STATEWIDE SYSTEM FOR ANALYSIS OF PEDESTRIAN AND BICYCLE ACCIDENTS

by

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ATTENTION

The enclosed report is a reprint of the original technical report which has recently gone out of print. Its content does not differ in any way from the original report. The format differs slightly due to time restrictions in the reprinting process.

We hope that this report will fulfill your interests. We appreciate your continued concern in highway safety.

ABSTRACT

An investigation was made into the existing methods of collecting and analyzing data on North Carolina pedestrian and bicycle accidents. Based on this investigation and additional analyses of 1973, 1974, and a sample of 1975 pedestrian and bicycle accidents, recommendations were made for a statewide system of analysis with emphasis on the importance of understanding contributing factors and identifying specific countermeasures.

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INTRODUCTION

Over the past several years, increasing emphasis has been placed on pedestrians and bicyclists as important elements of the traffic system. As the cost of fuel continues to rise and the population becomes more urbanized, increasing numbers of persons are using the roadways on foot and on bicycle. Almost everyone is a pedestrian, and the estimated number of current active bicyclists is approximately 100 million (Cleckner, 1974). Despite recent advances in pedestrian and bicycle safety, much remains to be done in this area.

While several studies concerning either pedestrian or bicycle accidents have recently been conducted, very few have dealt with the two accident types simultaneously. With pedestrians accounting for nearly 20 percent of all traffic accident fatalities and with bicycle fatalities almost doubling in the last ten years (Accident Facts), it is obvious that measures designed to prevent these accidents should be implemented and evaluated. As a step in that direction, it is believed that it will be helpful to compare pedestrian and bicycle accidents in order to determine if some suggested countermeasures could be combined to be of benefit for both.

METHOD

Extent, Distribution, and Usefulness of Existing Data Analyses

In the first phase of the study, a determination was made of the extent of existing analyses of pedestrian and bicycle accidents routinely conducted by the North Carolina Department of Motor Vehicles and others. Additionally, mailing lists of the Department of Motor Vehicles (D.M.V.) were obtained, and a random sample of names was selected. Telephone interviews were conducted with those chosen in order to determine the usefulness of the D.M.V. reports which were routinely received. The procedures used by the State Highway Commission, local urban highway engineers, and police departments in making changes for the benefit of bicyclists and pedestrians were investigated. All of this information was gathered to serve as background for making recommendations for more meaningful, available, and useful analyses in the state of North Carolina, with the ultimate goal being the reduction in casualties to pedestrians and bicyclists.

Conduction of Additional Data Analyses

To further appreciate the conditions and circumstances surrounding pedestrian and bicycle accidents in North Carolina, detailed analyses of accident data available to HSRC were made. These were carried out by means of computer tabulations of information on 1973 and 1974 reported North Carolina accidents which involved a pedestrian or bicyclist.

Collection and Analysis of Supplementary Data

The major aspect of the study involved the development of a supplementary accident report form and analysis of the data gathered from its use. Through a review of previous research and an investigation of narrative

descriptions of 1973 pedestrian and bicycle accidents, a group of questions concerning pedestrian and bicycle accidents which were not routinely being asked but which might be helpful in terms of suggesting causes and countermeasures was selected. These questions were added to a selection of questions already appearing on the standard accident report form to make up the supplementary form (see Appendix A).

Because the majority of North Carolina pedestrian and bicycle accidents occur in urban areas and are reported by municipal police, the 11 largest cities in the state, as well as the town of Chapel Hill, were chosen for the experimental use of the supplementary form. It was decided that a three-month period would be an adequate amount of time to gather enough information and brief enough to keep the interest and cooperation of police personnel. Because the numbers of pedestrian and bicycle accidents vary with seasonal changes (more in spring than winter), the months of March, April, and May were chosen for this study.

The police departments were contacted by mail, telephone, and personal visit, and their cooperation was elicited. The supplemental forms, instructions (Appendix B), and explanatory notes (Appendix C) were mailed to a contact person at each department, who then distributed them. Each officer who might possibly report a pedestrian or bicycle accident received 3 or 4 forms, a set of instructions, and a cover note along with additional instructions from commanding officers. The supplemental forms were to be completed at the scene of any accident involving a pedestrian or bicyclist being investigated and were then to be returned to the records division of the department. At that point, the records division would mail the supplement and a copy of the standard report completed for that accident to HSRC. In the event that the records division did not receive a

supplement along with a pedestrian or bicycle report, they were to inform the reporting officer that he should complete a supplement. HSRC also received a copy of the standard reports of the accident from D.M.V. in order to check the return rates.

When received by HSRC, the forms were numbered. Data from both standard and supplemental forms were coded onto computer cards for easy access and analysis. Implications for accident reporting, future research, and the development of countermeasures were considered based on analyses of these data.

RESULTS

Analyses of Existing Data

D.M.V. traffic records.

Accident reports.

North Carolina has an excellent traffic records system. Specific information about a particular accident can be obtained from the traffic accident report, and more general North Carolina accident data can be secured from the Division of Motor Vehicles Traffic Records Section. All investigating officers (highway patrol, municipal police, county police, etc.) use the same form (Appendix D) to report traffic accidents. All crashes involving personal injury or property damage amounting to $200 or more must be investigated and the report sent to D.M.V. At D.M.V. the data are transferred to computer tape at which time information becomes more readily accessible.

Because the majority of the information on the report form refers to motor vehicles and their occupants, the reporting of motor vehicle accidents involving pedestrians and bicycles is less clearcut and

perhaps less informative as it pertains to them. Information which would be very valuable in analyzing pedestrian and bicycle accidents is often not included on the standard form. For example, it would be valuable to know whether a pedestrian is a licensed driver because it seems that lack of knowledge of road rules or understanding of the dangers of cars may be a contributing factor in accidents. With so many racing bikes on the road, it would be beneficial to give estimated speed for bicycles as well as for motor vehicles. The standard instructions for completing the N.C. traffic accident report state that "only action by motor vehicle drivers which violate rules of the road are to be considered." Bicyclists are frequently violators but are not drivers of motor vehicles. Consequently, some important information regarding cause and/or fault is lost.

Statistical Pedestrian Report.

A report of Pedestrian Accident Statistics is published by D.M.V. monthly and summarized yearly (see Appendix E). Members of the Traffic Records Section conducted a questionnaire survey by mail, inquiring into the usage of their various reports and asking for suggestions for revisions. Three-fourths of the respondents said that they did use the statistics on the pedestrian report, especially for educational programs and for safety and enforcement priorities.

The existing mailing list for the pedestrian statistical report was examined, and some potential users who were not receiving the reports were notified. Urban police, who do most of the reporting on pedestrian accidents, were not receiving the statistical reports but expressed interest when asked. Although the reports are available upon request, many potential users were unaware of their availability.

It should be mentioned here that the format of the pedestrian report is excellent in that both frequencies and percentages are included as are categories for fatal and non-fatal accidents.

Traffic Accident Summary.

In addition to pedestrian reports, D.M.V. also publishes monthly and annual Traffic Accident Summaries. Data on these summaries are of great value to persons who wish to obtain information about the general characteristics of traffic accidents in North Carolina. The statistics are reported in terms of frequency counts and are usually self-explanatory.

Uses of data.

Statistical reports are often used as a basis for educational accident countermeasures and for selective enforcement purposes. Still, the potential uses are greater than the realized ones. Analyses of pedestrian and bicycle data are limited, and analyses which are carried out are not conducted with an orientation towards developing recommendations for countermeasures.

Highway engineering.

At both state and local highway engineering levels, special projects have occasionally led to in-depth investigations of pedestrian or bicycle accidents. It was found through statewide interviews, however, that these departments devote the majority of their time to investigations of high-accident locations, often ignoring crashes involving pedestrians or bicyclists.

Others.

Research agencies also study pedestrian and bicyclist safety. At the Highway Safety Research Center, analyses of accident data are

routinely conducted. Two major reports concerning bicycles have been published (Waller and Reinfurt, 1969; Pascarella et al., 1971), and a study is presently being completed on the development and evaluation of a pedestrian and bicycle safety education program for North Carolina schools. A bicycle program and facility handbook has been funded by the Governor's Highway Safety Program and prepared by Barton-Aschman Associates, Inc. This manual covers many aspects of bicycle safety, methods of organizing and planning bicycle programs, and principles of bikeway development. Additionally, the Governor's Highway Safety Program funded a three-year project ending in FY75 for a 4-H Youth Safety Program at N.C. State University Extension. The program includes, among other traffic safety activities, urban pedestrian and bicycle safety. A study of the total program, which reached over 132,000 youth, will be conducted with possible recommended countermeasures resulting.

Communities around the state are at various levels of planning and activity in the field of pedestrian and bicycle safety. All of the police departments that participated in the study have accident and citation information available, but none routinely collect the data into a meaningful summary.

It was found that police departments vary a great deal in terms of efforts expended to improve the pedestrian/bicycle situation. Some have conducted campaigns to educate children in the community (Wilmington's "Ghost Rider" program is exemplary), and some have systematically increased efforts to enforce laws and ordinances, such as citing pedestrians for jaywalking. In general, however, it appears that enforcement of pedestrian and bicycle rules-of-the-road is at a low level, and the appropriate actions to be taken should be better defined and communicated at all levels.

Additional Data Analyses

Pedestrians.

In the following analyses, when dealing with pedestrian variables, all pedestrians involved in an accident with a motor vehicle were used. When dealing with accident variables, only those accidents which were classified in the category "collision of motor vehicle with pedestrian" were used, unless stated otherwise. It was sometimes necessary to use data on pedestrian and bicycle accidents from 1973 and the first half of 1974, but the majority of the analyses were conducted on all of 1973 and 1974 accident data. The particular data set which was used for the following analyses will be pointed out in the text.

Who.

Drivers.

It is important, in terms of several countermeasures as well as the general understanding of pedestrian accidents, to have information concerning the persons involved. Few researchers have looked at driver variables but rather have focused on the characteristics of the pedestrians. However, for purposes of the present study, data on the drivers involved in motor vehicle accidents with pedestrians will also be analyzed. In order to more safety assume that the drivers being studied were driving the primary, or the "striking," motor vehicle, the present analyses included only those drivers (4457 in all) of the first vehicles involved in the accident type "collision of motor vehicle in road with pedestrian," implying that no other crash took place in the accident sequence prior to the one between motor vehicle and the pedestrian.

Table 1 presents the age and sex of drivers involved in accidents with pedestrians in North Carolina in 1973 and 1974.

Table 1

Of the accident-involved male drivers, 20.7 percent were 16-20 years of age. Almost one-half (49.3 percent) of the male drivers were 30 years of age or less. Female drivers show a similar age distribution to their male counterparts. Over one-half (56. 4 percent) of the accident-involved female drivers were 30 years old or younger. After age 20 and up to age 70, the proportion of accident involvement decreases as age, grouped in five-year categories, increases, both for males and females (the only exception being males, aged 46-50 years).

Pedestrians.

An important variable to consider when studying pedestrian accidents is the age of the pedestrian involved. Because differences in accident characteristics occur along with variations in pedestrian ages, many variables were analyzed in terms of this one variable.

Table 2 presents pedestrian age by sex.

Table 2

Of the 3417 males involved in pedestrian accidents in 1973 and 1974, 29.6 percent were children aged 12 years or less. Almost one-tenth (8.4 percent) of the accident involved male pedestrians were 61 years or older. Over one-third (35.1 percent) of the 1825 accident-involved female pedestrians were 1-12 years of age, while 9.2 percent were elderly persons, aged 61 years or older.

Where.

Pedestrian accidents are primarily an urban problem. However, pedestrian fatalities occur predominantly in rural areas. Because

Table 1. Age of drivers in pedestrian accidents by sex (column percentages in parentheses).

Age	Sex					
	Male		Female		Not Stated	
Not stated	29	(1.0)	14	(1.1)	209	(95.9)
6-10	1	(0.0)	1	(0.1)	0	(0.0)
11-15	7	(0.2)	2	(0.2)	0	(0.0)
16-20	613	(20.7)	290	(22.6)	2	(0.9)
21-25	468	(15.8)	254	(19.8)	0	(0.0)
26-30	372	(12.6)	176	(13.7)	1	(0.5)
31-35	268	(9.1)	118	(9.2)	2	(0.9)
36-40	208	(7.0)	99	(7.7)	1	(0.5)
41-45	191	(6.5)	87	(6.8)	0	(0.0)
46-50	225	(7.6)	81	(6.3)	0	(0.0)
51-55	186	(6.3)	61	(4.8)	0	(0.0)
56-60	138	(4.7)	47	(3.7)	2	(0.9)
61-65	121	(4.1)	26	(2.0)	1	(0.5)
66-70	60	(2.0)	11	(0.9)	0	(0.0)
71-97	71	(2.4)	14	(1.1)	0	(0.0)
Total	2958		1281		218	

Table 2. Age of pedestrians in pedestrian accidents by sex (column percentages in parentheses).

Age	Sex		
	Male	Female	Not Stated
Not stated	591 (17.3)	334 (18.3)	148 (64.3)
1-6	494 (14.5)	299 (16.4)	24 (10.4)
7-12	517 (15.1)	341 (18.7)	21 (9.1)
13-18	354 (10.4)	227 (12.4)	9 (4.0)
19-24	347 (10.2)	112 (6.1)	5 (2.2)
25-30	182 (5.3)	68 (3.7)	1 (0.4)
31-36	136 (4.0)	57 (3.1)	3 (1.3)
37-42	142 (4.2)	44 (2.4)	3 (1.3)
43-48	122 (3.6)	56 (3.1)	4 (1.7)
49-54	135 (4.0)	58 (3.2)	2 (0.9)
55-60	114 (3.3)	59 (3.2)	3 (1.3)
61-66	82 (2.4)	52 (2.8)	2 (0.9)
67-72	84 (2.5)	58 (3.2)	0 (0.0)
73-78	61 (1.8)	41 (2.2)	4 (1.7)
79-84	33 (1.0)	15 (0.8)	1 (0.4)
$\geq$ 85	23 (0.7)	4 (0.2)	0 (0.0)
Total	3417	1825	230

North Carolina is more rural than the national average (over 55 percent of the population live in rural areas), and perhaps for other reasons as well, pedestrian accidents are more rural there than elsewhere. While 33 percent of all traffic fatalities, pedestrian and non-pedestrian combined, occur in urban areas in this country, only 15 percent of North Carolina's traffic deaths are urban. Even more dramatic is the fact that in 1973, 65 percent of the nation's pedestrian fatalities were urban, compared with only 26 percent of North Carolina's. Still, pedestrians accounted for 37 percent of the country's urban traffic deaths and for 30 percent of North Carolina's. It is also the case that only 8 percent of the injuries sustained by pedestrians throughout the country are fatal, and 12 percent of North Carolina's pedestrian injuries result in death, probably because more accidents occur on high-speed rural roads.

According to pedestrian accident data from 1973 and 1974, the locality of the accident varied according to pedestrian age. Results are presented in Table 3.

Table 3

The locality of pedestrian accident did fall into an identifiable pattern by age as seen in Table 3. Accidents in the business areas represented 24.0 percent of the total group. However, no age category under 19-24 reached that level. Thereafter, with little deviation, the proportion of accidents occurring in this type of area rise steadily until they reach a peak of 44.1 percent of the accidents of the 61-66 age group. After that they decline somewhat.

Table 3. Age of pedestrians in pedestrian accidents by locale of accident (row percentages in parentheses).

	Locale					
Age	Business	Residential	School or Playground	Open Country	Not Stated	Total
Not stated	239 (22.3)	459 (42.8)	20 (1.9)	267 (24.9)	88 (8.2)	1073
1-6	103 (12.6)	473 (57.9)	19 (2.3)	155 (19.0)	67 (8.2)	817
7-12	182 (20.7)	393 (44.7)	35 (4.0)	231 (26.3)	38 (4.3)	879
13-18	124 (21.0)	220 (37.3)	28 (4.7)	180 (30.5)	38 (6.4)	590
19-24	125 (27.0)	128 (27.6)	7 (1.5)	167 (36.0)	37 (8.0)	464
25-30	54 (21.5)	91 (36.3)	3 (1.2)	79 (31.5)	24 (9.6)	251
31-36	55 (28.1)	56 (28.6)	1 (0.5)	70 (35.7)	14 (7.1)	196
37-42	53 (28.0)	53 (28.0)	1 (0.5)	69 (36.5)	13 (6.9)	189
43-48	55 (30.2)	47 (25.8)	0 (0.0)	68 (37.4)	12 (6.6)	182
49-54	66 (33.8)	52 (26.7)	2 (1.0)	56 (28.7)	19 (9.7)	195
55-60	75 (42.6)	48 (27.3)	1 (0.6)	38 (21.6)	14 (8.0)	176
61-66	60 (44.1)	32 (23.5)	2 (1.5)	35 (25.7)	7 (5.1)	136
67-72	57 (40.1)	42 (29.6)	0 (0.0)	40 (28.2)	3 (2.1)	142
73-78	42 (39.6)	29 (27.4)	0 (0.0)	27 (25.5)	8 (7.5)	106
79-84	16 (32.7)	15 (30.6)	0 (0.0)	16 (32.7)	2 (4.1)	49
> 85	9 (33.3)	9 (33.3)	0 (0.0)	8 (29.6)	1 (3.7)	27
Total	1315 (24.0)	2147 (39.2)	119 (2.2)	1506 (27.5)	385 (7.0)	5472

By contrast, the younger age groups are overrepresented in residential areas which account for 39.2 percent of the accidents for all ages but 57.9 percent of the 1-6 year olds accidents.

Accidents in the immediate area of schools and playgrounds account for only 2.2 percent of all pedestrian accidents but over 4.0 percent of persons of school age between 7 and 18.

Open country pedestrian accidents represent 27.5 percent of the whole and appear to be almost uniformly distributed across all age categories.

The classes of highway on which pedestrian accidents occur were examined and results are presented in Table 4.

Table 4

Based on data from 1973 and 1974, over one-half (57.8 percent) of the 4457 accidents occurred on city streets, 20.2 percent on rural paved roads, 11.4 percent on U.S. highways, 8.1 percent on N.C. highways, and only 1.1 percent and 0.9 percent on interstates and rural unpaved roads, respectively. Because it is not required that accidents occurring on private property be reported, there may be many more than the 0.2 percent reported here.

When.

Pedestrian accidents were fairly evenly distributed over the months of the year, with October containing more pedestrian accidents than any other month. Accidents were also evenly distributed over the days of the month.

Table 4. Highway class on which pedestrian accidents occurred.

Interstates	48	(1.1)
U.S. highway	509	(11.4)
N.C. highway	363	(8.1)
Rural paved road	899	(20.2)
Rural unpaved road	41	(0.9)
City street	2577	(57.8)
Private property	10	(0.2)
Not stated	10	(0.2)
Total	4457	

Pedestrian accidents occurred with the least frequency on Sunday and with the most frequency on Friday. The most salient single time period was on Friday between the hours of 2:00 p.m. and 8:00 p.m., when over 10 percent of the pedestrian accidents occurred. The hours just before and just after both school and work showed increases in pedestrian accidents, when both pedestrian and motor vehicle traffic were presumably heavy.

Over 60 percent of the accidents in question happened during daylight hours, but the accidents at night were more severe. Table 5 presents these results for 1973 and 1974 pedestrian accidents.

Table 5

Although only 32.4 percent of the accidents occurred during the hours of darkness, 60.2 percent of the fatal accidents happened after dark. Only 18.0 percent of all pedestrian accidents were on dark, unlighted roads, but 46.9 percent of the fatal accidents occurred on these roads. Approximately two-thirds of the injury accidents occurred in daylight.

How.

The actual classifications of accidents involving pedestrians are of interest. Some of these involve an event prior to the collision of motor vehicle and pedestrian which led to the accident sequence, eventually involving a pedestrian. For example, if a car runs off the road before it hits a pedestrian, it should be classified as a "run off road" accident. If the motor vehicle hits another car before the pedestrian, then the accident falls into another category of two-car crashes. It was found that, of all the pedestrians involved in

Table 5. Accident severity by light condition for pedestrian accidents (row percentages in parentheses).

	Light Condition						
	Daylight	Dusk	Dawn	Darkness-Street Lighted	Darkness-Street Unlighted	Not Stated	Total
Fatal accident	208 (35.4)	15 (2.6)	7 (1.2)	78 (13.3)	276 (46.9)	4 (0.7)	588
A or B injury class accident	1934 (65.8)	114 (3.9)	17 (0.6)	404 (13.8)	452 (15.4)	16 (0.5)	2937
C injury class accident	641 (70.1)	31 (3.4)	3 (0.3)	159 (17.4)	75 (8.2)	6 (0.7)	915
Property damage only	4 (44.4)	2 (22.2)	0 (0.0)	2 (22.2)	1 (11.1)	0 (0.0)	9
Not stated	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	8 (100.0)	8
Total	2787 (62.5)	162 (3.6)	27 (0.6)	643 (14.4)	804 (18.0)	34 (0.8)	4457

accidents, 84 percent were involved in accidents classified as "collision of motor vehicle in road with pedestrian." This is the accident type of interest when discussing countermeasures, but it can be seen that 16 percent of the accidents involving pedestrians are ignored when omitting these other accident types from consideration. The next most frequent accident types were found to be "ran off road right" and "collision of motor vehicle with parked vehicle." Other accident types occasionally involve pedestrians also, but these are considered rare events, many of which are "freak" accidents occurring in open country areas.

The pedestrian's action and the motor vehicle's maneuver just prior to the crash are of great interest in understanding the causes of these accidents. The great majority (86.1 percent) of pedestrian accidents occurred when the vehicle was going straight ahead. Almost one-half (46.1 percent) of the accidents happened when the pedestrian was crossing, not at an intersection. The most frequent single type of accident was the one which involved a pedestrian crossing the street, not at an intersection, and a motor vehicle traveling straight ahead. These two moves happening simultaneously comprised 42.9 percent of all pedestrian accidents (those classified as "collision of motor vehicle with pedestrian"). The second most frequently occurring pedestrian action was found to be crossing at an intersection (in 13.2 percent of the accidents) followed by "coming from behind a parked vehicle" (5.9 percent), "other" (7.0 percent), and "walking with traffic" (5.9 percent). After "going straight ahead", the next most frequently occurring vehicle maneuvers were left turn (3.6 percent of the accidents), backing (2.4 percent), and slowing or stopping (1.8 percent).

The violations of the pedestrians and drivers were investigated to get an idea of causal factors. Because the violations listed on the accident report form were applied to vehicles only, no violation was checked for the pedestrian in 99 percent of the cases. In 84 percent of the accidents, no violation was checked for the motor vehicle . This is in contrast with all motor vehicle accidents in general where 56 percent result in charges not being filed. When motor vehicle violations were checked, the most frequent were speeding, failure to yield, failure to see if move could be made safely, drinking, (each making up about 2 percent of the cases) and "other improper driving" (about 4 percent).

Analyses of these and other data concerning the "how" of pedestrian accidents reveal at least three distinct accident categories. A first group is composed of children who run out into the road in residential areas during daylight hours. The children may not have an understanding of the dangers of their behaviors and may not be properly supervised. They often appear suddenly so that a driver is unable to stop. These accidents are by far the most prevalent type of pedestrian accident. They frequently occur while children are playing after school, but are rarely fatal because of the low motor vehicle speeds in residential areas.

The second type of accident involves adult, mostly middle-aged pedestrians, who are intoxicated at night, especially on dark, unlighted streets in open country areas. These pedestrians most frequently wander out into the path of oncoming traffic. The motor vehicle driver usually either does not see them at all or is not able to anticipate their moves. These accidents are more frequently fatal.

The third category is composed of the elderly pedestrian in traffic. The elderly person may be crossing the roadway legally and carefully in a business area when a motor vehicle driver fails to yield right-of-way while turning. An accident could occur as the result of the older person's slowed reactions, poorer hearing and reflexes which allow him to be hit in the same situation in which a younger person could have jumped out of the way. Because of the elderly's lessened recoverability from injury, these accidents are also often fatal.

Severity.

Analyses dealing with severity of pedestrian accidents were conducted on 1973 and the first half of 1974 accident data. In this period of time, 11.4 percent of all accident-involved pedestrians were killed, 30.2 percent received Class A (incapacitating) injuries, 31.4 percent sustained Class B (visible, non-incapacitating) injuries, 19.6 percent had Class C (not visible but complaint of injury), 0.1 percent received no injury, and 7.3% were not stated.

The question of what makes on accident fatal and another not fatal was investigated. Taking all pedestrians who were accident-involved into account, it was found that 12.6 percent of the pedestrians who were crossing between intersections were killed, but only 7.8 percent of those who crossed at an intersection were killed. Together, these made up approximately one-half, (49.4 percent) of the fatalities. Of those persons who were lying in the road, 73.9 percent were killed. The next most lethal actions were "walking against traffic" (22.3 percent of these pedestrians were killed) and "walking with traffic" (19.0 percent being killed).

Pedestrian injury by highway class was examined, and results are presented in Table 6.

Table 6

It was found that 5.0 percent of the pedestrians hit on city streets were fatally injured. Of the small number (56) of pedestrians hit on interstates, 32.1 percent were killed. Approximately one-fourth of the pedestrians involved in accidents both on U.S. highways or N.C. highways (23.8 percent and 25.2 percent respectively) were fatally injured.

Accident severity in terms of pedestrian injury varied by locale. Table 7 shows that almost one-half of pedestrians receiving C injuries or B injuries were involved in accidents in residential areas (49.8 percent and 47.1 percent, respectively), while 12.1 percent of pedestrians receiving C injuries and 21.4 percent of pedestrians receiving B injuries were involved in accidents in open country areas.

Table 7

The highest percentage (38.4 percent) of pedestrians receiving A injuries were also hit in residential areas. However, of the 485 pedestrians who were killed, over half (61.2 percent) were hit in open country areas and only slightly over one-fourth (27.6 percent) were involved in accidents in residential areas. Open country areas accounted for 27.2 percent of all pedestrian accidents,and residential areas accounted for 39.6 percent of all pedestrian accidents.

Table 6. Pedestrian injury by highway class for pedestrian accidents (column percentages in parentheses).

Injury	Highway Class							
	Interstate	U.S. Highway	N.C. Highway	Rural Paved Road	Rural Unpaved Road	City Street	Private Property	Not Stated
Not injured	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (0.0)	3 (1.0)	0 (0.0)
C class injury	2 (3.6)	52 (11.5)	36 (10.7)	72 (9.0)	3 (6.8)	665 (29.5)	8 (2.5)	0 (0.0)
B class injury	15 (26.8)	102 (22.5)	91 (27.0)	234 (29.3)	16 (36.4)	855 (37.9)	20 (6.4)	6 (75.0)
A class injury	21 (37.5)	186 (41.1)	120 (35.6)	328 (41.1)	14 (31.8)	612 (27.1)	7 (2.2)	2 (25.0)
Killed	18 (32.1)	108 (23.8)	85 (25.2)	151 (18.9)	9 (20.5)	112 (5.0)	2 (0.6)	0 (0.0)
Not stated	0 (0.0)	5 (1.1)	5 (1.5)	14 (1.8)	2 (4.5)	11 (0.5)	274 (87.3)	0 (0.0)
Total	56	453	337	799	44	2256	314	8

Table 7. Pedestrian injury by locale of pedestrian accident (row percentages in parentheses).

	Locale					
	Business	Residential	School or Playground	Open Country	Not Stated	Total
Not injured	0 (0.0)	1 (25.0)	0 (0.0)	0 (0.0)	3 (75.0)	4
C class injury	287 (34.2)	417 (49.8)	25 (3.0)	101 (12.1)	8 (1.0)	838
B class injury	362 (27.0)	630 (47.1)	40 (3.0)	287 (21.4)	20 (1.5)	1339
A class injury	306 (23.7)	496 (38.4)	24 (1.9)	456 (35.3)	8 (0.6)	1290
Killed	48 (9.9)	134 (27.6)	5 (1.0)	297 (61.2)	1 (0.2)	485
Not stated	7 (2.3)	12 (3.9)	0 (0.0)	18 (5.8)	274 (88.1)	311
Total	1010 (23.7)	1690 (39.6)	94 (2.2)	1159 (27.2)	314 (7.4)	4267

Table 8 presents pedestrian injury by light condition.

Table 8

Over one-half of those pedestrians receiving C, B, and A injuries (68.4 percent, 69,8 percent, and 59.0 percent, respectively) were involved in accidents in daylight hours. Only slightly over one-third (37.5 percent) of those pedestrians killed were hit in daylight hours, while 46.2 percent of the fatalities occurred on dark, unlighted roads and another 12.6 percent on dark, lighted roads.

The relationship between accident severity and driver's estimated speed was investigated for those accidents classified as "collision of motor vehicle with pedestrian" which occurred in 1973 and the first half of 1974. Results are presented in Table 9.

Table 9

It was found that almost one-half (48.4 percent) of all these accidents took place at estimated motor vehicle speeds of 25 mph or less, and only 10.6 percent at estimated speeds of over 45 mph. However, 12.1 percent of the fatal accidents occurred at these lower speeds and 35.6 percent at the higher speeds. Whereas almost one-half (49.2 percent) of the A or B injury accidents occurred at estimated vehicle speeds of less than 25 mph, only 8.2 percent of these accidents took place when the vehicle was traveling at speeds over 45 mph. The relationship between lower estimated vehicle speeds and less severe accidents is even more evident when considering the C injury accidents,

Table 8. Pedestrian injury by light condition at time of pedestrian accident (row percentages in parentheses).

Injury	Light Condition						
	Daylight	Dusk	Dawn	Darkness-Street Lighted	Darkness-Street Unlighted	Not Stated	Total
Not injured	0 (0.0)	0 (0.0)	0 (0.0)	1 (25.0)	0 (0.0)	3 (75.0)	4
C class injury	573 (68.4)	24 (2.9)	3 (0.4)	158 (18.9)	68 (8.1)	12 (1.4)	838
B class injury	934 (69.8)	50 (3.7)	3 (0.2)	165 (12.3)	161 (12.0)	26 (1.9)	1339
A class injury	761 (59.0)	45 (3.5)	11 (0.9)	187 (14.5)	273 (21.2)	13 (1.0)	1290
Killed	182 (37.5)	11 (2.3)	4 (0.8)	61 (12.6)	224 (46.2)	3 (0.6)	485
Not stated	21 (6.8)	4 (1.3)	0 (0.0)	5 (1.6)	7 (2.3)	274 (88.1)	311
Total	2471 (57.9)	134 (3.1)	21 (0.5)	577 (13.5)	733 (17.2)	331 (7.8)	4267

Table 9. Accident severity by estimated speed of motor vehicle in pedestrian accident (row percentages in parentheses).

	Estimated Speed								
Accident Severity	Not Stated	0-15	16-25	26-35	36-45	46-55	56-65	≥ 66	Total
Fatal	22 (4.8)	25 (5.4)	31 (6.7)	97 (21.1)	121 (26.3)	126 (27.4)	30 (6.5)	8 (1.7)	460
A or B injury	98 (4.3)	565 (24.7)	561 (24.5)	578 (25.3)	299 (13.1)	172 (7.5)	12 (0.5)	4 (0.2)	2289
C injury	45 (6.5)	312 (45.2)	167 (24.2)	116 (16.8)	35 (5.1)	13 (1.9)	0 (0.0)	2 (0.3)	690
Property damage only	1 (11.1)	1 (11.1)	1 (11.1)	4 (44.4)	2 (22.2)	0 (0.0)	0 (0.0)	0 (0.0)	9
Not stated	0 (0.0)	8 (100.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	8
Total	166 (4.8)	911 (26.4)	760 (22.0)	795 (23.0)	457 (13.2)	311 (9.0)	42 (1.2)	14 (0.4)	3456

69.4 percent of which occurred at the lower speeds of 0-25 mph and only 2.2 percent of which took place at vehicle speeds in excess of 45 mph.

Bicycle.

Who.

Drivers.

Traffic violations which contributed to bicycle accidents were studied for 1973 and the first half of 1974. It was found that no violation was reported for the motor vehicle in 83.3 percent of the accidents. The most frequently reported violation was the failure to see if a move could be made safely. The next most frequently checked categories were failure to yield and speeding.

Bicyclists.

Ages of bicyclists involved in accidents in 1973 and 1974 were investigated. Those bicyclists having the highest percentage of accidents were 13-year-olds, with that age group accounting for 9.2 percent of the total 2606 bicyclists (1138 in 1973 and 1468 in 1974) involved. Children under 10 years of age accounted for 16.0 percent of the accident-involved bicyclists, and those from 10-15 years accounted for 45.6 percent.

Age and sex of accident-involved bicyclists are presented in Table 10.

Table 10

Table 10. Age of bicyclists in bicycle accidents by sex (row percentages in parentheses).

	Sex			
Age	Male	Female	Not Stated	Total
Not stated	256 (68.1)	66 (17.6)	54 (14.4)	376
0-4	16 (76.2)	5 (23.8)	0 (0.0)	21
5-9	294 (74.8)	90 (22.9)	9 (2.3)	393
10-14	808 (80.6)	169 (16.9)	25 (2.5)	1002
15-19	350 (77.4)	88 (19.5)	14 (3.1)	452
20-24	142 (80.2)	32 (18.1)	3 (1.7)	177
25-34	66 (82.5)	14 (17.5)	0 (0.0)	80
35-44	25 (89.3)	3 (10.7)	0 (0.0)	28
45-54	23 (82.1)	3 (10.7)	2 (7.1)	28
55-64	18 (90.0)	2 (10.0)	0 (0.0)	20
65-74	20 (95.2)	1 (4.8)	0 (0.0)	21
≥ 75	8 (100.0)	0 (0.0)	0 (0.0)	8
Total	2026 (77.7)	473 (18.2)	107 (4.1)	2606

Over three-fourths (77.7 percent) of the bicyclists involved in accidents in 1973 and 1974 were males, while just under one-fifth (18.2 percent)were females. Males predominated in each age category and accounted for 90.0 percent of the bicyclists over age 45 who were hit.

Because of poor reporting, very little other information exists on other bicyclists' characteristics. Based on data from 1973 and the first half of 1974, sobriety was not stated for 92.5 percent of the accident-involved bicyclists. For only 7.3 percent of the bicyclists did the accident report indicate that the bicyclist had not been drinking. The same was true for physical condition -- this condition not being stated for 93.2 percent of the bicyclists and being reported as normal for 6.7 percent of the bicyclists. Also, for 99.5 percent of the accident-involved bicyclists, violation was not stated. It is doubtful that less than 1 percent of the bicyclists were committing a violation at the time the accident occurred. The reasons for the underreporting involve both the reluctance of officers to charge children with violations and the children's lack of understanding of the rules applying to bicyclists. It would be most helpful if the child were reprimanded and his violation reported on the accident report. In terms of reporting, the bicycle is too often not considered a vehicle, and the bicyclist is not considered a driver.

Where.

There were some differences among age groups in the localities in which the bicyclists were riding when involved in the accident. Table 11

shows that, for 1973 and the first half of 1974, approximately one-half (47.1 percent) of the bicyclists were hit in residential areas, 26.7 percent in open country, 19.0 percent in business areas, and 1.6 percent at school or playground.

Table 11

The highest percentage of pedestrians in each age category were involved in accidents in residential areas. Up to age 9, well over one-half (62.7 percent) of the accident-involved bicyclists were hit in residential areas, while slightly over one-fourth (26.8 percent) of the bicyclists over age 45 who were hit were riding in residential areas. Compared to all other age groups, bicyclists aged 0-4 had the largest percentage of accidents in residential areas (84.2 percent), while those aged 55-64 years had the largest percentage of accidents in open country (53.3 percent).

The great majority of these accidents happened on smooth asphalt roads with no defects. Of great interest in bicycle accidents has been the road feature, especially intersection versus non-intersection accidents. Forty-two percent of the bicyclists had their accidents at the intersection of two roadways, and another 15 percent at driveway or alley intersections. Approximately two-thirds of the intersections had some sort of traffic control, most of which were stop signs. Only 18 percent of the accident intersections had stop and go signals.

When.

Bicycle accidents happen throughout the year with the most occurring during the summer months. The least number of accidents (about 45-50 each month in 1973 and 70-90 in 1974) happened in North Carolina

Table 11. Age of bicyclists in bicycle accidents by locale of accident (row percentages in parentheses).

Age	Locale					
	Business	Residential	School or Playground	Open Country	Not Stated	Total
Not stated	68 (21.9)	157 (50.6)	2 (0.6)	62 (20.0)	21 (6.8)	310
0-4	0 (0.0)	16 (84.2)	0 (0.0)	3 (15.8)	0 (0.0)	19
5-9	32 (9.6)	206 (61.5)	9 (2.7)	78 (23.3)	10 (3.0)	335
10-14	116 (15.1)	365 (47.5)	8 (1.0)	240 (31.2)	40 (5.2)	769
15-19	92 (25.8)	127 (35.7)	6 (1.7)	101 (28.4)	30 (8.4)	356
20-24	47 (34.8)	49 (36.3)	4 (3.0)	27 (20.0)	8 (5.9)	135
25-34	17 (27.4)	26 (41.9)	2 (3.2)	12 (19.4)	5 (8.1)	62
35-44	4 (16.0)	13 (52.0)	1 (4.0)	7 (28.0)	0 (0.0)	25
45-54	4 (19.0)	7 (33.3)	1 (4.8)	7 (33.3)	2 (9.5)	21
55-64	3 (20.0)	4 (26.7)	0 (0.0)	8 (53.3)	0 (0.0)	15
65-74	7 (43.8)	4 (25.0)	0 (0.0)	4 (25.0)	1 (6.3)	16
≥ 75	2 (50.0)	0 (0.0)	0 (0.0)	2 (50.0)	0 (0.0)	4
Total	392 (19.0)	974 (47.1)	33 (1.6)	551 (26.7)	117 (5.7)	2067

during the months from November through February, and the most (135-170 per month in 1973 and 170-195 in '74) in June, July,and August. This is as would be expected on the basis of assumed exposure because most people ride bicycles during warm weather and because school age children, who make up most of the bicyclists, are riding more hours during the summer months.

More bicycle accidents happened on Friday than any other day of the week. In 1973-74, only a few more bicyclists were hit on Fridays than Saturdays or Mondays. The day on which the least number of accidents occurred was Sunday. The time of day particularly conducive to bicycle accidents appeared to be 4-6 p.m., when nearly 30 percent of the involved bicyclists were hit. The hours between 2:00 p.m. and 3:00 p.m. accounted for 65 percent of the bicycle accidents, even on weekends. The time of day that bicyclists were involved varied only slightly with age. All age groups had most of their accidents between 2:00 and 8:00 p.m. except those over age 40 who had more in the hours between 8:00 a.m. and noon. In each time group, about 1/2 of the accidents occurred in residential areas except for the periods of time between noon - 2:00 p.m. and midnight - 8:00 a.m., when both business area and open country accidents increased.

How.

Almost all of the bicycle maneuvers and violations were left unstated on accident reports. When these variables were indicated, however, it was found that the majority of the accident-involved bicycles were going straight ahead with no violation. Because approximately 77 percent of the motor vehicles involved in these accidents were going straight ahead and another 4 percent were passing, and because the

bicycle's maneuver was not obtainable, one cannot determine much about what actually took place just before the accident occurred, i.e., how it happened. Also, the small number of violations checked may be misleading in terms of what actually happened. Indeed, the types of accidents as well as their causes and precipitating events can at this time be retrieved only from the narrative descriptions.

What has been found concerning precipitating factors in 1973 and 1974 bicycle accidents is that these crashes involved left turning motor vehicles 7.6 percent of the time and right-turning vehicles 4.7 percent of the time; the majority of these were in residential areas. Another 4.4 percent were passing, predominantly (74.3 percent of the time) in open country areas. The motor vehicle was going straight ahead in 76.8 percent of the cases, and the remaining maneuvers were indicated in less than 2 percent of the accidents. These figures give only small indications of what happened that contributed to the accident.

Severity.

Based on 1973 and 1974 data, 6.6 percent of the accident-involved bicyclists were killed, while 2.1 percent of the cyclists received A injuries, 22.9 percent received B injuries, 43.9 percent sustained C injuries, and 20.9 percent were not injured.

Although 85 percent of the striking motor vehicles in all bike accidents were cars and 11 percent were trucks, only 70 percent were cars and 26 percent trucks in the case of fatal bicycle accidents. Only 2 percent of the bicyclists hit by cars were killed, but 6 percent of those hit by trucks were killed. Again, it is not known whether this was a function of speeds, accident types, or the physical characteristics of the motor vehicle.

Supplementary Data Analyses

General characteristics.

Pedestrian and bicycle accidents were investigated using a supplementary report form (Appendix A) in 12 North Carolina cities during the months of March, April, and May, 1975. Municipal police officers were instructed to complete a form at the scene of any accident involving a pedestrian or bicyclist for which a standard accident report form was also being completed. Data from both reports were analyzed in order to use all available information. The purpose of the supplementary data collection was to obtain information not otherwise available about pedestrian and bicycle accidents, especially concerning how and why they occur and what might be done to prevent them.

The 12 cities cooperating in this project contain about 20 percent of North Carolina's population, but account for about 36 percent of the pedestrian and bicycle accidents. The completed reports received totaled 357 which was in the range expected. Results of the supplementary data analyses are presented in the following pages. Because the forms were used only in major North Carolina cities, the results may be applicable to urban accidents only and not to those accidents occurring in rural areas. It should also be kept in mind that a sample of 357 accidents is relatively small, and results of the analyses conducted on these accidents are not generalizable to all pedestrian and bicycle accidents. Analyses were conducted on the 242 pedestrian accidents and 115 bicycle accidents which occurred during the three-month investigation period. The first pedestrian and first bicyclist involved in an accident were taken into consideration when looking at persons involved in the 357 accidents. Consequently, the number of accidents and the number of

accident-involved persons is the same (both being 357). The cities appearing in Table 12 are arranged in order of population size, with the largest city, Charlotte, having a population of approximately 250,000 and the smallest, Chapel Hill, having approximately 30,000 residents.

Table 12 presents a breakdown of the participating cities with the frequency and percentage of pedestrian and bicycle accidents which occurred during the three months in which supplementary data were collected.

Table 12

Pedestrian/bicycle accidents were rather evenly distributed during the three months of supplementary data collection. Of the total sample, 30.5 percent of the accidents occurred in March; 36.7 percent occurred in April; and 32.8 percent took place in May.

Officers were asked to indicate the number of pedestrians, bicycles, and motor vehicles involved in each accident. Table 13 shows the various accident configurations which occurred.

Table 13

It can be seen from Table 13 that about 67.8 percent of the accidents were pedestrian accidents and 32.2 percent were bicycle accidents. The one accident involving both a pedestrian and a bicycle was classified as a pedestrian accident. Of all the accidents investigated, 31.4 percent involved no pedestrians, one bicycle, and one motor vehicle. Over one-half of the accidents investigated (62.5 percent) involved a

Table 12. Accident occurrence in cities participating in supplementary study.

City	Total	Pedestrian Accidents	Bicycle Accidents
Charlotte	81 (22.7)	64	17
Greensboro	52 (14.6)	35	17
Winston-Salem	49 (13.7)	33	16
Raleigh	34 (9.5)	18	16
Durham	23 (6.4)	16	7
High Point	26 (7.3)	20	6
Asheville	11 (3.1)	8	3
Fayetteville	21 (5.9)	13	8
Gastonia	19 (5.3)	14	5
Wilmington	24 (6.7)	15	9
Burlington	10 (2.8)	3	7
Chapel Hill	7 (2.0)	3	4
Total	357	242	115

Table 13. Accident configuration of sample accidents.

Accident Configuration				
Pedestrian(s)	Bicycle(s)	Motor Vehicle(s)		
0	1	1	112	(31.4)
0	2	0	1	(0.3)
0	2	1	1	(0.3)
0	2	2	1	(0.3)
1	0	1	223	(62.5)
1	0	2	11	(3.1)
1	1	0	1	(0.3)
2	0	1	6	(1.7)
3	0	1	1	(0.3)
		Total	357	

pedestrian, no bicycle, and a motor vehicle. All other presenting accident configurations occurred only once during the three-month period, except for: 1) those accidents with one pedestrian and two motor vehicles (3.1 percent) and 2) those accidents involving two pedestrians and one motor vehicle (1.7 percent).

On the North Carolina standard accident report form, accidents are typed by the first event in the continuous series of events which result in damage or personal injury. Not all of the pedestrian/bicycle accidents investigated during the three-month period actually began by a collision between a motor vehicle and pedestrian/bicycle. Consequently, the accident type appearing on the accident report form would be something other than "Collision of Motor Vehicle in Road with Pedestrian," or "Collision of Motor Vehicle in Road with Bicycle." Table 14 presents a breakdown of accidents by type as appearing on the standard report form.

Table 14

Ninety-five percent of the accidents investigated were actually typed as collision of motor vehicle with pedestrian/bicycle, while only 5 percent received other typings. Officers were asked to indicate the persons from whom they were able to obtain statements. Table 15 presents these data.

Table 15

Table 14. Accident type of sample accidents.

Not stated	1	(0.3)
Ran off road - right	5	(1.4)
Ran off road - left	1	(0.3)
Collision with pedestrian	230	(64.4)
Collision with parked vehicle	3	(0.8)
Collision with bicycle	109	(30.5)
Collision with object	2	(0.6)
MV-MV rear end slow	1	(0.3)
Sideswipe	2	(0.6)
Angle	1	(0.3)
Backing	2	(0.6)
Total	357	

Table 15. Persons from whom police officers obtained accident data in sample accidents.

Not stated	4	(1.1)
Driver	40	(11.1)
Pedestrian/bicyclist only	18	(5.0)
Driver and pedestrian/bicyclist	125	(35.0)
Driver and witness	51	(14.3)
Pedestrian/bicyclist and witness	10	(2.8)
Driver, pedestrian/bicyclist, and witness	101	(28.3)
Witness only	8	(2.2)
Total	357	

In over one-third (35.0 percent) of the accidents, the driver and the pedestrian and/or bicyclist were the only two persons who provided the officer with information. In over one-fourth of the accidents (28.3 percent), the investigating officer was able to obtain statements from the driver, pedestrian and/or bicyclist, and witness(es). The small number of accidents in which only the pedestrian or bicyclist and a witness provided information account for only 2.8 percent of the accidents which occurred and probably represent hit-and-run collisions. In almost one-half of the cases (45.4 percent), witnesses supplied the investigating officer with information concerning the accident. It was found that 71.1 percent of the accidents elicited comments from the pedestrian and/or bicyclist himself.

Pedestrian accidents.

Who.

The age and sex of drivers involved in motor vehicle accidents with pedestrians in the three-month investigation period were examined. Over two-thirds (68.2 percent) of the drivers were male, while only slightly over one-fourth (25.6 percent) were females. Young drivers, aged 15-18, accounted for 11.2 percent of all drivers involved in pedestrian accidents. Almost one-fourth (22.7 percent) of the accident-involved drivers were aged 26-35 years, with an additional 20.7 percent being 19-25 years of age.

Age and sex were similarly investigated for the pedestrians involved in the 357 accidents. The youngest pedestrian was one year of age, while the oldest was 90 years old. Approximately two-thirds (63.6 percent) of the accident-involved pedestrians were males, while 36.4 percent were females. Pedestrians under 14 years of age were

heavily represented, accounting for 78.5 percent of the pedestrians involved in accidents with motor vehicles. Percentages of males and females in this 0-14 year category were very similar to the breakdown of the total 242 pedestrians -- 68.8 percent males and 31.2 percent females. Over one-tenth (10.7 percent) of the accident-involved pedestrians were 60 years of age or older. The pedestrian's driving status, sobriety, and physical and emotional condition were investigated. While 26.9 percent of the pedestrians involved in accidents with motor vehicles were licensed drivers themselves, 60.7 percent were not licensed drivers. Of the 20 accident-involved pedestrians who were 15-18 years old, 10 (50.0 percent) were not licensed drivers. Eight of the 15 elderly ($\geq$ 66 years old) accident-involved pedestrians were not licensed drivers. Reporting officers indicated that 80.6 percent of the pedestrians had not been drinking at the time of the accident, 5.4 percent had been drinking and were impaired, and 6.2 percent had been drinking but impairment was unknown. Physical problems either did not exist or were unknown for 80.1 percent of the accident-involved pedestrians, while emotional stress was absent or unknown for 86.0 percent of the pedestrians.

Where.

The locations at which pedestrian accidents occurred were examined, and results appear in Table 16.

Table 16

Table 16. Accident location of sample pedestrian accidents.

Not stated	3	(1.2)
Intersection	43	(17.8)
One-way street	4	(1.7)
Divided road	24	(9.9)
Two-way road	129	(53.3)
Parking lot	21	(8.7)
Driveway	8	(3.3)
Yard	7	(2.9)
Island, median	1	(0.4)
Sidewalk	2	(0.8)
Total	242	

It can be seen that over one-half (53.3 percent) of the accidents occurred on two-way streets. The location with the second highest frequency of occurrence of pedestrian accidents was the intersection, with 17.8 percent of the accidents taking place there. Only four (1.7 percent) of the accidents took place on one-way streets.

Highway class and road condition are important variables to consider when examining the locations and conditions under which accidents take place. Dry, city streets were the scene of 176 (72.7 percent) of the 242 pedestrian accidents.

The presence of sidewalks was examined. It was found that sidewalks were present at 36.8 percent of the pedestrian accident scenes. Almost one-half (47.9 percent) of the locations did not have sidewalks. Nine (7.8 percent) of the pedestrian accidents that occurred at those locations without sidewalks involved pedestrians walking with traffic, and one (0.9 percent) pedestrian accident involved a person walking against traffic. If present and utilized, a sidewalk could possibly have prevented the occurrence of these 10 accidents. The location having the highest frequency of pedestrian accidents was the two-way road. Over half (50.4 percent) of this particular accident location had no sidewalks present. The area having the highest frequency of pedestrian accidents was the residential area, 54.7 percent of which had no sidewalks.

The type of parking at the scene of the accidents was investigated. Although 42.6 percent of the pedestrian accidents took place at locations where there was no parking, almost one-fifth (19.8 percent) occurred where both sides of the street had parallel parking. Over one-tenth (10.3 percent) of the pedestrian accidents occurred on streets with one-side parallel parking, and an additional 11.6 percent occurred

in parking lots. In those locales that had two-side parallel parking, 14 (29.2 percent) of the pedestrian accidents occurred when the pedestrian came from behind a parked car. One (4.0 percent) of the accidents that took place on streets with parallel parking occurred when the pedestrian made such a maneuver, and six (21.4 percent) pedestrian accidents taking place in parking lots transpired when the pedestrian came into the path of the striking motor vehicle from behind a parked car.

When.

Pedestrian accidents were fairly evenly distributed over the three-month period of investigation. Almost one-third (30.6 percent) of the accidents occurred in March, 36.0 percent in April, and 33.5 percent in May. Friday was the day with the highest frequency of pedestrian accidents (21.5 percent) with Wednesday and Thursday having the next highest frequencies (15.3 percent and 14.0 percent, respectively). Almost one-third (32.6 percent) of the pedestrian accidents occurred from 4:00 p.m. to 8:00 p.m., while another one-fourth (23.6 percent) took place from noon to 4:00 p.m. The hours from 8:00 a.m. to noon accounted for 16.9 percent of the accidents, with 20.7 percent of the accidents happening in the hours from 8:00 p.m. to midnight.

How.

Weather and light conditions existing at the time of the pedestrian accidents were analyzed. One-half of the accidents occurred during daylight hours when the weather was clear. Over three-fourths (77.7 percent) of the total number of pedestrian accidents took place during daylight hours, while 16.5 percent occurred on dark, lighted roads. Almost two-thirds of the pedestrian-motor vehicle collisions happened during clear weather, with an additional one-fourth (27.7 percent) occurring when the weather was cloudy.

The distance at which the driver first saw the pedestrian was examined. Table 17 presents this information and its relationship to the person(s) who attempted to avoid the accident.

Table 17

Neither the driver nor pedestrian attempted to avoid the accident in 42.1 percent of the cases, while the driver alone made such an attempt in 41.7 percent of the accidents. Both the driver and pedestrian made moves to avoid the accident in only 4.5 percent of the cases. The driver alone attempted to avoid the accident in over two-thirds (68.2 percent) of the accidents in which the pedestrian was seen by the driver at a distance of over 50 feet and in over three-fourths (76.9 percent) of the accidents when the pedestrian was sighted at a distance of 20-50 feet. In those accidents in which the pedestrian was not seen by the driver until the time of impact, neither the driver nor pedestrian attempted to avoid the accident 75.0 percent of the time.

Distractions to the driver and/or pedestrian were examined. In 60.3 percent of the accidents, neither the pedestrian nor driver was distracted. The driver only was distracted in 12.8 percent of the accidents, while the pedestrian only was distracted in 18.6 percent of the accidents.

Investigating officers were asked to indicate if the pedestrian were crossing or entering a roadway when the collision occurred and, if so, where he was crossing. Results appear in Table 18.

Table 18

Table 17. Distance seen by attempts to avoid for sample pedestrian accidents (row percentages in parentheses).

	Attempts to Avoid					
Distance	Not Stated	Driver	Pedestrian	Driver and Pedestrian	Neither	Total
Not stated	1 (14.3)	0 (0.0)	1 (14.3)	0 (0.0)	5 (71.4)	7
> 50 feet	1 (4.5)	15 (68.2)	1 (4.5)	2 (9.1)	3 (13.6)	22
20-50 feet	1 (2.6)	30 (76.9)	0 (0.0)	4 (10.3)	4 (10.3)	39
< 20 feet	6 (7.5)	48 (60.0)	4 (5.0)	5 (6.3)	17 (21.3)	80
At impact	2 (3.8)	7 (13.5)	4 (7.7)	0 (0.0)	39 (75.0)	52
After impact	0 (0.0)	0 (0.0)	1 (4.3)	0 (0.0)	22 (95.7)	23
Unknown	1 (5.3)	1 (5.3)	5 (26.3)	0 (0.0)	12 (63.2)	19
Total	12 (5.0)	101 (41.7)	16 (6.6)	11 (4.5)	102 (42.1)	242

Table 18. Crossing behavior of those pedestrians crossing at time of accident in sample pedestrian accidents.

Not stated	2	(1.0)
At intersection, marked crosswalk	16	(8.7)
At intersection, unmarked crosswalk	6	(3.3)
At intersection, not in crosswalk	19	(10.4)
Within 10' of intersection, marked crosswalk	1	(0.5)
Within 10' of intersection, not in crosswalk	26	(14.2)
Neither at intersection nor within 10', not in crosswalk	113	(61.7)
	183	

In the case of those pedestrians who were crossing, 22.4 percent were at an intersection. Intersections are categorized according to the presence or absence of crosswalk provisions. Sixteen of the pedestrians (8.7 percent) who were crossing were at an intersection in a marked crosswalk, 3.3 percent were crossing at an intersection in an unmarked crosswalk, while 10.4 percent were crossing at an intersection, but were not utilizing a crosswalk. Of the pedestrians who were crossing at the time of the accident, 14.7 percent were crossing within 10 feet of an intersection. Only 0.5 percent of those who were crossing were crossing within 10 feet of an intersection and were using a marked crosswalk, while 14.2 percent were within 10 feet but were not in a crosswalk. Over one-half (61.7 percent) of those pedestrians who were crossing at the time of the accident were not at or within 10 feet of an intersection nor using a crosswalk.

The pedestrian's action at the time of the accident was investigated, and results appear in Table 19.

Table 19

Over one-third (38.4 percent) of the pedestrians were crossing, not at an intersection, at the time the accident occurred. The next two most frequently occurring activities were crossing at an intersection (16.1 percent of the pedestrians) and coming from behind parked cars (10.7 percent of the pedestrians). One of the pedestrians was lying in the road when struck by the motor vehicle, and one was walking against traffic when the accident occurred.

Table 19. Pedestrian action at time of collision for sample pedestrian accidents.

Not stated	2	(0.8)
Crossing, intersection	39	(16.1)
Crossing, not intersection	93	(38.4)
Behind parked vehicle	26	(10.7)
Walking with traffic	10	(4.1)
Walking vs. traffic	1	(0.4)
On, off vehicle	8	(3.3)
Standing	16	(6.6)
Working	3	(1.2)
Playing	15	(6.2)
Lying	1	(0.4)
Other	17	(7.0)
Not in road	11	(4.5)
Total	242	

Motor vehicle maneuver at the time of the accident was examined. It was found that over two-thirds (67.8 percent) of the motor vehicles were going straight ahead. When this variable was investigated in relation to the pedestrian's movement, it was found that 41.3 percent of all 242 accidents occurred when the motor vehicle was going straight ahead and the pedestrian was running.

The reporting officer indicated the pedestrian and motor vehicle violation on the supplementary report form. In almost three-fourths (73.6 percent) of the accidents, no violation was indicated on the part of the driver. However, in over one-half (53.3 percent) of the cases, the officer reported that the pedestrian did not look for cars.

Researchers who dealt with the supplementary accident report forms completed during the three-month period made a subjective judgment of fault based on the officer's report. It was decided that the pedestrian alone was at fault in 65.7 percent of the accidents, the driver alone in 17.8 percent of the accidents, both the pedestrian and driver in 14.5 percent of the cases, and "other" in 2.1 percent of the accidents.

Severity.

A breakdown of pedestrian-motor vehicle accident severity is as follows: 5.8 percent of the accidents were fatal, 15.7 percent resulted in A injury to the victim, 41.3 percent were B injury accidents, 35.1 percent of the accidents resulted in C injury, and 0.8 percent were property-damage only accidents.

Bicycle accidents.

Who.

The age and sex of drivers involved in motor vehicle accidents with bicyclists in the three month-investigation period were examined. Patterns were found which are similar to those which emerged in the

analysis of pedestrian accidents. Approximately two-thirds (66.1 percent) of the motor vehicle drivers were male, with less than one-third (27.8 percent) being female. Almost one-fourth (24.3 percent) of the drivers were 19-25 years of age, with an additional 23.5 percent being 26-35 years old. Young drivers, aged 15-18 years, accounted for nearly one-tenth (9.6 percent) of the accident-involved drivers.

Bicyclists' age and sex were investigated. The youngest bicyclist involved in an accident was 5 years of age, and the oldest was 42 years old. Males were highly represented in the bicyclist group, accounting for 86.1 percent of the bicyclists hit. Only 16 (13.9 percent) of the bicyclists involved in accidents were female. Over one-half (54.8 percent) of the cyclists were under 14 years of age.

The bicyclists' driving status, sobriety, and physical and emotional condition were examined. Almost three-fourths (74.8 percent) of the cyclists were not licensed drivers, while 17.4 percent were definitely licensed drivers. The bicyclist had either no or unknown emotional stress in 94.0 percent of the accidents, while physical problems were absent or unknown for 93.9 percent of the bicyclists. Reporting officers indicated that the bicyclist had not been drinking in 93.9 percent of the accidents.

Bicycle defects were investigated. In 10 (8.7 percent) of the 115 bicycle accidents, defects in the bicycles were noted. Bicycle equipment was also observed. It was reported that 21 (18.3 percent) of the 115 bicycles examined had lights, while lights were reported as not being present on 75 (65.2 percent) of the bicycles. Officers reported that reflectors were definitely present on 74 (64.3 percent) of the bicycles and not present on 24 (20.9 percent). Presence of reflectors

was unknown in 11 (9.6 percent) of the cases. Flags appeared on only one of the accident-involved bicycles and were reported as being absent on 92 (80.0 percent) of the bikes. Officers indicated that only four (3.5 percent) of the bicycles had bells, while 81 (70.4 percent) definitely did not. Mirrors were part of the equipment on 11 (9.6 percent) bikes but were absent on 77 (67.0 percent) of the accident-involved bicycles. In 18 (15.7 percent) of the accidents involving bicycles, it was unknown whether a mirror was present. Handbrakes were reported as being present on 60 (52.2 percent) of the bikes and absent on 31 (27.0 percent). The presence or absence of handbrakes was unknown in 15 (13.0 percent) of the accidents.

Officers were also asked to indicate whether those bicycles that were involved in accidents were registered. In 15 (13.0 percent) of the cases, the bicycles were registered; 51 (44.3 percent) of the bicycles were definitely not registered; this information was unknown for 39 (33.9 percent) of the bikes.

Bicycle type was also observed and recorded by investigating officers. Resulting data are presented in Table 20.

Table 20

Over one-third (38.3 percent) of the accident-involved bicycles were male lightweight; over one-fourth (27.8 percent) were male standard; and almost one-fifth (19.1 percent) were male highrise. Female lightweight bicycles and tricycles were the least involved (each appearing in only one accident, representing 0.9 percent).

Table 20. Bicycle type for bicycles involved in sample bicycle accidents.

Not stated	2 (1.7)
Male highrise	22 (19.1)
Female highrise	2 (1.7)
Male standard	32 (27.8)
Female standard	9 (7.8)
Male lightweight	44 (38.3)
Female lightweight	1 (0.9)
Tricycle	1 (0.9)
Other	1 (0.9)
Incomplete information	1 (0.9)
Total	115

Where.

Over one-half (64.3 percent) of the bicycle accidents occurred in residential areas, while almost one-third (30.4 percent) took place in business districts. Table 21 presents a breakdown of specific accident locations.

Table 21

It can be seen that almost one-half (48.7 percent) of the bicycle accidents took place at an intersection. Over one-fourth (27.8 percent) occurred while the bicyclist was traveling on a two-way road and 11.3 percent when the pedestrian was in a driveway. Only five (4.3 percent) of the accidents took place on one-way streets. All other locations were the scene of bicycle accidents in less than ten occasions.

Highway class and road condition at the time of the accident were investigated. The great majority (90.4 percent) of the 115 bicycle accidents occurred on dry, city streets. City streets were the scene of 96.5 percent of the accidents. The roadway was dry in 93.9 percent of the cases.

Because bicycle provisions have recently received much attention, an investigation into their presence at the accident scene was made. It was found that 103 (89.6 percent) of the bicycle accident locations did not have bikeways while one (0.9 percent) location had a bike lane, one (0.9 percent) had a warning sign, and one (0.9 percent) had a bike route sign. Where there was no bike provision, almost one-half (49.5 percent) of the cyclists were traveling with traffic and an additional 17.5 percent were traveling against traffic. It can be

Table 21. Accident location of sample bicycle accidents.

Intersection	56 (48.7)
One-way street	5 (4.3)
Divided road	6 (5.2)
Two-way road	32 (27.8)
Parking lot	2 (1.7)
Driveway	13 (11.3)
Sidewalk	1 (0.9)
Total	115

argued that bikeways, if they had been present, would have provided the cyclist with a separate traveling area and could have been responsible for avoiding 69 bicycle accidents.

When.

Bicycle accidents were fairly evenly distributed over the three-month period. Almost one-third (30.4 percent) took place in March, 38.3 percent in April, and 31.3 percent in May. Accidents were also fairly evenly distributed over the days of the week, with Friday having the highest percentage of accidents (18.4 percent). Monday and Tuesday accounted for 15.8 percent and 17.5 percent of the accidents, respectively. Almost one-half (44.7 percent) of the accidents happened from 2:00 p.m. to 4:00 p.m., and an additional 25.5 percent occurred in the hours from noon to 2:00 p.m. The time period with the next highest frequency of accidents was 4:00 p.m. to 8:00 p.m., with 16.7 percent of the accidents taking place during those hours.

How.

Over one-half (64.3 percent) of all the bicycle accidents occurred during daylight hours when the weather was clear. The weather was clear in 81.7 percent of the accidents, cloudy in 12.2 percent of the cases, and rainy when an additional 6.1 percent of the accidents occurred. Over three-fourths (78.3 percent) of the accidents took place during daylight hours, while 13.9 percent occurred in dark, lit areas. Only 7.0 percent of the accidents occurred during the hours of dusk.

The distance at which the driver saw the bicyclist was investigated, and its relationship to attempts to avoid the accident was noticed. Results appearing in Table 22 indicate that the driver alone attempted

to avoid the collision in 31.3 percent of the accidents, while the bicyclist only made such an attempt in 15.7 percent of the accidents.

Table 22

In 19.1 percent of the collisions, both the pedestrian and cyclist made moves to avoid the mishap. In almost one-third (31.3 percent) of the accidents, neither the driver nor the bicyclist made an attempt to avoid the occurrence of the accident. The driver attempted to avoid the collision in 9 of the 11 cases in which the driver sighted the bicyclist at a distance of over 50 feet. The driver made such an attempt in almost one half (45.7 percent) of the 46 accidents in which he saw the cyclist at a distance of less than 20 feet.

It is possible that distractions to the bicyclist and/or driver could contribute to an accident. However, neither the driver nor bicyclist was distracted by another person or object in 73.9 percent of the accidents. In only 11.3 percent of the accidents was only the driver distracted, while only the bicyclist was distracted in 9.6 percent of the cases. Only four (3.5 percent) of the accidents occurred when both the driver and bicyclist were distracted.

Bicycle maneuver at the time of the accident is presented in Table 23.

Table 23

One-half (50.4 percent) of the bicyclists were traveling with traffic at the time the accident took place. Nineteen (16.5 percent) of the

Table 22. Distance seen by attempts to avoid for sample bicycle accidents (row percentages in parentheses).

Distance	Attempts to Avoid					
	Not Stated	Driver	Bicyclist	Driver and Bicyclist	Neither	Both
> 50 feet	0 (0.0)	9 (81.8)	0 (0.0)	1 (9.1)	1 (9.1)	11
20-50 feet	1 (3.8)	6 (23.1)	1 (3.8)	11 (42.3)	7 (26.9)	26
< 20 feet	1 (2.2)	21 (45.7)	4 (8.7)	10 (21.7)	10 (21.7)	46
At impact	0 (0.0)	0 (0.0)	7 (38.9)	0 (0.0)	11 (61.1)	18
After impact	0 (0.0)	0 (0.0)	3 (42.9)	0 (0.0)	4 (57.1)	7
Unknown	1 (14.3)	0 (0.0)	3 (42.9)	0 (0.0)	3 (42.9)	7
Total	3 (2.6)	36 (31.3)	18 (15.7)	22 (19.1)	36 (31.3)	115

Table 23. Bicycle maneuver at time of accident for sample bicycle accidents.

Not stated	1 (0.9)
Traveling with traffic	58 (50.4)
Traveling vs. traffic	19 (16.5)
Entering from driveway	5 (4.3)
Entering, not from road	3 (2.6)
Entering, from road	9 (7.8)
Crossing road	16 (13.9)
Passing	1 (0.9)
Making right turn	1 (0.9)
Making left turn	1 (0.9)
Other	1 (0.9)
Total	115

cyclists were traveling against traffic, while 16 (13.9 percent) were crossing the road when the accident occurred. Each of the other bicycle maneuvers appeared in less than ten of the accidents.

An investigation of motor vehicle maneuver at the time of the accident revealed that over half (56.5 percent) of the motor vehicles were going straight ahead at the time of the accident. Nineteen (16.5 percent) of the drivers were making left turns, while an additional 15 (13.0 percent) of the drivers were turning right.

The reporting officer indicated that the driver of the motor vehicle did not commit a violation in 64.9 percent of the accidents, and failed to see that a move could be made in safety in almost one-tenth (8.8 percent) of the cases. Several bicycle violations showed up on the supplementary accident report form. The bicyclist was traveling against traffic in 14.9 percent of the cases, committed a yield violation in 10.5 percent of the accident situations, committed a stop sign violation which contributed to 13.2 percent of the accidents, and failed to look for cars in an additional 13.2 percent of the accidents.

According to research personnel who read and evaluated the supplementary forms, the bicylist only was at fault in 63.2 percent of the accidents, the driver only in 21.9 percent of the cases, both the driver and bicyclist in 14.0 percent of the accidents, and another person in one (0.9 percent) case.

Severity.

None of the bicyclists involved in accidents during the three-month investigation period were fatally injured. Approximately one-fourth (23.5 percent) of the accidents involved C injury to the victim, 46.1 percent resulted in B injury, and only 13.9 percent resulted in

A injury. Slightly over one-tenth (13.9 percent) of the accidents involved property damage only.

RECOMMENDATIONS AND CONCLUSIONS

Based on a review of the literature on pedestrian and bicycle safety and the findings of the present study, the following recommendations are made:

Recommendations

State level.

Improved reporting.

The primary source of motor vehicle accident data is the standard accident report form. Completed by police officers and highway patrolmen across the state, this report form is the basis of most research conducted on North Carolina accidents. In order for that research to be accurate and thorough, it is imperative that the information provided by the investigating officer be accurate and thorough. Research findings and subsequent countermeasures based on these findings can only be as good as the data upon which they are based. It is for this reason that officers should take extreme care in completing the accident report form at the scene of an accident. The form should be completed in its entirity with emphasis on accuracy. Through initial training of officers and ongoing programs designed for in-service training, officers should be made aware of the paramount importance of this reporting task.

In order to obtain more information on pedestrian and bicycle accidents, consideration should be given to changing the instructions which officers follow when completing the accident report form. Presently,

"only action by motor vehicle drivers which violate rules of the road are to be considered." By changing the instructions to include violations committed by drivers of non-motorized vehicles (bicycles), much additional information would be obtained. It would also be helpful if officers indicated whether the pedestrian and/or bicyclist were a licensed driver himself. Space for this information is already provided on the standard report form, but such data are often left unreported unless the driver of a motor vehicle ("Vehicle 1") is being considered. Additionally, with so many racing bicycles on the road today, estimated speeds of these vehicles would be useful information as high speeds could be a contributory factor in bike accidents. Again, provisions are made on the standard form for this information, but in the case of bicycles, it is usually omitted. Characteristics of highway design provide information in the development of countermeasures dealing with the environment. Officers should be encouraged to include data on number of lanes and presence of items such as sidewalks, crosswalks, and bikeways. This information is presently being included very often in the collision diagram and narrative description of the accident, and its inclusion should be encouraged. Possible contributing factors could be mentioned. View obstructions and/or distractions often lead to an accident, and their presence should be pointed out on the accident report.

In order to obtain this very useful information on pedestrian and bicycle accidents, no changes in the standard report form itself would be necessary. Memoranda could be sent to all enforcement personnel

using the forms with instructions to : (1) indicate violations of bicyclists as well as drivers of motor vehicles, (2) complete driver license information on pedestrian and/or bicyclist under the space on the report form allotted for "Vehicle 2," (3) indicate estimated speed of the bicycle under space allotted for "Vehicle 2", and (4) complete the collision diagram and narrative as thoroughly as possible in order that aspects of the roadway and other environmental conditions surrounding and possibly contributing to the accident be included. Subsequent printings of the instructions manual could include, in bold type, an emphasis on completely obtaining information on pedestrians and bicyclists as "Vehicle 2" and a change of the category "violation" to include bicyclists as well as drivers of motor vehicles.

Conduct of research and dissemination of findings.

The following suggestions are made for improving research on North Carolina pedestrian and bicycle accidents: (1) At the present time, researchers concerned with bicycle accidents have only numerator data, only the numbers of accidents and no measure of the number of bicyclists at risk of an accident. It is important to know the numbers of bicycles involved in accidents in a given period of time, but the number of bicycles on the road should be known in order to determine the intensity of the problem. This could be accomplished by requiring that all bikes presently owned be registered and every bicycle subsequently sold be registered when purchased. Registration is not presently required in all towns and cities in North

Carolina. In those areas where such a reguirement does exist, the ordinance is often not enforced. (2) It is believed that analyses of bicycle accidents should be conducted on a routine basis. A separate section on the Traffic Accident Summary devoted to bicycle accidents would be beneficial. It is also suggested that D.M.V. publish a statistical bicycle report which would be similar to the presently existing statistical pedestrian report. (3) Special attention should be paid to presenting statistical information in a consistent manner. The Traffic Accident Summary issued by D.M.V. for 1973 showed 2293 pedestrian accidents, while the statistical pedestrian report for that year reported 2510 pedestrian accidents. Although neither piece of information was inaccurate, the different numbers, accounted for by the classification of accident type, are somewhat confusing. If accidents are not categorized the same way in all publications, then methods of categorization should be explained along with each report. (4) It is believed that the present list of persons receiving the statistical pedestrian report should be expanded. Consideration should also be given to making some minor changes in the format of the presently existing form. These categories indicating accident locality, motor vehicle maneuver, injury class, accident type, driver characteristics, and others would be interesting and informative to readers. Crosstabulations of variables would also provide additional information which would give a more accurate portrayal of accident causal factors. (5) In order to coordinate the gathering and dissemination of information on pedestrian

accidents, a coordinator whose functions are similar to those of the State Bicycle coordinator should be appointed.

In summary, the North Carolina Department of Motor vehicles, in conjunction with research agencies, should make continuing and expanding efforts to monitor and inventory pedestrian and bicycle accidents and identify crash and injury producing factors. Only through investigative research can realistic suggestions for countermeasures be made.

Consideration, initiation, implementation of countermeasures.

Education.

Educational programs designed to teach safe driving, riding, and walking practices have and are being instituted. Over three-fourths (78.5 percent) of the pedestrians involved in accidents in the three-month period of supplementary data collection were children, aged 1-14 years. Well over one-half (60.7 percent) of the accident-involved pedestrians were not licensed drivers. Over one-half (54.8 percent) of the accident-involved bicyclists were 14 years of age or younger, while 74.8 percent of the bicyclists were not licensed drivers. Children under driving age and non-licensed drivers of every age are probably not extremely familiar with rules-of-the-road and consequently are possibly unprepared to behave appropriately and interact cautiously with other users of the roadway. Useful highway safety information can be disseminated to these persons in many ways. The Highway Safety Research Center recently completed an evaluation of a K-9 Traffic Safety Curriculum introduced in 14 pilot schools in North Carolina

last year. Designed with an emphasis on pedestrian and bicycle safety on the elementary school level, this curriculum is being considered for implementation on a statewide basis. The media also provide a vehicle for disseminating traffic safety information and could reach those persons not enrolled in school. Via television, newspapers, magazines, and pamphlets, persons at home could be familiarized with safe driving, walking, and cycling practices. Use of such strategies should be considered.

Enforcement.

Researchers collecting and analyzing the data recorded on the supplementary form made a subjective judgment of fault for persons involved in each pedestrian and bicycle accident. It was determined that the pedestrian alone was at fault in 65.7 percent of the pedestrian accidents, with both the pedestrian and driver being at fault in an additional 14.5 percent of the pedestrian accidents. In regard to bicycle accidents, it was judged that the bicyclist alone was responsible for 63.2 percent of the accidents, while both the bicyclist and driver were at fault in an additional 14.0 percent of the accidents.

At the present time, investigating officers are not required to indicate whether a pedestrian or bicyclist involved in an accident commits a violation. Very few pedestrians and bicyclists receive citations for violations which they obviously do commit. It is suggested that citations be given to persons on foot and on bicycles who are responsible, solely or partially, for accidents with motor vehicles and that these violations be reported on the standard accident report form.

In regard to increased education and enforcement as methods of combating the bicycle accident situation, the following comments appeared in "State Bicycle Program Progress" (September, 1974):

> ...existing rules-of-the-road are sufficient for the time being (with respect to the bicycle). However, adherence to these rules is the problem. Therefore, additional safety education programs should be undertaken for all ages and improved enforcement procedures should be incorporated at State and local levels of government."

Evaluation.

It is necessary that investigative research be conducted on pedestrian and bicycle accidents in order to develop an understanding of causal factors. After this determination is made, countermeasures can realistically be suggested and implemented. It is important that the chain of events not stop there, however. Without evaluation of countermeasures, it is impossible to determine which programs are being effective in reducing pedestrian and bicycle accidents. It is suggested that all countermeasures designed and implemented to improve the pedestrian and bicycle accident situation be evaluated according to a rigorous evaluative experimental design.

Local level.

Ongoing data collection and research.

Engineering departments.

It is suggested that highway engineering departments in municipalities throughout the state conduct routine studies of pedestrian and bicycle accidents. Mandatory registration of bicycles, along with bicycle accident data, would provide a sound data base on which to build suggestions for making roadway improvements designed to reduce the number of bicycle accidents. Special projects for providing

increased pedestrian protection could be suggested on the basis of observed pedestrian exposure and pedestrian accident data for various areas.

Police departments.

It is suggested that local police departments collect pedestrian and bicycle accident data and compile them into a publishable summary. It is also believed that police personnel should be more attuned to violations committed by pedestrians and bicyclists and increase the number of citations given to these persons who are oftentimes at least partly responsible for causing an accident.

Potential countermeasures.

Sidewalks.

Sidewalks were not present in 116 (47.9 percent) of the urban pedestrian accident locations and present at 36.8 percent of the locations, while the presence of sidewalks was not stated for 15.3 percent of the accident locations. Ten (8.6 percent) of the 116 pedestrian accidents which occurred where sidewalks were not present occurred when the pedestrian was traveling with or against traffic. If sidewalks had been present, these ten accidents could possibly have been avoided. Based on these data, recommendations for the installation of sidewalks alongside roadways cannot be made. Each community should study its unique set of needs based on both pedestrian accident and exposure data before recommending and initiating countermeasures.

Bikeways.

Bike provisions existed at only 2.6 percent of the bicycle accident locations, were absent in 89.6 percent of the locations, and their presence was not stated for 7.8 percent of the locations.

Almost one-half (49.5 percent) of the bicycle accidents that occurred where bike provisions were not present occurred when the bicyclist was traveling with traffic, and an additional 17.5 percent took place when the bicyclist was traveling against traffic. That is, over two-thirds (67.0 percent) of the bicycle accidents that occurred where bike provisions were not available took place when the bicyclist was mixing with motor vehicle traffic. If present and utilized, bikeways could possibly have prevented these 69 accidents. While bikeways have potential value for preventing bicycle accidents, such provisions are expensive to develop and construct. Again, bicycle registration is necessary in order to provide data on the population at risk so that determinations can be made regarding the intensity of the bicycle accident problem. After this determination is made, additional research on bike provisions and their effectiveness in terms of bicycle accident prevention should be conducted for each locality in which a bike provision is being considered.

Conclusions

Because the non-randomized sample of 357 pedestrian and bicycle accidents was a relatively small sample and was representative of only urban occurrences, generalizations cannot be made regarding all pedestrian and bicycle accidents in North Carolina. However, despite the fact that some of the suggestions for countermeasures based on the analyses of the supplementary data are pertinent to urban areas only, others would be beneficial in all areas of the State. For example, sidewalks and bikeways are obviously not feasible in rural areas, but improved reporting procedures are recommended for enforcement departments statewide.

The collection of supplementary data is not recommended on a long-term, statewide basis. While the three-month period of in-depth investigation of pedestrian and bicycle accidents yielded much interesting information, a lack of exposure data renders the value of the accident data questionable. It is suggested that, in the future, ongoing exposure studies be conducted in selected areas of the State. Information on numbers of pedestrians and bicyclists, number of miles traveled annually, and demographic characteristics of persons on foot and on bicycles should be obtained in order to make accident data meaningful for recommendation of countermeasures.

Even though pedestrian and bicycle accidents were investigated in 12 North Carolina municipalities during a three-month period, recommendations for urban countermeasures based on the analysis of the data obtained might not be appropriate or even necessary in each city in the state. It is suggested that local enforcement and engineering departments cooperate in collecting accident and exposure data in an effort to get an accurate picture of the needs of the pedestrians and bicyclists in their particular community.

Without revising or expanding the standard accident report form which is presently in existence, certain improvements in the information yielded can be obtained. Completeness and accuracy of reporting is of extreme importance. Additionally, instructions for completing the report form could be slightly altered so that more data on pedestrian and bicycle accidents are included. By increasing the quantity and improving the quality of data collected and analyzed on both the state and local levels, factors contributing to pedestrian and bicycle accidents can be better understood and specific countermeasures can be recommended.

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APPENDIX A

Supplementary Report Form

PEDESTRIAN/BICYCLE SUPPLEMENT

1 City _____
Was form completed at the scene? ☐yes ☐no 4

2 Accident involved:
____ (#) pedestrians
____ (#) bicycles
____ (#) motor vehicles

3 Able to get statement from:
☐driver of motor vehicle
☐pedestrian
☐bicyclist
☐witness

Driver of striking motor vehicle saw pedestrian or bicycle at what distance from collision? 5
☐over 50 feet away
☐20-50 feet away
☐less than 20 ft.
☐not until impact
☐not until after impact
☐unknown -- hit & run

Did P/B see motor vehicle in time to try to avoid accident? 6
☐yes
☐no

Attempted to avoid collision:
☐driver of motor vehicle 7
☐pedestrian/cyclist
☐neither

Distracted from seeing the other:
☐driver distracted by: _____ 8
☐P/B distracted by: _____
☐no known distractions

Check if motor vehicle or bicycle was turning at signalized intersection immediately before impact: 9

M.V.	B	
☐	☐	right turn on green
☐	☐	right turn on yellow
☐	☐	right turn on red
☐	☐	left turn with arrow
☐	☐	left turn on green
☐	☐	left turn on yellow
☐	☐	left turn on red
☐	☐	unknown

View obstruction/limitation: 10

M.V.	P/B	
☐	☐	curve
☐	☐	hill
☐	☐	parked cars
☐	☐	sun glare
☐	☐	headlight glare
☐	☐	stopped bus
☐	☐	stopped car, truck
☐	☐	moving vehicle
☐	☐	building
☐	☐	sign, post
☐	☐	bush, tree
☐	☐	none
☐	☐	unknown
☐	☐	other; describe:

PEDESTRIAN/BICYCLIST INFORMATION

①	②	③
Age ___	11 Age ___	Age ___
Sex ___	12 Sex ___	Sex ___
Injury ___	13 Injury ___	Injury ___
Clothes: ☐dark ☐neutral ☐light ☐reflective	14 Clothes: ☐dark ☐neutral ☐light ☐reflective	Clothes: ☐dark ☐neutral ☐light ☐reflective
Licensed driver? ☐yes ☐no ☐uncertain	15 Licensed driver? ☐yes ☐no ☐uncertain	Licensed driver? ☐yes ☐no ☐uncertain
Where injured: ☐head ☐arm/hand ☐leg/feet ☐body/trunk	Where injured: 17 ☐head ☐arm/hand ☐leg/feet ☐body/trunk	Where injured: ☐head ☐arm/hand ☐leg/feet ☐body/trunk
Last drove: ___	16 Last drove: ___	Last drove ___
Emotional Stress: ☐yes; describe: _____ ☐no or unknown	18 Emotional Stress ☐yes; describe: _____ ☐no or unknown	Emotional Stress ☐yes; describe: _____ ☐no or unknown
Physical Problems ☐poor vision, blind ☐poor hearing, deaf ☐difficulty in walking ☐other; describe: _____ ☐no or unknown	19 Physical Problems ☐poor vision, blind ☐poor hearing, deaf ☐difficulty in walking ☐other; describe: _____ ☐no or unknown	Physical Problems ☐poor vision, blind ☐poor hearing, deaf ☐difficulty in walking ☐other; describe: _____ ☐no or unknown

Location where P/B was struck: 20
☐in intersection
☐one-way street
☐divided roadway
☐two-way road
☐parking lot
☐driveway
☐yard
☐island
☐median
☐sidewalk
☐other; describe: _____

Bicycle Provisions: 21
☐bike route sign
☐bike warning sign
☐bike lane (marked)
☐bike path
☐none

Sidewalk present? ☐yes ☐no
Dividing median? ☐yes ☐no 22
Parking lanes? ☐yes ☐no
Parking:
☐one side ☐parallel
☐both sides ☐diagonal 23
☐parking lot ☐90°; head-in

24 Number of traffic lanes: ____

Width of lane in which P/B was struck: _____ ft.

25 All same width? ☐yes ☐no

26 Width of paved shoulder: _____ft.

Shoulder:
27 ☐paved
☐unpaved (soft)
☐none

ANSWER ONLY IF PEDESTRIAN OR BICYCLE WAS CROSSING OR ENTERING ROADWAY

- ☐ at intersection 28
- ☐ within 10' of intersec.
- ☐ neither

Crossing provision within 50 ft. (same road): 30
- ☐ crosswalk
- ☐ P. bridge, underpass
- ☐ other crossing
- ☐ none

Collision occurred in: 32
- ☐ parking lane
- ☐ 1st lane entered
- ☐ 2nd lane entered
- ☐ 3rd lane entered
- ☐ 4th lane entered
- ☐ after crossing 4,more

- ☐ in marked crosswalk 29
- ☐ unmarked crosswalk
- ☐ not in crosswalk

Any other vehicle stopped for crossing P/B? 31
- ☐ yes, same direction
- ☐ yes, different direction
- ☐ no
- ☐ uncertain

Traffic controls present: 33
- ☐ P/B caution,yield sign
- ☐ caution signal
- ☐ crosswalk sign
- ☐ walk/wait signal
- ☐ none
- ☐ other: _____

PEDESTRIAN ONLY

Was pedestrian: P34
- ☐ running
- ☐ walking
- ☐ not moving (standing, sitting, lying)
- ☐ not in road
- ☐ other (skating, etc.)

If he ran out into road, check reason: P35
- ☐ playing
- ☐ chased or chasing
- ☐ crossing, heavy traffic
- ☐ crossing, medium or light traffic
- ☐ no known reason
- ☐ other: _____

Check any which apply: P36
- ☐ failed to look for cars
- ☐ playing in road, supervised
- ☐ playing in road, unsupervised
- ☐ disregarded traffic signal
- ☐ hitchhiking
- ☐ reversed path while crossing
- ☐ walking in road when other available
- ☐ stepped into lane before clear
- ☐ diagonal crossing (jay walk)
- ☐ sitting, lying in road
- ☐ crossed in front of or behind bus
- ☐ fell in road
- ☐ crossed between moving vehicles
- ☐ crossed between stopped vehicles
- ☐ going to or from motor vehicle
- ☐ assisting another person, animal
- ☐ going to or from a vendor
- ☐ working on a vehicle
- ☐ pushing a vehicle, walking a bicycle
- ☐ police duty (ticketing, directing, etc.)
- ☐ drinking: state reasons for suspecting:

_____

- ☐ other action: _____

_____

Walking/Riding:
- ☐ alone
- ☐ with others:

_____ (number)

Purpose of trip:
- ☐ recreation
- ☐ transportation
- ☐ unknown

BICYCLE ONLY

Bicycle was: B34
- ☐ traveling with traffic
- ☐ traveling against traffic
- ☐ in middle of road
- ☐ entering from driveway or lot
- ☐ entering, not from roadway
- ☐ entering from other road
- ☐ crossing roadway

Accident type: B35
- ☐ rear end
- ☐ left turn
- ☐ right turn
- ☐ head on
- ☐ sideswipe
- ☐ angle
- ☐ other; describe:

_____

Where in the lane was bike traveling? B36
- ☐ left of center
- ☐ right of center
- ☐ center section
- ☐ other; _____
- ☐ doesn't apply

Check any which apply: B37
- ☐ riding on sidewalk
- ☐ riding against traffic
- ☐ swerve,skid,lost control
- ☐ fell off bike
- ☐ carrying passenger
- ☐ carrying object in hand
- ☐ attempting "tricks"
- ☐ improper lights
- ☐ yield violation
- ☐ stop sign violation
- ☐ traffic signal vio.
- ☐ speeding
- ☐ passing on right
- ☐ improper signal
- ☐ wrong way, 1-way
- ☐ didn't look for cars
- ☐ other unsafe action:

_____

B38 State any known reasons for swerve, skid, or loss of control:

_____

_____

BICYCLE INFORMATION

B39 List any defects or mechanical failures prior to impact: _____

_____

B40	Yes	No	Unknown
lights present	☐	☐	☐
lights on	☐	☐	☐
reflectors present	☐	☐	☐
flag present	☐	☐	☐
bell or horn	☐	☐	☐
registered	☐	☐	☐
mirror	☐	☐	☐
hand brake	☐	☐	☐

Type B41
- ☐ highrise
- ☐ standard
- ☐ lightweight
- ☐ tricycle
- ☐ other: _____

B42
- ☐ male (crossbar)
- ☐ female (no crossbar)

Number of speeds: ____

Reflectors present on: B43
- ☐ rear fender
- ☐ wheels
- ☐ pedals
- ☐ person
- ☐ other: _____

COMMENTS

APPENDIX B

Instructions for Pedestrian/Bicycle Supplement

INSTRUCTIONS FOR PEDESTRIAN/BICYCLE SUPPLEMENT

Highway Safety Research Center

Complete the supplement for any accident which:

a) involves a pedestrian or bicyclist anywhere in the accident sequence;
b) is reported to you or your department and a standard accident report form is filled out (whether or not is is sent to Raleigh);
c) occurs on or between March 1 and May 31.

This form should be filled out on the scene. If an accident is reported late and a report is being sent to Raleigh, the supplement should be completed as much as possible by interview and investigation of the scene.

The standard accident report form should be filled out as usual and the supplement turned in with it. The supplement and a copy of the standard form should be mailed to HSRC at the end of each week. If more forms or envelopes are needed, please contact HSRC immediately.

The Pedestrian/Bicycle Supplement has been designed so that the reporting officer can answer all questions in the most efficient manner. You will never need to fill out the entire form, but you are asked to complete all questions which do apply to the accident. It is also important that you fill out your regular form accurately and completely.

Note: If there is more than one pedestrian or cyclist involved, answer questions for the first one mentioned on the standard form.

The top line of the supplement can be filled out last. These are the only questions which can be answered after leaving the scene. They are:

(1) CITY: Write name of city reporting the accident. This will keep our records straight.

(2) ACCIDENT INVOLVED: a) Write actual number of pedestrians involved (injured or complaining of injury). Define pedestrian as you did on standard form. b) Write number of bicycles (vehicles, not persons) hit and/or damaged. Define bicycle as on standard form. Note: a bicycle is defined by the state as "a non-motorized vehicle with two or three wheels tandem, a steering handle, one or two saddle seats, and pedals by which the vehicle is propelled." This excludes motorized bicycles or "mopeds." c) Write number of motor vehicles struck by or striking any other vehicle, person,or object during the accident sequence. (The accident sequence is that series of events which makes up the accident. This includes the first maneuver which contributed to the accident and all events and maneuvers following until all vehicles and persons involved have come to rest).

(3) ABLE TO GET STATEMENT FROM: Check any which gave some statement or description of the accident.

(4) WAS FORM COMPLETED AT SCENE: Check "no" (or "N") only if it was impossible, because of late reporting or unusual circumstances, to fill out the form at the scene just following the accident. Otherwise check "yes".

The next section on the form (3 large blocks across) should be filled out first, along with the Pedestrian/Bicyclist Information. There are 6 questions in this section. (P/B = Pedestrian or Bicyclist):

(5) DISTANCE AT WHICH P/B WAS SEEN: Ask the driver of the motor vehicle which struck (or was struck by) the pedestrian or bicyclist how far away the person was from P.O.I. when he first saw him. Consider one average car length as 20 ft. if needed as description. Check only one of the available responses. "Not until impact" should be checked if the driver first saw P/B as the impact occurred or only one second before or after impact. In this case, the driver did not have time to react at all until impact or after. Check "not until after impact" if the driver was not sure that he hit or was hit by the person or did not see him until after the collision, e.g. he may have heard a noise and then saw P/B or realized he was hit. "Unknown" should be checked only if driver was not available for questioning, which should only be in the case of a hit and run driver.

(6) DID P/B SEE MOTOR VEHICLE IN TIME: Ask the pedestrian or bicyclist whenever possible at what distance he saw the motor vehicle. Get an estimate from driver or witness if necessary. Check "no" if it is apparent that the person was not aware of the presence of a motor vehicle in time to try to avoid the accident. Check "yes" if P/B saw the motor vehicle prior to one or two seconds before impact.

(7) ATTEMPTS TO AVOID COLLISION: Check any who attempted to avoid the collision by some evasive action such as swerving, skidding, braking, running, jumping, etc. If pedestrian "froze", this is not an evasive action. Check "neither" if there was no evidence of evasive action on anyone's part, as in the case of not seeing the other until impact.

(8) DISTRACTIONS: Check any person involved who was known (by statement or questioning) to be distracted by anything which may have prevented him from being aware of either the presence of the other or the danger of an accident. Then name the distraction in the space provided. Distractions do not include visual obstructions (#10), but may include anything which the person attended to other than driving, walking or riding. These may be such things as: Reading signs or signals, speaking to another person, watching another person, lighting a cigarette, adjusting a mirror, picking something up, etc.

(9) CHECK IF TURNING: Answer only if the motor vehicle or bicycle was turning at an intersection with a traffic signal immediately before collision (i.e. if accident occurred while turning or completing a turn). Ask about the color of the light at the time the turn was being made. If the light was yellow or amber as the vehicle was proceeding in the turn, even if red before turn was actually completed, check the block for yellow light (the last color driver could see as he made the turn). Check the appropriate response for the turning motor vehicle on the left and for the bicycle on the right. This is an important question to answer accurately so that signal improvements can be made. "Unknown" should be checked only if the person was turning at a signalized intersection but there was no way to tell what color the light was because driver or witness not available or unaware.

(10) VIEW OBSTRUCTION/VISIBILITY LIMITATION: Check any which apply. In left-hand column, check any which were reported to have limited the driver's view or sight distance and may have prevented him from seeing the pedestrian or bicyclist in time to avoid him. In the right-hand column, check any which blocked the view of the pedestrian or bicyclist and kept him from seeing the motor vehicle sooner. Check "none" if you are certain that no view obstructions existed for one or the other. Check "stopped bus" if a bus is stopped, or if it is just starting from or stopping at a bus stop.

The third section is labeled "PEDESTRIAN/BICYCLIST INFORMATION". You may wish to get this information first, especially if the person is still at the scene and able to answer questions. Obtain this information from the victim or a witness or bystander who knows the person. The columns are numbered 1, 2, and 3. Obtain the information for any pedestrian or bicyclist who was involved or injured in the accident. The numbers should follow the same order used on the standard form. If more than three were involved, fill out information for first three only. These 9 questions apply to the pedestrian or cyclist:

(11) AGE: State actual age in years.
(12) SEX: Write "M" or "F".
(13) INJURY: Write injury class (K, A, B, C)as stated on other form.
(14) CLOTHES: Check only one of the first three responses which best describes the color of the outer clothes worn by the person. In addition, check "reflective" if there was any reflective material worn which would reflect car headlights in darkness.
(15) LICENSED DRIVER: Check "yes" if person was a licensed driver at the time of the accident. Make every effort to find out by questioning, asking or searching for driver's license or even car keys. Also yes if person had learner's permit. Check "no" only if person is under legal age for licensing or if you are certain that person does not have a license. Otherwise, check "uncertain."
(16) LAST DROVE: State the year the person last drove, if he is 15 years or older, whether or not he is now licensed. Write "0" if never drove or under 15. Leave blank if unable to determine.
(17) WHERE INJURED: Check any which apply.
(18) EMOTIONAL STRESS: Check "yes" and describe the circumstances or type of stress if, upon questioning, you find that the person was upset about something (argument, loss, etc.) just before the accident. Otherwise, check "unknown".
(19) PHYSICAL PROBLEMS: Check any impairments the person had or demonstrated prior to crash. Check "vision" if he had poor eyesight; check same, plus circle "blind" if he was blind. If the person was deaf, circle "deaf" and check "hearing". If hearing was impaired but not a total loss of hearing, simply check "hearing". Check ""difficulty in walking" if he was crippled or had difficulty walking or running. Check "other" if some other physical disability may have been a factor (illness, drunkenness, etc.)

The following section contains four sub-sections, all of which may be answered last since they do not involve any questioning of persons involved or witnesses. They must be answered at the scene. You should proceed to the back of the form before answering the following 8 questions.

(20) WHERE COLLISION OCCURRED: Check the one response which best describes the place where the person was struck. If it was in an intersection, check only that response. If the collision did not occur in the roadway, check one of the last 7 responses which best describes the place the victim was standing, riding, walking, etc. when hit.
(21) BICYCLE PROVISIONS: Check any which are available in immediate area of where collision occurred. Check even if accident did not involve a bicycle. a) Check if a "bike route sign" was present on the roadway being used by the persons involved in the accident. Look carefully for these guide signs in the area. b) "bike warning sign": Check if any sign warns of the presence of

bicycles or bicycle crossing but does not mark a route. c) Check "bike lane" if there is a lane marked on the roadway in question, or in close proximity, for bicycle use only. d) Check if a "bike path", separated from the roadway, is available for use by bicyclists within a mile of the accident location. e) "None" if none of the above available.

(22) SIDEWALK, DIVIDING ISLAND, PARKING LANE PRESENT? Check "yes" if it is present on the roadway where the pedestrian was walking or bicyclist riding, check "no" if not. A "dividing median" means anything in middle of road which could serve as a pedestrian refuge, or place to stand between traffic lanes out of the line of travel; this could be a raised, or simply painted, area.

(23) PARKING: Check the appropriate responses if there is on-street parking on the roadway in question (if you answered "parking lanes?" yes). "Diagonal" refers to angle parking which is at less than a 90° angle to the curb, but not parallel.

(24) NUMBER OF TRAFFIC LANES: Write actual number of travel lanes (not including parking lanes) on the roadway where collision occurred. If the collision occurred out of the roadway, write "not in road" or use road traveled on by motor vehicle.

(25) WIDTH OF ONE LANE: Write actual width (in feet) of the travel lane in which P/B was struck. Then check "no" if the lanes are of unequal width.

(26) WIDTH OF SHOULDER: If a paved shoulder is present, measure its width and write actual width in feet.

(27) SHOULDER: Check response to show the kind of shoulder present.

The first section on the back of the form is labeled "ANSWER IF PEDESTRIAN OR BICYCLE WAS CROSSING OR ENTERING ROADWAY" (when collision occurred). You may skip over this section if the person was not crossing or entering. There are 6 questions which apply to the crossing of a roadway:

(28) Check response to show whether the person was crossing, or starting to cross, the roadway at an intersection, within 10 feet (approximately) of an intersection or not in or near an intersection.

(29) Check response to show whether or not the person was crossing in a crosswalk. An "unmarked crosswalk" is the crossing at an intersection which follows an imaginary line, even with a sidewalk, across the street, about 10 feet wide.

(30) CROSSING PROVISION: Check which type of crossing, if any, was available within about 50 feet of where the person crossed, but unused. This applies to any crossing provision which the person did not use but which would have allowed him to cross the same road. "Crosswalk" should be checked if either a marked or unmarked crosswalk was available within 50 ft. of where the person crossed. "P. bridge, underpass" is a crossing provision which is available for exclusive pedestrian use and separates pedestrians from traffic.

(31) OTHER VEHICLE STOPPED: Check one of the first two responses if any motor vehicle, other than the striking motor vehicle, was stopped for the crossing pedestrian, or bicyclist at the time of the accident. "Yes, same direction" means the stopped vehicle was headed the same direction as the approaching vehicle. This will usually cause a vision obstruction; be sure to check the appropriate response in the view obstruction category if this is the case.

(32)COLLISION OCCURRED IN: Check where in the line of crossing the collision occurred. If the person was in the parking lane, and had not crossed any traffic lanes, check "parking lane". If he had entered one travel

lane but had not yet reached the second, check "1st lane entered", etc. Check "after crossing 4, more" if the person had crossed 4 lanes and was still in the roadway or a parking lane when hit. Be sure to get this information from witness, driver, or victim.

(33) TRAFFIC CONTROLS PRESENT: Check which traffic controls were present at the crosswalk or intersection where the accident occurred. You will answer this question only if the collision occurred at, or within 10 ft of, an intersection and/or if it occurred at a crosswalk. You will note that the traffic controls listed on the standard form are not listed here, so be sure to check appropriate responses on that form (stop sign, stop and go signal, etc.). On the supplement, check "P/B caution, yield sign" if there is a warning sign such as "Yield to Pedestrians", "Watch for Pedestrians", etc. A "caution signal" would be a yellow flashing light; check first two if both were present. A "crosswalk sign" would be "Ped Xing", Bike Xing", "Crosswalk", etc., and a "Walk/Wait signal" is a signal, flashing or steady, which tells pedestrians when to walk and not to walk at a crosswalk or intersection. Check "none" only if no responses were checked on the standard form under "traffic control" and no controls were present, but the collision occurred at an intersection or crosswalk.

The sections labeled "PEDESTRIAN ONLY" and BICYCLE ONLY" will never both be filled out, unless the accident involved both a pedestrian and bicyclist (a rare event). Answer all questions in whichever section is appropriate. Note: A person on a bicycle, whether riding or stopped, is a bicyclist; he is not a pedestrian on a bicycle. A person walking with or pushing a bicycle is a pedestrian.

If the accident involved one or more pedestrians:

(P34) WAS PEDESTRIAN: It is important to know whether the person was running, walking or not moving. If he was running across or down the road immediately before the collision, check "running". (He was running across or into the roadway, also answer the next question)"Not in road" if he was not in the roadway when hit. Do not count a driveway or parking lot as "not in road" here. "Other" should be checked if the pedestrian was not on foot and not lying or sitting in road (occasionally, some people are reported as pedestrians on skates, sled, horseback, etc.) You should explain that "other" is on one of the 2 forms.

(P35) REASON FOR RUNNING: Answer only if the pedestrian ran or darted out into or across the road. Make every effort to find out the reason. If he was playing in an undefined sort of way or showing off, check "playing". If he was chasing something such as a person, animal, ball, etc., or being chased by person or animal, check "chased or chasing". The next response, "crossing, heavy traffic" should be checked if he ran across the street to get to the other side and traffic was heavy (in general terms); in other words, he was forced to run across the road to avoid cars due to traffic conditions. If the traffic was not heavy at the time but the person ran across rather than waiting for traffic to clear, check "crossing, medium or light traffic". Answer "no known reason" only if it was impossible to gather any information about why the person ran across the road.

(P36) CHECK ANY WHICH APPLY: Read each response carefully and check any which apply to the pedestrian's actions in the accident.
"failed to look for cars" would apply in many cases;
"playing in road, supervised" if playing with adult supervising or watching;
"playing in road, unsupervised" if no adult watching;
"disregarded traffic signal" if crossing against light or walk/wait signal;
"hitchhiking" if soliciting a ride;
"reversed path" if crossing and turned around to walk other way;
"walking in road when other available" if sidewalk or shoulder present;
"stepped into lane before clear" if stepped down from curb or into travel lane;
"diagonal crossing" if jaywalking or running diagonally across intersection;
"sitting, lying in road" if applies; please comment on any known reason;
"crossed in front of or behind bus" usually involves view obstruction;
"fell in road" if falling contributed to the accident;
"crossed between moving vehicles" if ran or walked between two or more moving vehicles, not including striking vehicle;
"crossed between stopped vehicles" if ran or walked between stopped or parked vehicles;
"going to or from motor vehicle" if getting on or off vehicle or if walking away from a vehicle or known to be going to a vehicle;
"assisting another person or animal" often follows a previous accident;
"going to or from a vendor" includes ice cream trucks and similar vehicles;
"working on a vehicle" if person was standing beside a vehicle changing tire, etc.
"pushing a vehicle, walking a bicycle" if doing so when accident occurred;
"police duty" if police officer hit in line of duty or if private citizen performing police-type activities, such as directing traffic at the scene of an accident;
"drinking" if drinking suspected, state reasons for suspecting;
"other" if pedestrian was doing something else, especially if unsafe.

If the accident involved one or more bicyclists:

(B34) BICYCLE WAS: These responses are in addition to the vehicle maneuver on the standard form, so be sure to check the appropriate response as usual for the bicycle. Also, check any which apply on supplement to show what the bicycle was doing immediately before the collision. If it was going straight ahead on a roadway, check one of the first three responses to show in which direction it was traveling. Check "middle" only if impossible to tell which lane it was in because on or very near center line. Check one of the next three if bicycle was just entering road or lane of travel, and "crossing roadway" if in the process of crossing after having crossed most or all of one travel lane ("lot" means parking lot).

(B35) ACCIDENT TYPE: Check only one which best describes the accident. "Rear end" applies if either the bike hit car in rear end or car hit bike in rear end, both going same direction. "Left turn" applies if either was turning left, etc.

(B36) WHERE IN THE LANE: Check one to indicate the position <u>in the travel lane</u> (not in the roadway) of the bicycle just before the accident. Mentally divide the width of the lane in which the bike was traveling (if going straight) into three equal parts. Then check the appropriate section of the lane in which he was traveling (left, right, or center).

(B37) CHECK ANY WHICH APPLY: Read each response carefully and check any of the actions which took place just before or during the accident sequence on the part of the cyclist. "Tricks" means such things as riding without hands on handlebars, wheelies, showing off, etc.
Check "improper signal" if bicyclist was turning and gave either no hand signal or an incorrect one.

(B38) STATE ANY KNOWN REASON...: State any reasons given or apparent for the bicycle to swerve or go out of control immediately before collision, if this occurred. This may include any mechanical failures, defects; defects in road such as bumps, sand, slick, grates, etc; or any other factors such as being frightened by a noise or sudden move or foot slipping from pedal.

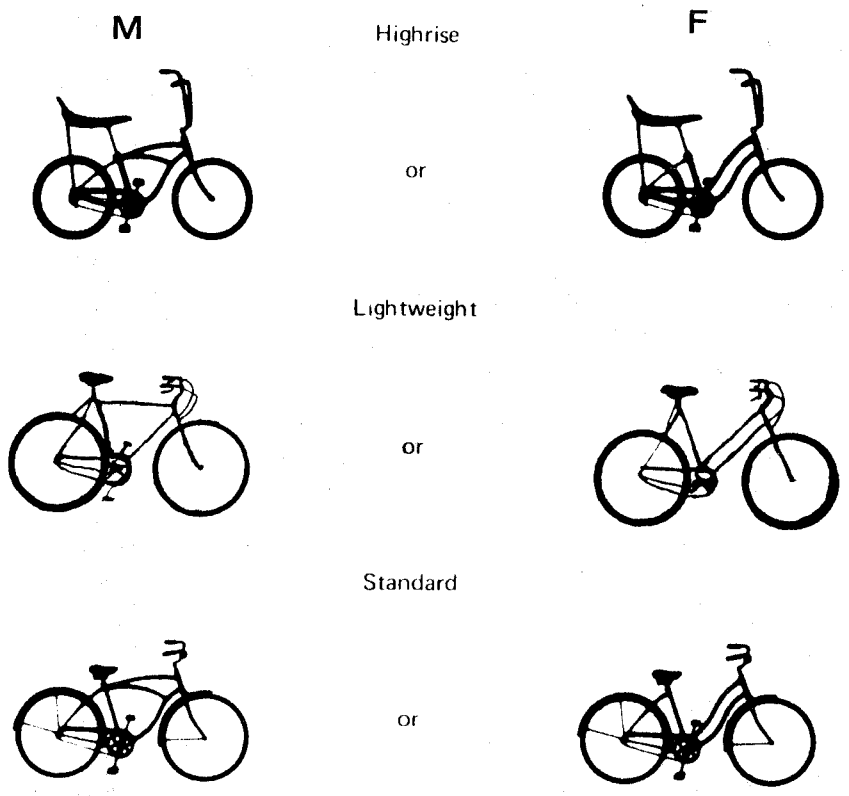
The next 5 questions apply to the bicycle itself. Check the vehicle carefully and ask questions. If the vehicle is not present for some reason, answer as many as possible.

(B39) LIST ANY DEFECTS or mechanical failures observed or reported which may have contributed to the accident in some way. Check them out. This may include brakes, gears, tires, lights, handlebars, etc.

(B40) Check whether or not the following were present on the bicycle: headlight, headlight turned on, rear end reflector, touring flag, bell or horn, registration number, rear-view mirror, and hand brakes.

(B41) TYPE: Use the diagram to determine which type most closely describes the bicycle in question.

(B42) Check "male" if there is a crossbar (drawings on left) or "female" if there is no crossbar (as on right). Also write actual number of speeds available on the vehicle (write "1" if no gearshift). Leave blank if impossible to determine.



(B43) REFLECTORS ON: Check any which show where reflectors were placed (shine a light on it if necessary). "Person" is checked if the cyclist had reflective material on, as on his shoes.

The final section should be answered for either pedestrian or cyclist. There are 2 questions:

WALKING/RIDING: Check if person was walking, riding, standing, playing, etc. alone or with others just before the collision. Answer "with others" if one or more other people were with the person in question, whether or not they were involved in any way or known by the victim. Then state the number of people accompanying him.

PURPOSE OF TRIP: Check "recreation" if pedestrian or cyclist or witness stated, upon questioning, that he had no destination in walking, riding, playing, working, etc. That is, there was no reason for being in the road other than pleasure. Check "transportation" if victim or witness can give any particular destination when asked where he was going. This may include walking or riding to school, home, friend's house, car, bus, etc.

COMMENTS: Use any available space to comment either on the accident itself or on problems you are having with the form. We can use this space to communicate and find out how we can help if the form is mailed promptly.

APPENDIX C

Cover Letter Received by Police Officers

The University of North Carolina Highway Safety Research Center is requesting your cooperation in a statewide effort to gather information about the causes of pedestrian and bicycle accidents. From this information, we hope to develop ways of reducing the numbers of these accidents. First, we need to answer several questions which are not asked on the standard accident report form. Therefore, we are asking that a supplementary form be used, as well as the standard form, for a three-month period (March 1 - May 31).

Please read the Instructions carefully and become familiar with the form before using it. It is to be filled out at the scene of any traffic accident involving a pedestrian or bicyclist which you are investigating. The form should be completed carefully and accurately and turned in with your regular report form. More forms are available if needed.

You will be performing a valuable service for the research center, the state, and those people whose lives we may be able to save. Thank you for your time and cooperation.

APPENDIX D

Standard North Carolina Accident Report Form

TRAFFIC ACCIDENT REPORT

N. C. Department of Motor Vehicles DMV-349 (Rev. 1-1-73)

ADDED BY ____ (Initial)

MARKS

LOCATION

Date of Accident 19 | Day of Week | Hour | A.M. ☐ P.M. ☐

Accident Occurred ☐ In ☐ Near City or Town of _____ In _____ County

Outside City or Town _____ Miles ☐ N ☐ E ☐ S ☐ W of ☐ Limits ☐ Center

On _____

☐ Miles ☐ Feet (0 Ft. if Intersec.) ☐ N ☐ E ☐ S ☐ W At or From _____ Toward _____

Hwy. No. (I., U.S., N.C., R.P., R.U.) If No., or within corporate limits, identify by name

Hwy. No., or Adjacent County Line | Hwy. No., City, or Adjacent County Line

Do not write in this space

Patrol Area

ACCIDENT TYPE

Ran off Road			Non-Collision in Road		Collision of Motor Vehicle in Road With:						
1. Right	2. Left	3. Straight Ahead	4. Overturn	5. Other in Road	6. Pedestrian	7. Parked Vehicle	8. Train	9. Bicycle	10. Animal	11. Fixed Obj.	12. Other Obj.

Collision of M.V. in Road With Another M. V.

13. Rear End Slow or Stop	14. Rear End Turn	15. Left Turn Same Roadway	16. Left Turn Cross Traffic	17. Right Turn Same Roadway	18. Right Turn Cross Traffic	19. Head On	20. Sideswipe	21. Angle	22. Backing

VEHICLE NO. 1

No. of Vehicles Involved ☐

Driver: First Middle Last Name

Address: _____

City: _____ State: _____

Is above address same as on Driver's License? Yes ☐ No ☐

Race/Sex: _____ Driver's Lic: _____ State: _____

Date of Birth: Month Day Year Specify Restriction: _____

Member of Armed Forces Yes ☐ No. ☐ Veh. Year: _____ Veh. Make: _____ Veh. Type: _____

Lic. Plate No. _____ State: _____ Year: _____

VIN _____ ODOM. _ _ _ _ _ • _

Owner: _____

Address: _____

City: _____ State: _____

Parts Damaged (TAD) _____ Amount of Damage $ _____

Drivable: Yes ☐ No ☐ Vehicle Removed to: _____

By: _____ Authority: _____

VEHICLE NO. 2 or PEDESTRIAN

Driver: First Middle Last Name

Address: _____

City: _____ State: _____

Is above address same as on Driver's License? Yes ☐ No ☐

Race/Sex: _____ Driver's Lic. _____ State: _____

Date of Birth: Month Day Year Specify Restriction: _____

Member of Armed Forces Yes ☐ No. ☐ Veh. Year: _____ Veh. Make: _____ Veh. Type: _____

Lic. Plate No. _____ State _____ Year: _____

VIN _____ ODOM. _ _ _ _ _ • _

Owner: _____

Address: _____

City: _____ State: _____

Parts Damaged (TAD) _____ Amount of Damage $ _____

Drivable: Yes ☐ No ☐ Vehicle Removed to: _____

By: _____ Authority: _____

Other Property Damaged _____ Amt. of Dam. $ _____ Owner and Address _____

INJURY SECTION INSTRUCTIONS

Give injury class, restraint used, race, sex and age of all occupants in the space corresponding to the seat occupied. Names and addresses are necessary for persons who were injured. For type of Restraint (Res.) used: N – None, L – Lap Belt, LS – Lap and Shoulder, S – Shoulder Belt only, YR – Child Restraint System.

K=Killed | A=Incapacitating | B=Nonincapacitating – Injury other than K or A evident at the scene | C=No visible sign of injury but complaint of pain, momentary unconsciousness | O=No injury

SEAT	Inj cl	Res usd	Race, sex	Age	INJURED NAMES AND ADDRESSES First Name Last	SEAT	Inj cl	Res usd	Race sex	Age	INJURED NAMES AND ADDRESSES First Name Last
Left Front					DRIVER 1	Left Front					DRIVER 2 OR PEDESTRIAN
Center Front						Center Front					
Right Front						Right Front					
Left Rear						Left Rear					
Center Rear						Center Rear					
Right Rear						Right Rear					

Total No. Occupants _____ Total No. Inj. _____ | Total No. Occupants _____ Total No. Inj. _____

Injured taken to: _____

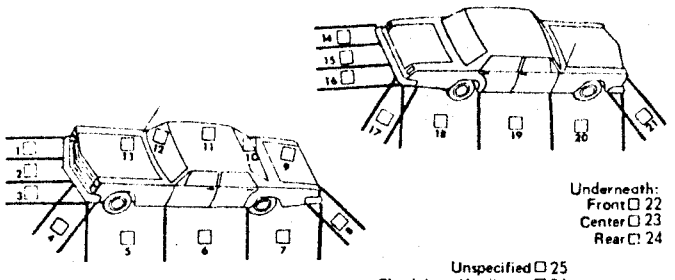
WITNESSES Name _____ Address _____ Phone No. _____

Name _____ Address _____ Phone No. _____

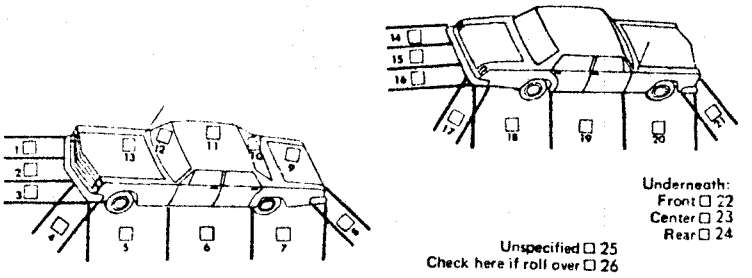
Arrests: Name _____ Charge(s) _____ (Cit. No.) _____

Name _____ Charge(s) _____ (Cit. No.) _____

VEHICLE 1 POINT OF INITIAL CONTACT



VEHICLE 2 POINT OF INITIAL CONTACT



1. Locality	9. Traffic Control	Not Operating ☐	Not Visible ☐		VEHICLE 1	VEHICLE 2
2. Speed Limit	10. Object Struck			15. Veh. Maneuver		
3. Road Feature		DRIVER 1	DRIVER 2 or PED.	16. Veh. Defects		
4. Road Surface	11. Sobriety			17. Estimated Speed		
5. Road Defects	12. Physical Cond.			18. Tire Impressions(ft)		
6. Road Condition	13. Chem. Test	YES ☐ NO ☐	YES ☐ NO ☐	19. Distance Traveled After Impact (ft.)		
7. Light Condition						
8. Weather	14. Ped. Action					

INDICATE NORTH

Vehicle 1 was Traveling ☐ N ☐ E ☐ S ☐ W on

Vehicle 2 was Traveling ☐ N ☐ E ☐ S ☐ W on

DESCRIBE WHAT HAPPENED:

Vehicle 1	Vehicle 2	VIOLATION INDICATED
☐	☐	1. No. Violation Indicated
☐	☐	2. Excessive Speed
☐	☐	3. Yield Violation
☐	☐	4. Left of Center
☐	☐	5. Passing Violation
☐	☐	6. Stop S. or Yield S. Vio.
☐	☐	7. Traffic Signal Vio.
☐	☐	8. Safe Movement Vio.
☐	☐	9. Too Close
☐	☐	10. Improper Turn
☐	☐	11. Improper or No Signal
☐	☐	12. Improper Parking Location
☐	☐	13. Other Improper Driving

(describe) _____

EMERGENCY ASSISTANCE INFORMATION

INVESTIGATOR NOTIFIED _____ BY _____ ☐ a.m. ☐ p.m.

INVESTIGATOR ARRIVED _____ ☐ a.m. ☐ p.m.

AMBULANCE ARRIVED _____ ☐ a.m. ☐ p.m.

OTHER COMMENTS: _____

RESERVED FOR STATE USE:

20.	21.	22.	23.	24.
25.	26.	27.	28.	29.

RESERVED FOR CITY OR OTHER USE:

APPENDIX E

Statistical Pedestrian Report

DRIVER EDUCATION AND ACCIDENT RECORDS DIVISION

PEDESTRIANS

ANNUAL, 1973

LOCATION	ACCIDENTS					
	Total	Percent	Injury	Percent	Fatal	Percent
Rural	1068	43 %	818	38 %	250	74 %
Urban	1442	57 %	1353	62 %	89	26 %
TOTAL	2510	%	2171	%	339	%
HIGHWAY CLASS						
Interstate	38	2 %	24	1 %	14	4 %
U.S. numbered highways	279	11 %	201	9 %	78	23 %
State numbered highways	220	9 %	163	8 %	57	17 %
Rural paved	511	20 %	411	19 %	100	29 %
Rural unpaved	26	1 %	21	1 %	5	1 %
City streets	1436	57 %	1351	62 %	85	25 %
		%		%		%
TOTAL	2510	%	2171	%	339	%
ROAD CHARACTER						
Straight		%		%		%
Sharp curve		%		%		%
Other curve		%		%		%
Not stated		%		%		%
TOTAL		%		%		%
ROAD DESCRIPTION						
Intersection	675	27 %	617	28 %	58	17 %
Driveway	324	13 %	262	12 %	62	18 %
All others	1511	60 %	1292	60 %	219	65 %
TOTAL	2510	%	2171	%	339	%
TIME OF DAY						
Midnight to 12:59 a.m.	34	1 %	24	1 %	10	3 %
1:00 a.m. to 1:59 a.m.	55	2 %	43	2 %	12	4 %
2:00 a.m. to 2:59 a.m.	22	1 %	15	1 %	7	2 %
3:00 a.m. to 3:59 a.m.	6	%	4	%	2	1 %
4:00 a.m. to 4:59 a.m.	15	1 %	10	%	5	1 %
5:00 a.m. to 5:59 a.m.	7	%	4	%	3	1 %
6:00 a.m. to 6:59 a.m.	34	1 %	24	1 %	10	3 %
7:00 a.m. to 7:59 a.m.	87	3 %	76	4 %	11	3 %
8:00 a.m. to 8:59 a.m.	78	3 %	73	3 %	5	1 %
9:00 a.m. to 9:59 a.m.	40	2 %	34	2 %	6	2 %
10:00 a.m. to 10:59 a.m.	72	3 %	65	3 %	7	2 %
11:00 a.m. to 11:59 a.m.	78	3 %	67	3 %	11	3 %
Noon to 12:59 p.m.	110	4 %	105	5 %	5	1 %
1:00 p.m. to 1:59 p.m.	117	5 %	108	5 %	9	3 %
2:00 p.m. to 2:59 p.m.	118	5 %	110	5 %	8	2 %
3:00 p.m. to 3:59 p.m.	274	11 %	261	12 %	13	4 %
4:00 p.m. to 4:59 p.m.	227	9 %	209	10 %	18	5 %
5:00 p.m. to 5:59 p.m.	217	9 %	192	9 %	25	7 %
6:00 p.m. to 6:59 p.m.	223	9 %	183	8 %	40	12 %
7:00 p.m. to 7:59 p.m.	190	8 %	153	7 %	37	11 %
8:00 p.m. to 8:59 p.m.	149	6 %	123	6 %	26	8 %
9:00 p.m. to 9:59 p.m.	149	6 %	116	5 %	33	10 %
10:00 p.m. to 10:59 p.m.	78	3 %	63	3 %	15	4 %
11:00 p.m. to 11:59 p.m. 59 Not Stated	71	3 %	54	2 %	17	5 %
TOTAL	2510	%	2171	%	339	%

	ACCIDENTS					
DAY OF WEEK	Total	Percent	Injury	Percent	Fatal	Percent
Monday	364	15 %	315	15 %	49	14 %
Tuesday	262	10 %	237	11 %	25	7 %
Wednesday	330	13 %	288	13 %	42	12 %
Thursday	324	13 %	281	13 %	43	13 %
Friday	492	20 %	434	20 %	58	17 %
Saturday	434	17 %	360	17 %	74	22 %
Sunday	304	12 %	256	12 %	48	14 %
Not stated		%		%		%
TOTAL	2510	%	2171	%	339	%
WEATHER						
Clear	1848	74 %	1602	74 %	246	73 %
Cloudy	408	16 %	354	16 %	54	16 %
Raining	187	7 %	162	7 %	25	7 %
Snowing	18	1 %	17	1 %	1	%
Fog	18	1 %	14	1 %	4	1 %
Other Sleet or Hail	3	%	3	%		%
Not stated	28	1 %	19	1 %	9	3 %
TOTAL	2510	%	2171	%	339	%
SPEED BEFORE ACCIDENT						
0 to 9 miles per hour	243	9 %	232	10 %	11	3 %
10 to 19 miles per hour	368	14 %	361	16 %	7	2 %
20 to 29 miles per hour	511	19 %	487	21 %	24	7 %
30 to 39 miles per hour	600	23 %	532	23 %	68	19 %
40 to 49 miles per hour	329	13 %	239	11 %	90	26 %
50 to 59 miles per hour	238	9 %	149	7 %	89	25 %
60 to 69 miles per hour	47	2 %	22	1 %	25	7 %
70 miles per hour and over	17	1 %	6	%	11	3 %
Not stated	271	10 %	245	11 %	26	7 %
TOTAL	2624	%	2273	%	351	%
VISION OBSTRUCTION						
Windshield or windows		%		%		%
Buildings, signs, bushes		%		%		%
No vision obstruction		%		%		%
Not stated		%		%		%
TOTAL		%		%		%

	PEDESTRIANS					
SOBRIETY	Total	Percent	Injured	Percent	Killed	Percent
Had not been drinking	1487	56 %	1356	59 %	131	38 %
Drinking – Ability impaired	146	6 %	131	6 %	15	4 %
Drinking – Ability impairment unknown	201	8 %	163	7 %	38	11 %
Not stated	806	31 %	646	28 %	160	47 %
TOTAL	2640	%	2296	%	344	%
LIGHT CONDITION						
Daylight	1618	61 %	1489	65 %	129	38 %
Dusk	103	4 %	95	4 %	8	2 %
Dawn	12	%	8	%	4	1 %
Darkness – street or highway lighted	404	15 %	352	15 %	52	15 %
Darkness – street or highway not lighted	487	18 %	338	15 %	149	43 %
Not stated	16	1 %	14	1 %	2	1 %
		%		%	344	%

	PEDESTRIANS					
PEDESTRIAN'S ACTION	Total	Percent	Injured	Percent	Killed	Percent
Crossing or entering roadway at intersection	342	13 %	312	14 %	30	9 %
Same – not at intersection	1035	39 %	882	38 %	153	44 %
Coming from behind parked cars	167	6 %	158	7 %	9	3 %
Walking in roadway – with traffic	153	6 %	125	5 %	28	8 %
Same – against traffic	75	3 %	57	2 %	18	5 %
Standing in roadway	140	5 %	124	5 %	16	5 %
Walking to or from stopped school bus	4	%	4	%		%
Getting on or off vehicle	35	1 %	31	1 %	4	1 %
Working in roadway	35	1 %	33	1 %	2	1 %
Playing in roadway	83	3 %	79	3 %	4	1 %
Lying in roadway	30	1 %	10	%	20	6 %
Other in roadway	203	8 %	178	8 %	25	7 %
Not in roadway	127	5 %	120	5 %	7	2 %
Not stated	211	8 %	183	8 %	28	8 %
TOTAL	2640	%	2296	%	344	%
PHYSICAL CONDITION						
Ill	13	%	12	1 %	1	%
Fatigued	8	%	8	%		%
Asleep	3	%	2	%	1	%
Other physical impairment	74	3 %	58	3 %	16	5 %
Normal	1362	52 %	1265	55 %	97	28 %
Condition not known	624	24 %	453	20 %	171	50 %
Not stated	556	21 %	498	22 %	58	17 %
TOTAL	2640	%	2296	%	344	%
SEX						
Male	1651	63 %	1413	62 %	238	69 %
Female	863	33 %	770	34 %	93	27 %
Not stated	126	5 %	113	5 %	13	4 %
TOTAL	2640	%	2296	%	344	%
AGE						
0 to 4 years	202	8 %	178	8 %	24	7 %
5 to 9 years	439	17 %	400	17 %	39	11 %
10 to 14 years	277	10 %	266	12 %	11	3 %
15 to 19 years	212	8 %	192	8 %	20	6 %
20 to 24 years	181	7 %	160	7 %	21	6 %
25 to 34 years	166	6 %	149	6 %	17	5 %
35 to 44 years	151	6 %	123	5 %	28	8 %
45 to 54 years	137	5 %	107	5 %	30	9 %
55 to 64 years	108	4 %	88	4 %	20	6 %
65 to 74 years	112	4 %	77	3 %	35	10 %
75 years and over	69	3 %	44	2 %	25	7 %
Not stated	586	22 %	512	22 %	74	22 %
TOTAL	2640	%	2296	%	344	%