stepped into the crosswalk has enough time to travel to the center of the farthest travel lane. According to Section 11-203(b) of the UVC, the upraised palm, or DON'T WALK message, means that pedestrians shall not begin crossing, but that pedestrians already crossing should continue to a sidewalk or raised median. Nearly half of all respondents answered this question incorrectly and may not clearly understand the meaning of the flashing DON'T WALK message. The test for statistical significance indicated that a higher percentage of female and younger respondents answered this question correctly.

TABLE 5 Summary of Responses: Knowledge of Traffic Control Devices

	Examination Station (%)		AARP (%)	
	Survey I	Survey II	Survey I	Survey II
<u>A flashing DON'T WALK means to return to the curb (No. 7)</u>				
True	42		46	
False	51		48	
Don't Know	7		6	
<u>The WALK signal appears immediately, at an actuated signal (No. 9)</u>				
True	10		10	
False	84		80	
Don't Know	6		10	
<u>Pedestrian sign (with lines) is placed in advance of a crossing (No. 11)</u>				
True	59		53	
False	17		18	
Don't Know	24		29	
<u>A WALK signal means there are no turning conflicts (No. 7)</u>				
True		47		47
False		51		51
Don't Know		2		2
<u>You may resume your speed when you see the END SCHOOL ZONE sign (No. 9)</u>				
True		66		74
False		30		23
Don't Know		4		30
<u>School pedestrian sign (with lines) is placed in advance of a crossing (No. 10)</u>				
True		72		74
False		12		7
Don't Know		16		19

The significance of Question 9 on actuated pedestrian signals is that it gives the research team an idea whether respondents understand how the pedestrian signal is coordinated with the traffic signal phasing. As required per Section 4B-28 of the MUTCD, pedestrian-actuated signals are installed at locations where traffic control timings may not provide the opportunity to cross without excessive delay. The signal that controls vehicle traffic must be allowed to complete its cycle and then provide a clearance interval before allowing pedestrian movements. Most pedestrian signals will not immediately change to WALK when actuated. Between 16 and 20 percent of the respondents did not know the correct answer and thus may be inclined to assume that a button or signal is malfunctioning if the change does not occur immediately.

A study by Zegeer (12) of more than 2,000 pedestrian accidents found that more than 37 percent involved collisions with either left- or right-turning vehicles. Pedestrians are often given a false sense of security by the presence of a steady WALK symbol or message. Question 7 on Survey II was asked to determine whether the respondents are aware of conflicts that may still occur with turning vehicles during the presence of a steady WALK signal. Section 4D-2(3) of the MUTCD stresses that there may or may not be conflicts with turning vehicles. While the 1978 MUTCD allowed the use of a flashing WALK message to warn pedestrians of turning vehicles, this practice has been eliminated in the 1988 publication because it was determined to present an unclear message. Just under one-half of all respondents answered this question incorrectly, which suggests that many of the respondents may not be cognizant of potential conflicts with turning vehicles. A significantly higher percentage of male respondents and respondents who remembered receiving pedestrian safety advice answered this question correctly.

Pedestrian Traffic Signs

Of the final three questions to be discussed, two deal with the use of the pedestrian crossing signs. Question 11 on Survey I and Question 10 on Survey II are similar and are an attempt to determine whether the respondents can differentiate between the use of crossing signs and advance crossing signs. The questions displayed graphics of the W11A-2 and the S2-1 signs provided in the MUTCD. Section 2C-32 of the MUTCD states that crossing signs are distinguished from advance crossing signs by the presence of crossing lines. Only 17 percent of the respondents to Question 11 and between 7 and 12 percent of the respondents to Question 10 answered correctly. The large percentage of DON'T KNOW responses may indicate that the respondents are not aware that two crossing signs are used or that some uncertainty exists about the indicated distance of 200 ft. Statistical tests indicate that a significantly higher proportion of male respondents, younger respondents, and respondents having reviewed their state's driver's license manual answered these questions correctly.

The final question, Question 9 on Survey II, deals with the use of the END SCHOOL ZONE sign (S5-2). The MUTCD in Section 7B-12 states that this sign or a standard SPEED LIMIT sign shall be used at the precise location where speeds at the end of a school zone are to change. This indicates that motorists must wait until after they have reached or passed this sign before resuming their speed. Motorists may not resume their speed simply because the sign is within sight distance. If the driver believes he or she may do so when the sign becomes visible, the vehicle may reach unsafe speeds long before leaving the school speed zone. Of the respon-

dents at the examination stations, 66 percent answered incorrectly, while 74 percent of the AARP respondents answered incorrectly. Both male and younger respondents had a significantly higher percentage of correct responses. Those respondents having received pedestrian safety advice and having reviewed their state's driver's license manual also had a higher proportion of correct responses.

CONCLUSIONS AND RECOMMENDATIONS

After evaluating the results of the questionnaires, the research team reached the following conclusions:

- The level of firsthand knowledge or experience in a pedestrian accident is relatively low.
- The majority of respondents believe children should be taught about pedestrian safety at home and in school.
- The majority of respondents underestimated the true ratio of pedestrian fatalities to all traffic fatalities.
- The respondents appear to understand the right-of-way issues when a pedestrian is in the crosswalk but not when the pedestrian is standing on the curb.
 - A significant proportion of respondents do not understand the flashing DON'T WALK signal.
 - A large percentage of respondents do not know that joggers must use sidewalks when provided.
 - The advance crossing and school crossing signs are misunderstood by the majority of respondents.
 - A significant number of respondents do not know to walk against traffic when no sidewalks are provided.
 - A significant number believed that a WALK signal means no turning vehicles will cross their path.
 - Most respondents believe they may resume their speed before reaching the END SCHOOL ZONE sign.
 - The majority of respondents believe that wearing white at night will enable them to be seen from a safe distance.
 - Several of the state contacts' official responses were incorrect concerning the rules of the road, which may indicate the confusion over pedestrian laws.

Based on these conclusions the research team developed several recommendations. These recommendations are divided into three categories: (a) pedestrian safety programming, (b) traffic engineering, and (c) enforcement.

Pedestrian safety programs should include the following elements:

- One in six traffic fatalities is a pedestrian.
- The flashing DON'T WALK symbol means not to start crossing but to continue if you've already begun.
- It is illegal to jog on the road surface when adequate sidewalks are provided.
- The difference between pedestrian crossing signs and advance crossing signs is that pedestrian crossing signs show the crossing lines.
 - Walk on the left facing traffic when sidewalks are not provided and when walking along a two-way road.
 - Pedestrians should be aware that a WALK message means that vehicles may still turn into the crosswalk.
 - A motorist may not resume speed until reaching the END SCHOOL ZONE sign.

- Retroreflective materials should be worn or a flashlight should be carried when walking at night because of increased hazards.

Traffic engineering recommendations include:

- The current distinctive features between crossing signs and advance crossing signs should be evaluated, perhaps using heavier lines or different colors. The use of supplemental distance plates also may prove useful.
- The use of informational signs indicating the meanings of the WALK and flashing DON'T WALK symbols at intersections should be considered.

Law enforcement activities should consider the following:

- Drivers who do not yield the right-of-way at the appropriate times should be given citations.
- Pedestrians who behave in an unsafe manner should also be given citations, particularly in corridors or areas that have traditional pedestrian safety problems.
- Review of the obligations at MBCs should be administered. The research indicates that some confusion still exists about the right-of-way issue when pedestrians are standing on the sidewalk waiting to cross. This may require a close review of Section 11-502 of the UVC.

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