M.F. SMITH

DOT HS-802 266

# CAUSATIVE FACTORS AND COUNTERMEASURES FOR RURAL AND SUBURBAN PEDESTRIAN ACCIDENTS: Accident Data Collection and Analysis

Contract No. DOT-HS-355-3-718

March 1977

Final Report

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16. Abstract

The objectives of this study were to collect and analyze data on rural pedestrian accidents and to identify potential countermeasures. Data on a stratified random sample of over 1,500 rural and suburban accidents from six states was collected during interviews and on-site observations. These data included behavioral sequence items, site characteristics items and exposure data items directed at identifying the precipitating and predisposing causal factors in each accident. The data analysis emphasized the development of characteristic accident situations or "accident types" from groups of behaviorally similar accidents. Although twenty-three accident types were identified, the six most frequently encountered types accounted for over 60% of the sample. Countermeasures intended to apply to each accident type are discussed.

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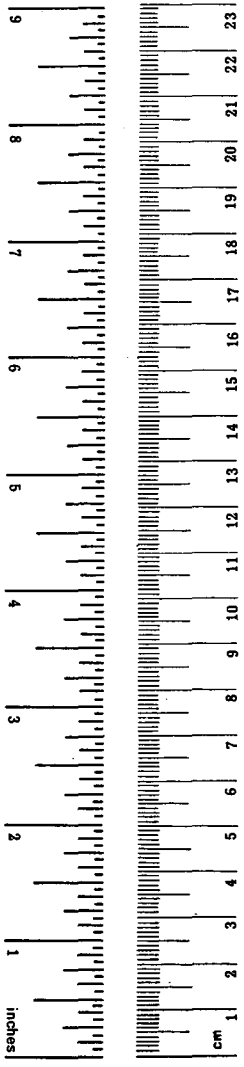
# METRIC CONVERSION FACTORS

## Approximate Conversions to Metric Measures

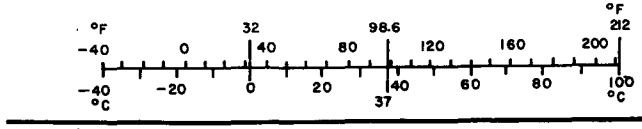
| Symbol | When You Know | Multiply by | To Find | Symbol |
|---|---|---|---|---|
| | **LENGTH** | | | |
| in | inches | *2.5 | centimeters | cm |
| ft | feet | 30 | centimeters | cm |
| yd | yards | 0.9 | meters | m |
| mi | miles | 1.6 | kilometers | km |
| | **AREA** | | | |
| $in^2$ | square inches | 6.5 | square centimeters | $cm^2$ |
| $ft^2$ | square feet | 0.09 | square meters | $m^2$ |
| $yd^2$ | square yards | 0.8 | square meters | $m^2$ |
| $mi^2$ | square miles | 2.6 | square kilometers | $km^2$ |
| | acres | 0.4 | hectares | ha |
| | **MASS (weight)** | | | |
| oz | ounces | 28 | grams | g |
| lb | pounds | 0.45 | kilograms | kg |
| | short tons (2000 lb) | 0.9 | tonnes | t |
| | **VOLUME** | | | |
| tsp | teaspoons | 5 | milliliters | ml |
| Tbsp | tablespoons | 15 | milliliters | ml |
| fl oz | fluid ounces | 30 | milliliters | ml |
| c | cups | 0.24 | liters | l |
| pt | pints | 0.47 | liters | l |
| qt | quarts | 0.95 | liters | l |
| gal | gallons | 3.8 | liters | l |
| $ft^3$ | cubic feet | 0.03 | cubic meters | $m^3$ |
| $yd^3$ | cubic yards | 0.76 | cubic meters | $m^3$ |
| | **TEMPERATURE (exact)** | | | |
| °F | Fahrenheit temperature | 5/9 (after subtracting 32) | Celsius temperature | °C |

*1 in = 2.54 (exactly). For other exact conversions and more detailed tables, see NBS Misc. Publ. 286, Units of Weights and Measures, Price $2.25, SD Catalog No. C13.10:286.




## Approximate Conversions from Metric Measures

| Symbol | When You Know | Multiply by | To Find | Symbol |
|---|---|---|---|---|
| | **LENGTH** | | | |
| mm | millimeters | 0.04 | inches | in |
| cm | centimeters | 0.4 | inches | in |
| m | meters | 3.3 | feet | ft |
| m | meters | 1.1 | yards | yd |
| km | kilometers | 0.6 | miles | mi |
| | **AREA** | | | |
| $cm^2$ | square centimeters | 0.16 | square inches | $in^2$ |
| $m^2$ | square meters | 1.2 | square yards | $yd^2$ |
| $km^2$ | square kilometers | 0.4 | square miles | $mi^2$ |
| ha | hectares (10,000 $m^2$) | 2.5 | acres | |
| | **MASS (weight)** | | | |
| g | grams | 0.035 | ounces | oz |
| kg | kilograms | 2.2 | pounds | lb |
| t | tonnes (1000 kg) | 1.1 | short tons | |
| | **VOLUME** | | | |
| ml | milliliters | 0.03 | fluid ounces | fl oz |
| l | liters | 2.1 | pints | pt |
| l | liters | 1.06 | quarts | qt |
| l | liters | 0.26 | gallons | gal |
| $m^3$ | cubic meters | 35 | cubic feet | $ft^3$ |
| $m^3$ | cubic meters | 1.3 | cubic yards | $yd^3$ |
| | **TEMPERATURE (exact)** | | | |
| °C | Celsius temperature | 9/5 (then add 32) | Fahrenheit temperature | °F |



# PREFACE

These documents constitute the report covering Phases I and II of Contract DOT-HS-355-3-718. The report is organized to report on the research performed and to serve as a reference document for interested highway safety personnel. There are four basic sections in the first document, as well as an Appendix of supporting information:

I. EXECUTIVE SUMMARY

II. METHODOLOGICAL PROCEDURES

III. RESULTS

IV. POTENTIAL COUNTERMEASURES

The Appendices are bound as a separate document and include:

A. DATA COLLECTION FORM

B. FIELD INVESTIGATOR CODING MANUAL

C. PRINTOUT DISTRIBUTION OF DATA ITEMS

D. PEDESTRIAN AND DRIVER PRECIPITATING FACTORS FOR EACH ACCIDENT TYPE

E. ABBREVIATED ACCIDENT DESCRIPTIONS FOR SELECTED ACCIDENT TYPES

F. OPERATION FORMS

## ACKNOWLEDGMENTS

Many individuals were involved in this project and contributed to its success. Since this study involved such a large scale data collection effort, it involved the cooperation of a number of Government officials, city officials, and even the accident victims who often provided the information that was needed. Hopefully, the contribution of the accident victims will be at least partly repaid by an eventual reduction of the pedestrian accident problem through this and subsequent efforts.

BioTechnology, Inc. would especially like to thank the officers and men in the various state police departments who assisted by providing the accident reports for the sample of pedestrian accidents. The officers in each of the police departments who coordinated our project efforts were:

Mr. Robert A. Bieber, Commander
Mr. Louis Hageman
Operational Analysis Section
Department of California Highway Patrol
Post Office Box 896
Sacramento, California 95804

Captain J. C. Amthor, Commanding Officer
Sergeant Don Calcatera
Traffic and Safety Division
Department of Michigan State Police
East Lansing, Michigan 48823

Captain C. S. Endicott, Director
Sergeant Bob Hagan
Traffic Division
Missouri State Highway Patrol
1510 East Elm Street
Jefferson City, Missouri 65101

Mr. Charles Hensley, Director
Mr. Joe K. Register
Traffic Records Division
Department of Motor Vehicles
1100 New Bern Avenue
Raleigh, North Carolina 27602

Captain Benjamin R. Jones, Director
Lieutenant Warren L. Shaffer
Records and Identification Division
Pennsylvania State Police
P.O. Box 2771
Harrisburg, Pennsylvania 17120

Mr. Richard G. Crosby, Manager
Statistical Services
Texas Department of Public Safety
5805 North Lamar Boulevard
Austin, Texas 78773

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Federal Highway Administration
F. J. Daniels III

A number of BioTechnology personnel made important contributions to the project; we would especially like to thank each of the local field investigators for their assistance in collecting the accident data. A listing of individuals is contained in Appendix F.

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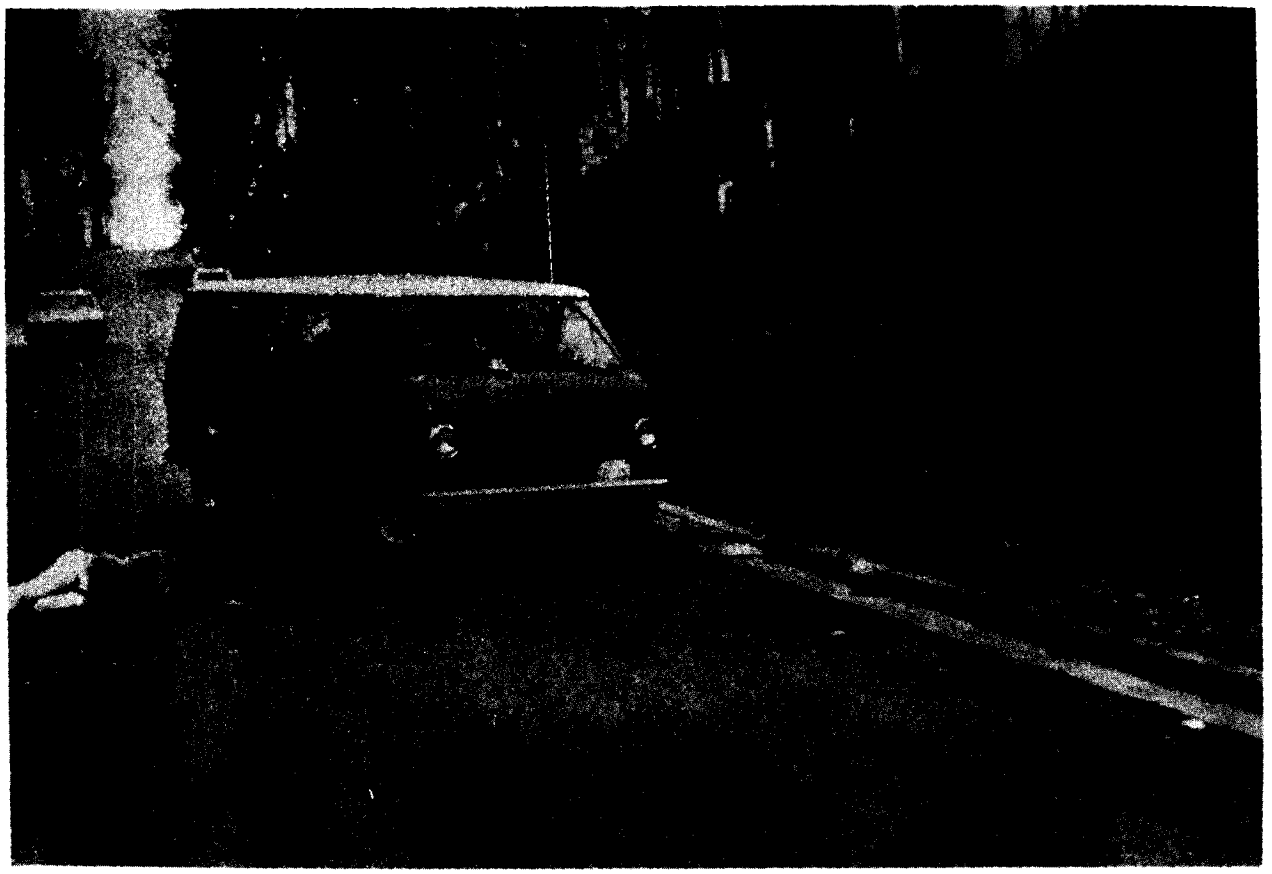

# I. EXECUTIVE SUMMARY

## Introduction

Pedestrian accidents constitute a very serious national and local safety problem. Each year approximately 300,000 pedestrians are struck by motor vehicles; nearly 9,000 die.[1] Thus pedestrian accidents account for approximately 20% of all motor vehicle fatalities nationwide. Research efforts to date have focused on pedestrian accidents that occur in urban areas,[2] yet more than 40% of the pedestrian fatalities and 15% of the injuries occur in nonurban areas. The research efforts reported here are aimed at the rural and suburban pedestrian accident problem.

The objectives of this study are: (1) to develop the necessary data collection rationales and techniques needed to investigate an adequate sample of rural pedestrian accidents, (2) to collect and analyze data for the purpose of identifying the causal factors of rural pedestrian accidents, (3) to identify countermeasures directly relevant to the accident situation, and (4) to evaluate countermeasures by means of a behavioral (operational) evaluation of pedestrians and traffic. This document describes the research directed at achieving the first three project objectives.

Although most frequently described as "rural" accidents, the phrase "nonurban" would perhaps be more appropriate. Included are all accidents that do not occur in major urban areas. Typically this includes all areas under the jurisdiction of state police agencies and small-town police departments. Throughout this report the term "rural" will be used; however, in this context the implied meaning of "rural" is actually "nonurban." Areas described as "rural" include rural, suburban and small-town locations.

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[1] National Safety Council, Accident Facts, 1975.

[2] M. Snyder and R. L. Knoblauch, Pedestrian Safety - The Identification of Precipitating Factors and Possible Countermeasures. Operations Research, Inc., 1971, Contract No. FH-11-7312.

## Procedures

In order to permit statistical inferences to be drawn from the study accident sample to the national rural accident population, an appropriate sampling procedure was developed. Basically, a stratified random sample of counties from six geographically distributed states was used.[3] All of the 1974 rural pedestrian accidents in each of the sample counties were included in the sample. Data were collected on 1,531 accidents representing 23.9% of the 6,399 accidents that occurred in the six-state sample and approximately 3% of the national rural pedestrian accident population.[4]

Appropriate data items were determined by considering the information needed to identify causal factors in rural pedestrian accidents and the information needed to develop countermeasures.

The following types of data items were developed:

- Identification items. Time, place, description of accident and accident site, persons involved.
- Behavioral sequence items. Preinvolvement and collision course factors; evasive action factors; pedestrian, driver, and environmental causal factors.
- Trip characteristics and pedestrian, driver, and vehicle descriptive items. Origin/destination, physical condition, driving experience, visual appearance, vehicle characteristics, and pedestrian injuries.
- Site characteristics items. Areas and roadway description, roadway geometry, traffic control devices, observed vehicle speeds, sight distance, and site photographs.

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[3] The six states included California, Michigan, Missouri, North Carolina, Pennsylvania and Texas.

[4] National Safety Council, op. cit.

- Baserate data items. Pedestrian volume and characteristics, traffic volume and characteristics observed at the accident site during the same time of day and day of week as the accident occurred.
- Field Investigator (FI) conclusion items. Sketch and narrative, precipitating factors, accident typology, potential countermeasures.

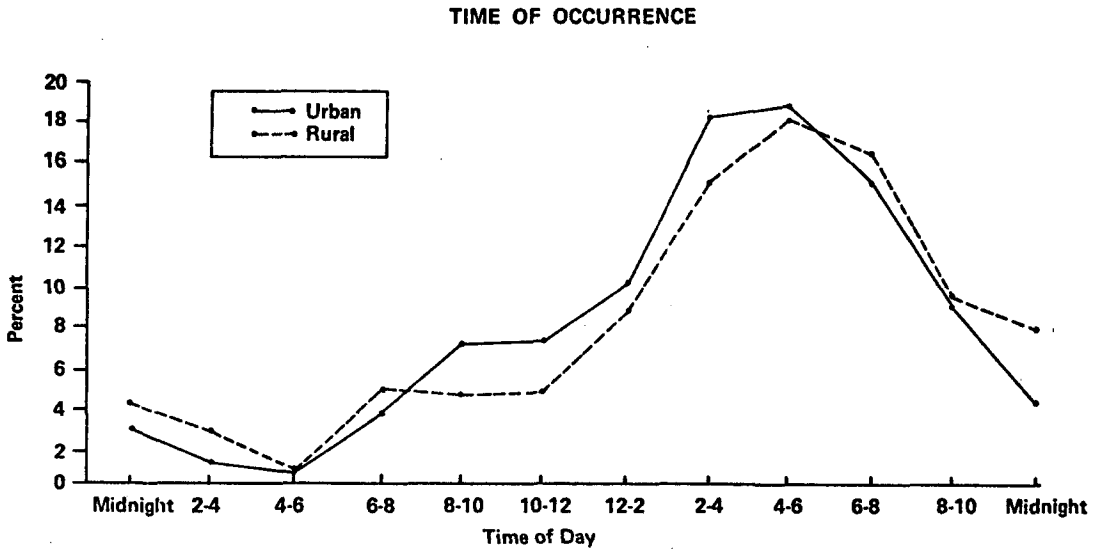
The data collection procedure had carefully trained local field investigators in each of the six sample states collect data on the accidents that occurred in their area. Arrangements were made to receive the police accident reports from the appropriate police agencies as soon as possible after the accident. Using the police accidents report as a starting point, the field investigators visited the accident site (at the same time of day and day of week that the accident occurred), and interviewed the driver, the pedestrian and any available witnesses. The field investigators completed a 20-page Data Collection Form (see Appendix A) on each accident. Elaborate training procedures as well as a detailed coding manual (see Appendix B) assured uniformity and consistency in the data collected. Each field investigator performed several practice investigations, and his work was carefully critiqued. When the field investigator completed his report, a project staff member carefully reviewed each response code prior to keypunching. If inadequate or contradictory information was found during this review, the report was returned to the field investigator for clarification. The data analysis process was aimed at developing accident typologies, descriptive information, and ultimately, accident preventive countermeasures.

## Results

The success in achieving a stratified random sample was confirmed in that the 1,531 accidents included in the sample were distributed across the six sample states as projected from 1972 rural pedestrian accident data. The characteristics of the entire sample of 1,531 accidents is summarized as follows:

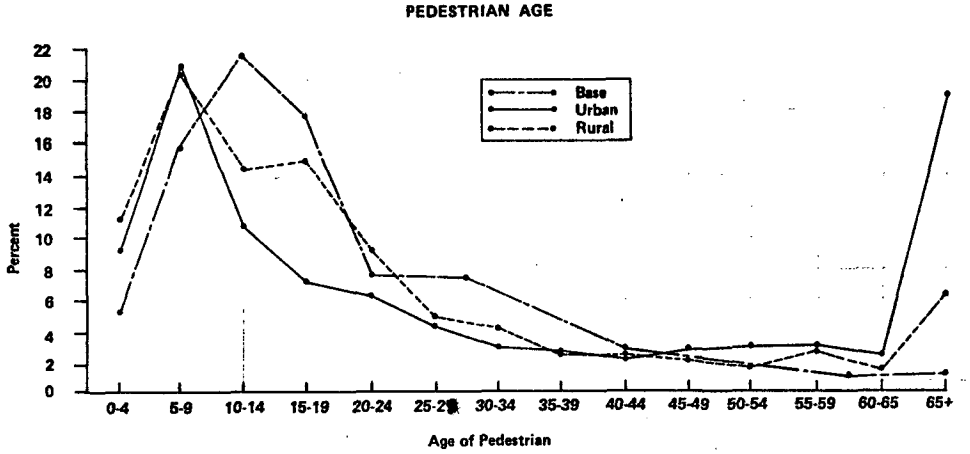
## Time of Occurrence

While the month and day-of-week distributions are relatively flat, the rural time-of-day distribution shows a late-afternoon peak similar to urban pedestrian accident data. The rural accidents tend to occur slightly more often during the late evening and early morning hours.




## Pedestrian Age

As is the case in urban pedestrian accidents, the young and the old tend to be overrepresented, especially when compared with the ages of the pedestrians in the rural baserate data.



## WEATHER, ROAD SURFACE AND LIGHTING CONDITIONS

| | RURAL, % | URBAN, % |
|---|---|---|
| **Weather** | | |
| Clear or cloudy | 92 | 88 |
| Rain | 4 | 9 |
| Snow | 2 | 1 |
| Reduced visibility; fog, etc. | 2 | 1 |
| **Road Surface** | | |
| Dry | 86 | 84 |
| Wet | 10 | 12 |
| Snow or ice | 3 | 1 |
| **Lighting Conditions** | | |
| Daylight | 60 | 67 |
| Twilight | 6 | 5 |
| Dark | 31 | 27 |

## Accident Site Characteristics

Although the accidents are considered to be "rural," the wide variety of land use and area descriptors represented show the heterogeneity of the population.

## ACCIDENT SITE CHARACTERISTICS

| Land Use | Type of Area | | | |
|---|---|---|---|---|
| | City or Town | Suburban | Country | Row Totals, % |
| Residential | 14 | 19 | 18 | 51 |
| Commercial | 12 | 8 | 4 | 24 |
| Open Area | 1 | 2 | 13 | 16 |
| School | 4 | 3 | 1 | 7 |
| Industrial | 0 | 0 | 1 | 2 |
| Playground | 0 | 0 | 1 | 1 |
| Column Total, % | 31 | 32 | 37 | 100 |

Suburban-residential (19%) and country-residential (18%) areas account for the largest percentage of the accidents. When combined with city and small town residential (14%), 51% of the accidents are found in residential areas.

## Preinvolvement and Collision Course Factors

Although most of the pedestrians were attempting to cross the road (60.5%) either alone (50.6%) or with other pedestrians (9.9%), a surprisingly high percentage were not attempting to cross (39.1%) either alone (25.0%) or with other pedestrians (14.1%). Most of the pedestrians were going somewhere, i.e., en route (50.6%), although a number of other specific pedestrian activities were found.

**PEDESTRIAN ACTIVITY**

| | |
|---|---|
| En route, going somewhere | 50.6% |
| At play | 13.3% |
| Standing, waiting, not moving | 5.7% |
| Going to or from school | 4.8% |
| At work | 4.0% |
| Going to or from a vehicle | 4.0% |
| Working on or pushing a vehicle | 3.5% |
| Going to or from a school bus | 2.1% |

Other activities were found to occur in between 1% and 2% of the accidents: flagging down a vehicle (1.9%), getting in or out of a vehicle (1.7%), going to or from a mailbox (1.4%), going to or from an ice cream truck (1.3%), and hitchhiking (1.1%).

Most of the pedestrians were running (41.0%), although many were walking (32.7%), standing and not moving (13.1%), stumbling or falling (3.1%) and lying down (1.3%).

Most of the vehicles were going straight ahead (74.8%), although some were changing lanes (3.0%), backing up (2.8%), negotiating curve (2.4%), turning left (2.3%), and turning right (22%).

More than half of the pedestrians were unaware of the need for evasive action. Nearly one-fourth of the drivers were also unaware of the need for evasive action.

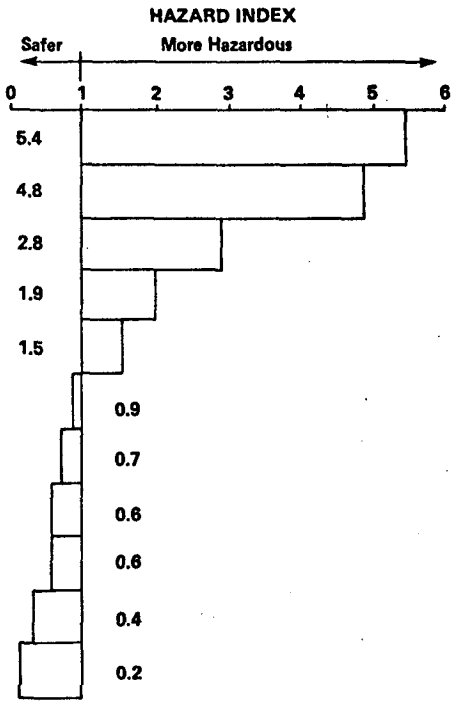
The actions of the pedestrians observed at the accident site were compared with those involved in accidents. A "hazard index" was calculated by dividing the percentage of the accident data base displaying a given behavior by the percentage of the base-rate population showing that behavior:

$$\text{HAZARD INDEX} = \frac{\% \text{ of Accident Data Base}}{\% \text{ of Baserate Data Base}}$$

Five pedestrian behaviors were found significantly more frequently in the accident data base: standing in the roadway, coming from behind a parked vehicle, working in the roadway, working on vehicle, and crossing not at intersection.

**PEDESTRIAN ACTION**
**ACCIDENT AND BASERATE DATA COMPARED**

| Pedestrian Action | Accident Data % | Baserate Data % | HAZARD INDEX |
|---|---|---|---|
| Standing in roadway | 8.1 | 1.5 | 5.4 |
| Coming from behind parked vehicle | 5.3 | 1.1 | 4.8 |
| Working in roadway | 2.2 | 0.8 | 2.8 |
| Working on vehicle | 3.5 | 1.8 | 1.9 |
| Crossing, not at intersection | 39.4 | 27.0 | 1.5 |
| Walking in road, with traffic | 10.8 | 12.3 | 0.9 |
| Playing in road | 3.6 | 4.9 | 0.7 |
| Walking in road, against traffic | 4.8 | 8.0 | 0.6 |
| Crossing, at intersection | 18.3 | 29.0 | 0.6 |
| Getting on/off school bus | 1.6 | 3.6 | 0.4 |
| Getting on/off other vehicle | 2.4 | 9.9 | 0.2 |

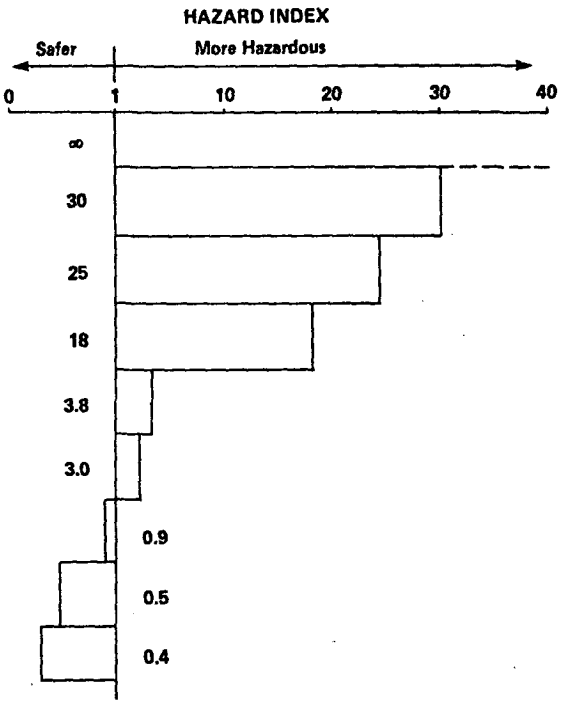



All except two of these differences were significant at the 0.001 level (Z-test). Playing in the roadway was significant only at the 0.05 level; walking in the roadway with traffic showed no significant differences between the accident and baserate data.

Although most of the vehicles were going straight ahead (77.2%), other vehicle actions appear to be more hazardous. A hazard index was calculated by dividing the percentage of the accident vehicles performing a given action by the percentage of the vehicles observed at the site performing the same action. Several vehicle actions were found to occur significantly more often in the accident population than in the baserate population. These included being out of control, backing, passing, starting in the roadway and changing lanes.

**VEHICLE ACTION**
**ACCIDENT AND BASERATE DATA COMPARED**

| Vehicle Action | Accident Data % | Baserate Data % |
|---|---|---|
| Out of control | 2.7 | 0.0 |
| Backing up | 3.0 | 0.1 |
| Passing | 2.5 | 0.1 |
| Other | 3.6 | 0.2 |
| Starting in roadway | 1.9 | 0.5 |
| Changing lanes | 1.2 | 0.4 |
| Going straight ahead | 77.2 | 85.1 |
| Turning right | 2.3 | 5.1 |
| Turning left | 2.2 | 5.2 |




All differences shown were significant at the 0.001 level (Z-test). Five other vehicle actions showed no significant differences: making U-turn, slowing or stopping, starting from parked position, stopped in travel lane, and parked.

## Pedestrian, Driver and Environmental Causal Factors

The precipitating, predisposing and causal factors identified were as varied as the accident pedestrian actions and vehicle actions already described. However, a number of causal factors were found to occur in at least 5% of the cases.

### PEDESTRIAN CAUSAL FACTORS

| Factor | Percent of Accidents |
|---|---|
| No contributory pedestrian factors | 7.8 |
| Running on or into the roadway | 29.5 |
| Risk-taking: pedestrian action was dangerous | 23.5 |
| Short-time exposure: pedestrian appeared suddenly | 17.4 |
| Inadequate search and detection | 17.3 |
| Misdirected search or detection pattern | 13.2 |
| Distraction | 11.5 |
| Condition of the pedestrian (alcohol, etc.) | 10.3 |
| Unexpected or unusual place for pedestrian | 8.9 |
| Inattention | 8.6 |
| Poor prediction of vehicle/pedestrian path | 6.2 |
| Pedestrian misinterpretation of driver's intent | 5.8 |

## DRIVER CAUSAL FACTORS

| Factor | Percent of Accidents |
|---|---|
| No contributory driver factor | 32.4 |
| Driver inadequate search and detection | 18.2 |
| Search and detection pattern not directed at pedestrian | 15.8 |
| Vehicle speed | 11.5 |
| Driver misinterpretation of pedestrian's intent | 10.1 |
| Poor prediction of vehicle/pedestrian path | 6.4 |
| Driver ran off traveled way | 6.4 |
| Condition of the driver (alcohol, etc.) | 6.0 |

## ENVIRONMENTAL CAUSAL FACTORS

| Factor | Percent of Accidents |
|---|---|
| No contributory environmental factors | 40.7 |
| Inadequate or no roadway lighting | 16.1 |
| Driver vision obscured by parked vehicles | 8.8 |
| Inadequate or no shoulder, no sidewalk | 8.5 |
| Driver vision obscured by moving or standing traffic | 8.3 |
| Pedestrian vision obscured by parked vehicles | 5.7 |
| Driver vision obscured by trees, roadside items | 4.5 |

## Accident Type Development

During the data collection and data analysis phases, it became apparent that the rural pedestrian accident sample represented an extremely heterogeneous population of accident situations. In order to better understand the problem and to identify appropriate countermeasures, a number of accident groups or types were developed. The entire sample was divided into a number of accident types that shared certain common elements or critical descriptors.

During the data reduction and data analysis phase a number of different accident situations were conceptually identified. The accident data were then examined to determine if the conceptualized accident situation occurred with sufficient frequency to justify the creation of an accident type. A total of 23 accident types were found such that each type accounted for at least 0.5% of the sample.

The following table lists these 23 different accident types in order of frequency, and shows the percentage of the sample represented by each type. Also shown are the "critical descriptors" for each type; a particular accident must have had those properties in order to be classified as a particular type.

| ACCIDENT TYPE | PERCENT (N) | CRITICAL DESCRIPTORS |
|---|---|---|
| Walking along the roadway (Type 25) | 11.6% (178) | Pedestrian is struck while walking along the edge of the roadway or on the shoulder; can be either walking with or against traffic. |
| Dart-out, first half (Type 01) | 10.8% (166) | Not at an intersection, the pedestrian appears suddenly in front of the vehicle and is struck in the first half of the roadway. |
| Dart-out, second half (Type 02) | 10.3% (157) | Same as Type 01, except the pedestrian is struck in the second half of the roadway. |
| Midblock dash (Type 03) | 9.9% (152) | Not at an intersection, the pedestrian runs into the roadway, but does not appear suddenly in the path of the vehicle (i.e., not Type 01). |
| Intersection dash (Type 11) | 9.9% (152) | At an intersection, the pedestrian either runs or appears suddenly in the path of the vehicle. |
| Other (Type 97) | 9.5% (145) | Involves unusual accident situations that are not included in the other causal types. Although unusual they are generally countermeasure-corrective, at least on an individual basis. |
| Weird (Type 98) | 7.5% (114) | Involves unusual, unique accident situations that are unlikely to recur. As such, they are not countermeasure-corrective. |
| Disabled vehicle-related (Type 33) | 5.6% (86) | The pedestrian is struck while working on or next to a disabled vehicle (not Type 42). |
| Result of vehicle going out of control (Type 39) | 3.7% (58) | The pedestrian is struck by a vehicle that had lost control prior to becoming involved with the pedestrian. |
| School bus-related (Type 36) | 3.0% (46) | The pedestrian is struck while going to or from a school bus or school bus stop. |
| Turning vehicle (Type 13) | 1.9% (29) | The pedestrian is struck by a turning vehicle while walking across the roadway (i.e., not running and not Type 11). It was not determined that the driver was attending to traffic and therefore failed to see the pedestrian (i.e., not Type 12). |
| Multiple threat (Type 22) | 1.7% (26) | A vehicle stops for the crossing pedestrian but the pedestrian is struck by another vehicle traveling in the same direction as the stopped vehicle. |

| ACCIDENT TYPE | PERCENT (N) | CRITICAL DESCRIPTORS |
|---|---|---|
| Backing up (Type 23) | 1.7% (26) | The pedestrian is struck by a vehicle that is backing up but the pedestrian does not realize that the vehicle is backing. |
| Working on roadway (Type 35) | 1.7% (26) | The pedestrian, a flagman or other construction worker, is struck while working on the roadway. |
| Limited information (Type 99) | 1.6% (24) | Insufficient information was available to specify the accident type. |
| Hitchhiking (Type 26) | 1.5% (23) | The pedestrian is struck while attempting to hitchhike or doing a hitchhiking-related activity, i.e., changing rides. |
| Pedestrian not in roadway (Type 24) | 1.4% (22) | The pedestrian is struck while not in the roadway (not Types 23, 25, 33, 34 or 39). |
| Vendor-ice cream truck (Type 32) | 1.4% (21) | The pedestrian is struck while going to or from a vendor in a vehicle on the street. |
| Mailbox-related (Type 37) | 1.4% (21) | The pedestrian is struck while going to or coming from a mailbox or newspaper box. |
| Vehicle turn/merge with attention conflict (Type 12) | 1.3% (20) | The pedestrian is struck by a vehicle whose driver is turning or merging and is not attending to traffic and not the pedestrian (not Type 13). |
| Result of an auto-auto crash (Type 34) | 0.9% (14) | The pedestrian is struck as the result of an auto-auto or solo auto accident. |
| Walking to or from a disabled vehicle (Type 42) | 0.7% (11) | The pedestrian is struck while going to or from a disabled vehicle (not Type 33). |
| Emergency/police vehicle-related (Type 38) | 0.6% (9) | The pedestrian is struck while near an emergency or police vehicle. |

The remaining discussion involves the eight accident types that each account for at least 5% of the sample. These eight types combined account for a total of 75.1% of the sample. The remaining types tend to be somewhat more specific in terms of causal factors and will be included in later discussions concerning suggested countermeasures.

Walking along roadway (11.6%). This, the largest type identified, involves a pedestrian, usually between 10-24 years old, walking along a two-lane roadway in a residential, country location. They frequently occur with the pedestrian walking with the traffic at night.

- 62.4% of the pedestrians were 10-24 years old.
- 55.0% occurred after dark.
- 56.2% occurred in country locations.
- 64.6% of the pedestrians were walking in the road with traffic.
- 69.7% of the collisions occurred on the roadway.
- 66.1% of the sites had no pavement edge markings.

Dart-out, first half (10.8%). The dart-out, first half, typically involves a child running into a two-lane local residential street not at an intersection during the late afternoon. The driver is almost always proceeding straight, but the most important condition is that the pedestrian appears suddenly in the path of the vehicle. Frequently he is running from behind a parked car.

- 65.7% of the pedestrians were under 10 years old.
- 57.1% occurred between 3-7 p.m.
- 74.7% occurred in urban or suburban locations.
- 52.9% involved a roadside visual obstruction.
- 72.6% of the pedestrians were running.
- 78.2% of the pedestrians were not attending to traffic.

Dart-out, second half (10.3%). The dart-out, second half, typically involves a child running across a local two-lane residential street not at an intersection. The major distinction between the dart-out, first half and this type is that the pedestrian is successful in crossing the first half of the roadway.

- 66.9% of the pedestrians were under 15 years old.
- 45.9% occurred between 3-7 p.m.

- 62.5% occurred in urban and suburban locations.
- 17.2% had moving traffic blocking the driver's vision.
- 78.3% of the pedestrians were running.

Midblock dash (9.9%). The midblock dash typically involves a child running across a two-lane road midblock in a residential area. The driver is usually aware of the pedestrian before the collision is imminent but frequently misinterprets the pedestrian's intentions. Thus, unlike the dart-out, the pedestrian does not appear suddenly in the path of the vehicle.

- 84.7% of the pedestrians were under 15 years old.
- 50.6% occurred between 3-7 p.m.
- 62.3% occurred in urban and suburban locations.
- 94.7% of the pedestrians were walking rapidly or running.
- 78.5% of the pedestrians were not attending to traffic.

Intersection dash (9.9%). The intersection dash typically involves a child running across the roadway at an intersection in a residential or commercial area. Although running and short-time exposure by the pedestrian are very frequent elements, the driver is also often aware of the pedestrian and misinterprets his intentions. The vehicle is near or in a nonsignalized intersection and is almost always going straight ahead.

- 56.0% of the pedestrians were under 15 years old.
- 38.8% occurred between 3-7 p.m.
- 90.2% occurred in urban and suburban locations.
- 80.9% occurred in residential and commercial areas.
- 18.2% occurred near schools.
- 69.5% of the pedestrians were running.
- 74.3% of the pedestrians were not attending to traffic.

Other (9.5%). This type includes other unusual accident situations which were not one of the more specific accident types previously described, but which were thought to be countermeasure-corrective. Since they are not grouped together because of selected conceptual similarities, a detailed discussion of their composite attributes is not particularly meaningful. A one-line description of each accident in this type is found in Appendix E.

Efforts to develop additional accident types from the cases remaining in this category were reasonably successful. However, 145 cases which did not fit elsewhere remain in the "other" type. Eight relatively loose groups were found to contain nearly three-fourths of the "others." There is too much variability between the cases within these groups to justify the development of additional causal types.

| GROUP CHARACTERISTICS | N | % of "OTHERS" |
|---|---|---|
| Pedestrian lying, staggering or walking in roadway while under the influence of alcohol or drugs | N=28 | 19.3% |
| Pedestrian riding bigwheel, roller-skates, skateboard, etc. | N=25 | 16.3 |
| Pedestrian standing in roadway, flagging vehicles, waiting, etc., not under the influence of alcohol or drugs | N=16 | 11.0 |
| Pedestrian either very young (under 3 years) or very old (senile) and age was a primary contributing factor | N=16 | 11.0 |
| Pedestrian struck by a defective vehicle, no lights, brakes, etc. | N=7 | 4.6 |
| Pedestrian walked into vehicle | N=7 | 4.6 |
| Pedestrian crossing midblock, not other type | N=7 | 4.6 |
| Pedestrian crossing at intersection, not other type | N=7 | 4.6 |
| | 106 | 73.1 |

Weird (7.5%). This type involves accidents that occur under unusual circumstances and were generally believed not to be countermeasure-corrective. The "weird" category included cases that were especially unusual or unique in terms of predisposing and precipitating factors. Thus it is unlikely that the same set of causal factors will occur again, and the accidents in this category were not considered to be amenable to treatment by countermeasures. A one-line description of each of the 114 accidents assigned to this category is contained in Appendix E.

Some "classic" weird cases involved a pedestrian on a wheelchair, a child falling out of a pickup truck, an 86-year-old slipping and falling while boarding a bus, and an escaped mental patient fleeing from interns. Although some of these cases shared certain characteristics, they were all very different in all other ways and any aggregate data must be interpreted with great care.

Perhaps the most useful function that the "weird" category serves is to remind us that many strange and unusual things happen in the real world. And even the most carefully designed research efforts or most well-intended safety programs will have a negligible effect on that portion of the accident problem.

Disabled vehicle related (5.6%). This type typically involves a young man working on or standing next to a disabled vehicle at night on a secondary or primary highway in an open, country location. The collision most frequently occurs on the edge of the traveled way although the vehicle occasionally runs off the traveled way and strikes the pedestrian. Rain, icy streets, and out-of-control collision vehicles are often involved.

- 55.8% of the pedestrians were 15-29 years old.
- 65.1% occurred after dark.
- 66.3% occurred in country locations.
- 44.2% of the sites had no shoulders or shoulders unsuitable for pedestrian travel.

- 52.3% of the sites had no pavement edge markings.
- 36.7% of the drivers were unaware of the need for evasive action.
- 22.1% of the drivers were attending to the standing vehicle once on the collision course.
- 18.6% of the drivers were attending to the pedestrian.
- 26.8% of the vehicles had their warning emergency flashers and lights on.
- 8,2% of the vehicles had just their emergency flashers on.
- 0.7% of the total sample involved pedestrians going to or from a disabled vehicle. Thus a total of 6.3% of all the accidents involved disabled vehicles (Type 40).

## Countermeasure Identification

Three distinct procedures or processes were used to identify potential countermeasures for the rural and suburban pedestrian accident problem. The first involved eliciting suggestions from the on-site field investigators concerning what might have prevented a given accident. The second approach involved having a senior traffic engineer review each complete accident investigation and make site-specific engineering comments on what might have prevented that accident. The final approach involved various analytical and descriptive procedures that attempted to identify descriptive categories and prescribe countermeasure treatment. The first two approaches deal with the individual cases that combine to form the aggregate sample and the third approach addresses itself to selected subsamples or groups of the accident population and not to particular cases.

The on-site field investigators were asked "What can be done to prevent accidents like this one?" Their responses were tallied and categories were developed to summarize their suggestions. The following suggestions were indicated in at least 1% of the cases:

COUNTERMEASURES IDENTIFIED BY F.I.'s

I

| COUNTERMEASURE | % OF ACCIDENTS |
|---|---|
| PROVIDE PEDESTRIAN–ORIENTED EDUCATION | 25.7 |
| PROVIDE DRIVER–ORIENTED EDUCATION | 12.1 |
| PROVIDE ADVISORY AND/OR WARNING SIGNS | 8.6 |
| ENFORCE EXISTING VEHICLE REGULATIONS | 7.3 |
| PROVIDE SIDEWALKS | 6.9 |
| PROVIDE CROSSWALKS | 6.9 |
| PROVIDE STREET LIGHTING | 6.6 |
| PROMOTE REFLECTORIZED CLOTHING | 5.9 |
| CONTROL DRINKING PEDESTRIANS | 5.7 |

COUNTERMEASURES IDENTIFIED BY F.I.'s

II

| COUNTERMEASURE | % OF ACCIDENTS |
|---|---|
| CONTROL DRINKING DRIVERS | 4.1 |
| ENFORCE EXISTING REGULATIONS | 3.9 |
| PROVIDE SIGNALS | 3.8 |
| PROVIDE PEDESTRIAN BARRIERS | 3.0 |
| CHANGE SPEED LIMIT | 2.5 |
| ENFORCE EXISTING VEHICLE REGULATIONS | 2.0 |

COUNTERMEASURES IDENTIFIED BY F.I.'s

III

| COUNTERMEASURE | % OF ACCIDENTS |
|---|---|
| IMPROVE HEADLIGHTS | 1.6 |
| IMPROVE EXISTING SIGNS, SIGNALS | 1.5 |
| IMPROVE VEHICLE FLASHERS | 1.4 |
| RELOCATE MAIL / PAPER BOXES | 1.2 |
| RESTRICT PARKING | 1.2 |

The project principal traffic engineer reviewed each case and provided suggestions on what might have helped to prevent the specific accident from occurring, under the circumstances described in the report. The following comments were made in at least 1% of the cases:

| COUNTERMEASURE | % OF ACCIDENTS |
|---|---|
| INSTALL PAVEMENT EDGE MARKINGS | 2.8 |
| INSTALL CROSSWALK | 1.7 |
| PROVIDE PEDESTRIAN PATH OR SIDEWALK | 1.4 |
| INSTALL PEDESTRIAN CROSSING WARNING SIGNALS | 1.2 |

These two approaches suggest agreement on at least one key issue, namely, there is no one countermeasure likely to impact on a high percentage of the rural pedestrian accidents. Rather, it is apparent that relatively specific countermeasures will have to be used to treat relatively specific accident situations. The third and final countermeasure approach used analytical methods to divide the accident sample into groups with certain common situational elements. Treatments or countermeasures could then be developed to alter or eliminate the group's common causal elements. The accident typology, as described in the preceding section, was developed to group accidents into "types" with common behavioral characteristics which might be modified by specific countermeasures.

The following table summarizes the countermeasure implications of 23 accident types. The table presents countermeasure concepts for each accident type. These concepts are based on the primary causal characteristic of the particular accident type. The concept pinpoints the basic characteristic or characteristics of the accident type that must be eliminated or modified if the occurrence of the specific accident type is to be reduced. Also presented in the tables are potential countermeasures that include ways to achieve the effect as described in the countermeasure concept column.

| Accident Type (%Sample) | Generalized Countermeasure Concept | Potential Countermeasures |
|---|---|---|
| 01 Dart-Out First-Half (10.8%) | Reduce or eliminate short-time exposure on the part of the pedestrian; i.e., reduce those factors that contribute to make the pedestrian appear suddenly in the path of the vehicle. | (1) Remove parked cars as a potential visual obstruction (38.0%).<br>(2) Remove trees, brush, and weeds as potential visual obstructions (13.8%).<br>(3) Provide fenced play areas so that playing children cannot run into the street (33.7%).<br>(4) Improve roadway lighting in target areas (10.9%).<br>(5) Improve school area safety (9.0%).<br>(6) Improve school trip walking safety (7.6%). |
| 02 Dart-Out Second Half (10.3%) | Same as 01 above. | (1) Remove parked cars (15.3%).<br>(2) Provide fenced play areas (18.5%).<br>(3) Improve roadway lighting (19.1%).<br>(4) Improve school trip walking safety (12.4%).<br>(5) Improve school area safety (6.4%).<br>(6) Provide median barriers (11.5%). |
| 03 Midblock Dash (9.9%) | Reduce or eliminate running into the roadway, midblock, by pedestrians. | (1) Provide fenced play areas (25.7%).<br>(2) Improve school zone safety (8.5%).<br>(3) Improve school trip walking safety (13.4%).<br>(4) Improve roadway lighting (2.0%). |

| Accident Type (% Sample) | Generalized Countermeasure Concept | Potential Countermeasures |
|---|---|---|
| 11 Intersection Dash (9.9%) | Reduce or eliminate running and/or short time exposure by pedestrian crossing at insections. | (1) Improve school zone safety (18.2%).<br>(2) Improve school trip walking safety (24.0%).<br>(3) Improve roadway lighting (6.6%).<br>(4) Provide fenced play areas (12.5%).<br>(5) Improve pedestrian safety at "T" intersections (55.3%).<br>(6) Improve pedestrian safety at nonsignalized intersections (86.2%).<br>(7) Provide marked crosswalk (81.6%). |
| 12 Vehicle Turn/Merge with Attention Conflict (1.3%) | Reduce or eliminate distractions to drivers turning. | (1) Provide signals at nonsignalized locations (50.0%).<br>(2) Improve signals at signalized locations (35.0%). |
| 13 Turning Vehicle (1.9%) | Reduce or eliminate pedestrian/vehicle conflicts at intersections. | (1) Improve signalized intersections to reduce conflicts (71.4%).<br>(2) Provide signals at nonsignalized locations (28.4%). |
| 22 Multiple Threat (1.7%) | Reduce situations where one vehicle stops to let a pedestrian cross and the pedestrian is then struck by another vehicle traveling in the same direction. | (1) Modify pedestrian right-of-way regulations so that multiple-threat situations are less likely to occur.<br>(2) Provide method for stopped vehicles to inform approaching vehicles that a pedestrian is crossing. |
| 23 Backing Up (1.7%) | Reduce or eliminate pedestrians not being aware of vehicles backing up. | (1) Provide auditory backup warning devices on vehicles (<100%).<br>(2) Improve rear visibility in vehicles. |

| Accident Type (% Sample) | Generalized Countermeasure Concept | Potential Countermeasures |
|---|---|---|
| 24 Ped Not in Roadway (1.4%) | Reduce or eliminate potential pedestrian/vehicle conflicts at non-roadway locations, parking lots and private drives. | (1) Design parking lots, driveways to minimize pedestrian/vehicle conflict (54.6%).<br>(2) Improve roadway (condition, signs, markings) to keep vehicles on traveled way (27.3%). |
| 25 Walking Along Roadway (11.6%) | Provide for pedestrian/vehicle separation when pedestrians are walking along the roadway. | (1) Improve roadway lighting (33.7%).<br>(2) Improve condition of shoulder as a walkway (19.1%).<br>(3) Provide pedestrian paths or sidewalks away from the roadway.<br>(4) Provide pavement edge markings to delineate roadway from shoulder (66.1%).<br>(5) Improve school trip walking safety (6.2%).<br>(6) Encourage the use of reflectorized clothing (16.9%). |
| 26 Hitchhiking (1.5%) | Provide for pedestrian/vehicle separation when pedestrians are hitchhiking. particularly hazardous are drinking hitchhikers at night when the roadway is wet. | (1) Improve roadway lighting (39.1%).<br>(2) Provide pavement edge markings to keep vehicles off the edge of the roadway (43.5% had no pavement edge marking). |

| Accident Type (% Sample) | Generalized Countermeasure Concept | Potential Countermeasures |
|---|---|---|
| 32 Vendor/Ice Cream Truck (1.4%) | Decrease hazard to pedestrians crossing the roadway going to or from street vendor trucks. | (1) Increase driver awareness of potential threat by signs and/or signals on vendor trucks.<br>(2) Restrict vendors to specific locations and/or a specific number of stops per block at specific locations, i.e., areas with no parked cars.<br>(3) Enact regulations specifically reducing vehicle speeds past stopped vendor truck. |
| 33 Disabled Vehicle-Related (5.6%) | Reduce danger to pedestrians who are at or near a disabled vehicle. | (1) Provide motorist aid services to more rapidly remove disabled vehicles from the roadway.<br>(2) Control drinking drivers (18.6%).<br>(3) Improve roadway so that vehicles do not go out of control (16.3%) particularly at night (65.1%), and when the road is wet (15.1%), icy (10.5%), or snow-covered (5.8%).<br>(4) Provide pavement edge markings to keep driver off the shoulder and edge of the traveled way (52.3%).<br>(5) Provide wider, better improved shoulder so that disabled vehicles can get completely off the traveled way (44.2%).<br>(6) Improve disabled vehicle visibility by requiring that lights and flashers be displayed (73.2%). |

| Accident Type % Sample | Generalized Countermeasure Concept | Potential Countermeasures |
|---|---|---|
| 34 Result of Auto-Auto Accident (0.9%) | Prevent accidents involving autos from occurring so that pedestrian "bystanders" will not be struck. | (1) Control drinking drivers (35.7%).<br>(2) Keep vehicles from going out of control (28.6%). |
| 35 Working on Roadway (1.7%) | Reduce the likelihood of flagman or other construction workers being struck by vehicles. | (1) Provide signs/signals to increase driver caution in construction areas (48.0% of the drivers were proceeding with a lack of caution).<br>(2) Increase visibility of construction personnel (only 31.6% were wearing orange safety vests).<br>(3) Increase driver awareness of potential threat; 30.8% of the drivers saw the pedestrian but did not think their vehicles would strike the pedestrian. |
| 36 School Bus-Related (3.0%) | Improve safety for children going to or from a school bus or a school bus stop. | (1) Locate school bus stops to minimize the number of children who must cross the roadway (77.2%), or do not permit children to cross until the bus is at the stop.<br>(2) Locate school bus stops so that children can safely wait for the bus.<br>(3) Provide additional enforcement to decrease number of drivers who proceed with a lack of caution near school children or a school bus (37.8%).<br>(4) Improve warning light system on buses to protect children actually getting on or off the bus (43.5%). |

| Accident Type (% Sample) | Generalized Countermeasure Concept | Potential Countermeasures |
|---|---|---|
| 37 Mailbox-Related (1.4%) | Reduce number of pedestrians struck while going to or from their mailbox or newspaper box. | (1) Relocate mailboxes so that pedestrians do not have to cross the roadway (95.2%).<br>(2) Restrict children under 9 years old from going to mailboxes (61.9%).<br>(3) Reduce visual obstructions due to roadside furniture, trees, and brush (19.1%). |
| 38 Emergency/Police Vehicle-Related (0.6%) | Increase driver awareness of police/emergency personnel at work. | (1) Increase personnel visibility by light-colored or reflectorized clothing (62.5%).<br>(2) Control drinking drivers (33.3%).<br>(3) Place restrictions on vehicle speed while in the vicinity of a disabled vehicle (55.6%). |
| 39 Result of Vehicle Going Out of Control (3.7%) | Reduce likelihood of vehicles going out of control so that pedestrian "bystanders" will not be struck. | (1) Improve roadway safety conditions when wet (8.9%), icy (12.5%), or snow-covered (3.6%).<br>(2) Control drinking drivers (21.0%).<br>(3) Improve vehicle safety conditions, brakes (12.3%).<br>(4) Control speeding (28.1%). |
| 40 Walking to or from Disabled Vehicle (0.7%) | Prevent motorists from leaving their disabled vehicles and walking for help in an unsafe manner. | (1) Provide motorist aid services on freeways (36.4%).<br>(2) Improve roadway lighting (54.5%).<br>(3) Improve roadway safety condition (27.3% wet; 9.1% snow). |

| Accident Type (% Sample) | Generalized Countermeasure Concept | Potential Countermeasures |
|---|---|---|
| 97 Other (9.5%) | Since this group includes a wide variety of accident situations, the accidents are not amenable to one encompassing countermeasure concept. However, specific countermeasures can impact on large subsets of this type. | (1) Control drinking pedestrians (23.4%).<br>(2) Improve school zone and playground area safety (11.1%).<br>(3) Reduce playing in the roadway (11.7%).<br>(4) Improve roadway lighting (22.8%).<br>(5) Control speeding drivers (12.4%).<br>(6) Control drinking drivers (9.0%). |
| 98 Weird (7.4%) | This group involves accidents which occurred under unusual circumstances and are not generally amenable to countermeasures. | None |
| 99 Limited Information (1.6%) | Very little was determined about the accidents in this group:<br>37.5% hit and run drivers<br>47.6% fatally injured pedestrians<br>However, certain causal elements are evident. | (1) Control drinking pedestrians (16.7%).<br>(2) Control drinking drivers (4.2%).<br>(3) Improve roadway lighting (29.2%). |

Each accident type was examined to determine the generalized countermeasure concept involved in each accident situation. The countermeasure concept pinpointed the basic characteristics of an accident type that must be eliminated or modified if the occurrence of the specific type is to be reduced. Potential countermeasures were then identified that might achieve this desired effect. For example, the countermeasure concept associated with the mailbox-related accident type is to reduce the number of pedestrians who are struck while crossing the roadway to go to a mailbox or newspaper box. A countermeasure to achieve this effect might be to relocate mailboxes so that pedestrians do not have to cross the roadway in order to get their mail. In the previous table each accident type was considered independently. The results were then compiled to represent the entire sample, as shown in the next table. This table summarizes the engineering enforcement and regulation-oriented countermeasures. Clearly there is an accident-reducing capability for pedestrian-and driver-oriented education programs for most of the various accident types; however, education as such is not included in the following summary.

Each of the countermeasures listed above were extracted by considering the various countermeasures suggested for each accident type. The "percentage of accidents" figure was derived by considering the percentage of each type that would be impacted by a particular countermeasure and projecting that percentage to the entire sample. The remainder of this section discusses the implications of each of the countermeasures listed below.

**COUNTERMEASURE IDENTIFIED BY ACCIDENT TYPOLOGY DEVELOPMENT**

| COUNTERMEASURES | % OF ACCIDENTS |
|---|---|
| IMPROVE ROADWAY MARKINGS | 11.7 |
| PROVIDE SIDEWALKS / PATHS | 11.6 |
| IMPROVE ROADWAY LIGHTING | 11.5 |
| IMPROVE PEDESTRIAN SAFETY AT NONSIGNALIZED INTERSECTIONS | 8.6 |
| PROVIDE FENCED PLAY AREAS | 8.1 |
| PROVIDE CROSSWALKS | 8.1 |
| IMPROVE SCHOOL TRIP WALKING SAFETY | 6.5 |
| IMPROVE VEHICLE WARNING SYSTEMS | 6.1 |
| PROVIDE MOTORIST AID SERVICES | 5.9 |
| IMPROVE VEHICLE VISIBILITY | 5.8 |
| PARKING RESTRICTIONS | 5.7 |
| IMPROVE SCHOOL / PLAYGROUND AREA SAFETY | 5.4 |
| ENFORCE EXISTING VEHICLE REGULATIONS | 3.9 |
| NEW PEDESTRIAN REGULATIONS | 3.7 |
| REFLECTORIZED CLOTHING | 3.5 |
| RELOCATE SCHOOL BUS STOPS | 3.0 |
| IMPROVE SHOULDERS | 2.9 |
| CONTROL DRINKING DRIVERS | 2.5 |
| CONTROL DRINKING PEDESTRIANS | 2.5 |
| PROVIDE NEW SIGNS / SIGNALS | 2.4 |
| IMPROVE ROADWAYS IN BAD WEATHER CONDITIONS | 2.0 |
| IMPROVE VEHICLE SAFETY | 2.0 |
| IMPROVE EXISTING SIGNS /SIGNALS | 1.8 |
| REMOVE TREES, BUSHES, ETC. AS VISUAL OBSTRUCTIONS | 1.8 |
| NEW VEHICLE REGULATIONS | 1.4 |
| RELOCATE MAILBOXES | 1.3 |
| PROVIDE PEDESTRIAN BARRIERS | 1.2 |
| IMPROVE PARKING LOT DESIGN | 0.8 |

Improve Roadway Markings

This countermeasure was suggested for walking along the roadway, hitchhiking, pedestrian not in the roadway and disabled vehicle accident types. Roadway markings, especially pavement edge markings, were frequently lacking at these accident sites. Pavement edge markings should help keep the pedestrian on the edge of the roadway and the vehicle on the traveled way.

Provide Sidewalks/Paths

This countermeasure is appropriate in those cases where the pedestrian was struck while walking along the roadway, particularly when the shoulder is unsuitable for pedestrian travel.

Improve Roadway Lighting

Although 31% of the accidents occurred after dark, it is projected that 11.5% could be prevented by improving roadway lighting.

Improve Pedestrian Safety at Nonsignalized Intersections

This countermeasure is appropriate for the intersection dash accident type; 86% occurred on nonsignalized intersections and 55% occurred at "T" intersections.

Provide Fenced Play Areas

This countermeasure was suggested for those dart-out and midblock dash accident types that involved children running into the street while playing.

Provide (Marked and/or Signalized) Crosswalks

This countermeasure is appropriate for the intersection dash accident types, the vast majority of which occur in unmarked crosswalks.

Improve School Trip Walking Safety

This countermeasure would affect the dart-out and dash type accidents when a child is struck crossing the street going to or from school.

Improve Vehicle Warning Systems

Countermeasures in this category include auditory back-up warning buzzers, vendor/ice cream truck signals and school bus flasher systems.

Provide Motorists Aid Services

These services should be designed to quickly get disabled vehicle-related pedestrians off the roadway.

Improve Vehicle Visibility

Improved vehicle flasher systems and/or flares would warn motorists that they are approaching a disabled vehicle.

Parking Restrictions

This type of countermeasure would be aimed at reducing the number of parked cars that served as visual obstructions particularly in suburban, residential areas.

Improve School/Playground Area Safety

This countermeasure would reduce the occurrence of accidents near schools and playgrounds.

Enforce Existing Vehicle Regulations

This type of countermeasure should be aimed at reducing speeding in certain areas and increasing compliance to school bus warning lights.

New Pedestrian Regulations

New regulations should consider: modifying right-of-way regulations to avoid the multiple-threat situation; restricting very young children from crossing major highways to pick up U.S. mail at mailboxes; and reducing playing in the roadway.

Reflectorized Clothing

This countermeasure should be considered for certain high-risk occupations, police and emergency personnel as well as the general public.

Relocate School Bus Stops

School bus stops should be located to minimize the number of children crossing the road.

Improve Shoulders

Better and wider shoulders would permit disabled vehicles to pull completely off the traveled way.

Control Drinking Drivers

Accidents involving disabled vehicles, result of auto-auto situations and vehicles out of control often were caused by drivers who had been drinking, running off the traveled way.

Control Drinking Pedestrians

This countermeasure would be directed at those accident types where a drinking pedestrian was the primary cause of the accident.

Provide New Signs/Signals

Improved and/or new signs and/or signalization are needed at nonsignalized intersections experiencing the turn/merge and turning vehicle accident types. Also needed are ways to increase driver vigilance and caution in construction areas.

Improve Roadway in Bad Weather Conditions

This countermeasure would reduce those accidents, particularly vehicle going out of control and disabled vehicle related types, that occur during inclement weather.

Improve Vehicle Safety

Improving the safety condition of vehicles would reduce the number of accidents involving inadequate brakes and lighting as well as those caused by a vehicle going out of control due to a mechanical defect. Improving the visibility to the rear would affect the backing-up type.

Improve Existing Signs/Signals

Signals at signalized intersections should be modified or improved to reduce turning vehicle accidents.

Remove Trees, Bushes, etc. as Visual Obstructions

Trees, brush and other roadside items were a visual obstruction for drivers and pedestrians in the dart-out and mailbox-related types.

New Vehicle Regulations

New regulations are needed to restrict street vendors to specific spots, or a specific number of stops per block.

Relocate Mailboxes

Mailboxes should be relocated so that pedestrians do not have to cross major or high-speed roadways in order to get the mail or newspapers.

Provide Pedestrian Barriers

Pedestrian barriers located in medians would be effective in preventing those dart-out second half accidents that occurred on divided highways with a median.

Improve Parking Lot Design

Parking lots should be designed to minimize pedestrian/vehicle conflicts. This would help to reduce the pedestrian not in the roadway and backing-up accident types.

# II. METHODOLOGICAL PROCEDURES

## Sampling Plan

The development of a strong sampling plan had been considered essential since the inception of the project. The basic problem was to determine which of the approximately 50,000* annual rural pedestrian accidents should be selected for detailed investigation. States representing six of the ten Federal Highway Administration field regions were selected and subsequently contacted; each agreed to cooperate with the study. It is felt that the six states (California, Michigan, Missouri, North Carolina, Pennsylvania, and Texas) provided a reasonably representative national sample (see Figure II-1).

The next sampling issue was to determine which pedestrian accidents in these six states should be selected for investigation. Specifically, the problem was to devise a plan that provided a sample of accidents that could be considered representative of each state so that the composite sample, comprised of the state subsamples, could be considered a reasonably representative national sample.

A stratified random sampling procedure was chosen as the technique appropriate for the selection of sampling areas within each state. The basic sampling unit in five states was the county; in the sixth state, Missouri, the sampling units were the seven state police districts. The stratified sampling procedure was designed to proportionally represent the accident experience of the six states in a composite sample. In addition, this sampling procedure randomizes (within the constraints of number of accidents per sampling unit) geographic, population density, and socioeconomic variables within each state. Thus, these situational variables are adequately represented in the selected sample of counties within each state.

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*Accident Facts, 1972, National Safety Council.

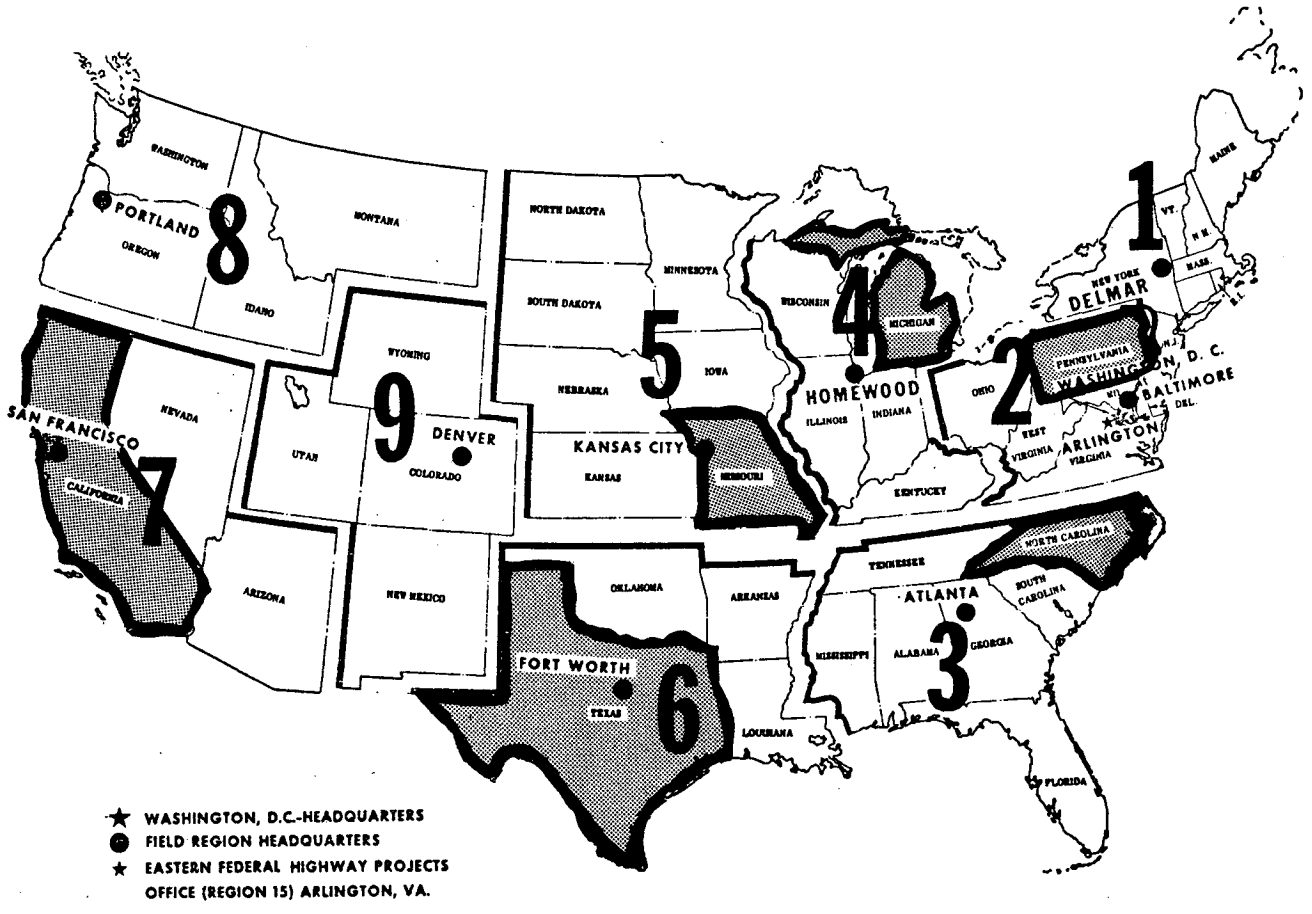



Figure II-1. The Six Study Sample States (Reprinted courtesy of FHWA).

The sampling process involves two stages. The first concern was to assure that the sample from each state be proportional to that state's contribution to the total number of rural/suburban pedestrian accidents experienced by all six states. For example, Texas had 633 of these accidents in 1972; the total for all six states in that year was 6,399, making Texas 9.9% (633/6,399) of the sample. We can now calculate the number of accident investigations required in Texas simply by taking 9.9% of the planned accident base of 1,439* cases, which yields 142 accident cases from Texas (see Table II-1).

Table II-1

Distribution of the Sampling Plan
and the Actual Sample Among the Six States

| Rural Pedestrian Accidents | | | | Sampling Plan | | Actual Sample | |
|---|---|---|---|---|---|---|---|
| State | Fatal | Nonfatal | Total | Percent | N | Percent | N |
| California | 274 | 2090 | 2364 | 36.9 | 532 | 32.8 | 501 |
| Michigan | 155 | 1066 | 1221 | 19.1 | 275 | 17.9 | 274 |
| Missouri | 77 | 369 | 446 | 7.0 | 100 | 7.5 | 115 |
| N. Carolina | 280 | 708 | 988 | 15.4 | 222 | 17.4 | 266 |
| Pennsylvania | * | * | 747** | 11.7 | 168 | 11.1 | 170 |
| Texas | 190 | 433 | 633 | 9.9 | 142 | 13.3 | 204 |
| TOTALS | | | 6399 | 100.0 | 1439 | 100.0 | 1531 |

* Not available.

**Based on 1973 data.

The second stage of the sampling process involved the selection of sampling units (areas) within each state. Once again, these areas were selected to represent a stratified random sample of the entire state (microcosm). Such a sample can be drawn if we

*The planned sample of 1,439 cases would have permitted population parameter estimates to within ± 2.5% confidence interval at the .95 level. This was determined to be a sufficiently large sample for statistical purposes. See page II-35 for a discussion of the reliability of the sample.

assign to each basic sampling unit a probability of inclusion in the sample which is proportional to its accident experience. For example, Bexar County experienced an estimated 19 rural/suburban accidents, and therefore would be 9½ times more likely to be selected than a county like Freestone that only had an estimated two accidents in 1972.

We used the following selection procedure to yield the appropriate probability sample:

1. Arranged the sampling units (i.e., counties or districts) in alphabetical order (Table II-2, Column 1).
2. Determined the number of rural/suburban accidents per sampling unit (Table II-2, Column 2).
3. Created a column containing a cumulative total (CT) of the pedestrian accidents starting with the first sampling unit (Table II-2, Column 3).
4. Created a second column consisting of a range of values (Table II-2, Column 4). For each sampling unit, the lower bound of the range is simply the immediately preceding CT, the upper bound is the CT plus the number of accidents in that sample unit.
5. Found the sampling unit with the largest number of accidents (i.e., Los Angeles County), multiplied this number of accidents by two and designated the product as the sampling interval (SI).*
6. Drew a set of values from a random number source. These values should be $\leq$ SI and are designated as the set $\{ RN \}$.

---

*A sampling interval of this size insures that during any one complete selection cycle, the probability of selecting the largest sampling unit (Los Angeles County) never exceeds 0.5. The use of the sampling interval reduced the number of times that the larger sampling units would be reselected after they were already included in the sample.

Table II-2

Sample of County Selection Procedure

| (1) County | (2) No. of Rural Ped Accidents | (3) Cumulative | (4) Range | (5) Order Selected |
|---|---|---|---|---|
| Alameda | 59 | 59 | 0-59 | 10 |
| Alpine | - | - | - | |
| Amador | 1 | 60 | 60-60 | |
| Butte | 19 | 79 | 61-79 | |
| Calaveras | 4 | 83 | 80-83 | |
| Colusa | 4 | 87 | 84-87 | |
| Contra Costa | 81 | 168 | 88-168 | 14 |
| Del Norte | 3 | 171 | 169-171 | |
| El Dorado | 11 | 182 | 172-182 | |
| Fresno | 48 | 230 | 183-230 | 13 |
| Glenn | - | - | - | |
| Humboldt | 9 | 239 | 231-239 | |
| Imperial | 11 | 250 | 240-250 | |
| Inyo | 3 | 253 | 251-253 | |
| Kern | 105 | 358 | 254-358 | |
| Kings | 5 | 363 | 359-363 | |
| Lake | 2 | 365 | 364-365 | |
| Lassen | 3 | 368 | 366-368 | |
| Los Angeles | 669 | 1037 | 369-1037 | 5 |
| Madera | 9 | 1046 | 1038-1046 | |
| Marin | 25 | 1071 | 1047-1071 | |
| Mariposa | 1 | 1072 | 1072-1072 | |
| Mendocino | 9 | 1081 | 1073-1081 | 6 |
| Merced | 16 | 1097 | 1082-1097 | 8 |
| Modoc | 1 | 1098 | 1098-1098 | |
| Mono | 3 | 1101 | 1099-1101 | |
| Monterey | 44 | 1145 | 1102-1145 | 12 |
| Napa | 5 | 1150 | 1146-1150 | |
| Nevada | 13 | 1163 | 1151-1163 | |
| Orange | 60 | 1223 | 1164-1223 | 7 |
| Placer | 16 | 1239 | 1224-1239 | |

Table II-2
Sample of County Selection Procedure
(Continued)

| County | No. of Rural Ped Accidents | Cumulative | Range | Order Selected |
|---|---|---|---|---|
| Plumas | 3 | 1242 | 1240-1242 | |
| Riverside | 81 | 1323 | 1243-1323 | |
| Sacramento | 123 | 1446 | 1324-1446 | 2 |
| San Benito | - | - | - | |
| San Bernardino | 125 | 1571 | 1447-1571 | 1 |
| San Diego | 85 | 1656 | 1572-1656 | 4 |
| San Francisco | - | - | - | |
| San Joaquin | 39 | 1695 | 1657-1695 | |
| San Luis Obispo | 11 | 1706 | 1696-1706 | |
| San Mateo | 40 | 1746 | 1707-1746 | |
| Santa Barbara | 19 | 1765 | 1747-1765 | |
| Santa Clara | 55 | 1820 | 1766-1820 | 3 |
| Santa Cruz | 22 | 1842 | 1821-1842 | 9 |
| Shasta | 14 | 1856 | 1843-1856 | |
| Sierra | - | - | - | |
| Siskiyou | 3 | 1859 | 1857-1859 | |
| Solano | 13 | 1872 | 1860-1872 | |
| Sonoma | 40 | 1912 | 1873-1912 | |
| Stanislaus | 32 | 1944 | 1913-1944 | |
| Sutter | 4 | 1948 | 1945-1948 | |
| Tehama | 5 | 1953 | 1949-1953 | |
| Trinity | - | - | - | |
| Tulare | 29 | 1982 | 1954-1982 | |
| Tuolumne | 4 | 1986 | 1983-1986 | |
| Ventura | 31 | 2017 | 1987-2017 | |
| Yolo | 20 | 2037 | 2018-2037 | |
| Yuba | 8 | 2045 | 2038-2045 | 11 |

7. Selected the first sampling unit by finding the sum of SI and RN. The sampling unit whose range encompasses the above sum (S) would be selected (Table II-2, Column 5).

8. Continued to select the second, third, etc. units as follows:

| | |
|---|---|
| 2nd | $SI + RN_1 + RN_2$ |
| 3rd | $SI + RN_1 + RN_2 + RN_3$ |
| Kth | $SI + RN_1 + RN_2 + ....RN_K$ |

9. Recycled through list when S exceeds the total number of accidents in that state. Proceeded by subtracting from S the total number of rural/suburban pedestrian accidents in the state and continue the process as in Item 8 above.

10. Continued the selection process until the number of accidents experienced by the selected counties equaled or exceeded the desired sample size of 15%. This 15% excess was included to ensure the adequacy of the sample because of projected random fluctuations in accidents by county, and because of variations in the efficiency of the different state accident report sorting and filing systems. In addition, because of the then-threatening "energy crisis," three alternate counties were selected in each state. Early in the data collection phase, the three alternate counties were added to each state's sample (including all their accidents retroactive to 1 January) to compensate for the slightly lower than projected accident rates than were found during the first three months.

Tables II-3 through II-8 show the counties that were selected in each state and each county's projected contribution to the states' subsamples. Figures II-2 through II-7 are outline maps of each state showing the counties that were selected by the

Table II-3

Selected Counties

| STATE: California | | | | Sample = 532<br>Sample + 15% = 612 | |
|---|---|---|---|---|---|
| (1)<br>Order<br>Selected | (2)<br>County | (3)<br>F.I.<br>Base | (4)<br># Ped<br>Accidents | (5)<br>Cumulative<br>Total | (6)<br>County<br>Code No. |
| 1 | San Bernardino | Los Angeles | (½ only)<br>62.5 | (½ only)<br>62.5 | 07 |
| 2 | Sacramento | Sacramento | 61.5 | 124 | 06 |
| 3 | Santa Clara | San Jose | 27.5 | 151.5 | 09 |
| 4 | San Diego | San Diego | 42.5 | 194 | 08 |
| 5 | Los Angeles | Los Angeles | 334.5* | 528.5 | 02 |
| 6 | Mendocino | Sacramento | 4.5 | 533 | 03 |
| 7 | Orange | San Diego | 30 | 563 | 05 |
| 8 | Merced | San Jose | 8 | 571 | 04 |
| 9 | Santa Cruz | San Jose | 11 | 582 | 10 |
| 10 | Alameda | San Jose | 29.5 | 611.5 | 01 |
| 11 | Yuba | Sacramento | 4 | 615.5 | 11 |
| 12 | Monterrey | San Jose | 22 | 637.5 | 14 |
| 13 | Fresno | San Jose | 24 | 661.5 | 13 |
| 14 | Contra Costa | San Jose | 40.5 | 702 | 12 |

*The large number of accidents in Los Angeles County (664) more than exceeded the sample needed statewide (612). Hence, a minor modification of the procedure was used to ensure the representativeness of the California sample. We selected twice as many counties as were needed to obtain the sample and subsequently investigated only every other accident, by county.

Table II-4

Selected Counties

STATE: Michigan

Sample = 275
Sample + 15% = 316

| (1) Order Selected | (2) County | (3) F.I. Base | (4) # Ped Accidents | (5) Cumulative Total | (6) County Code No. |
|---|---|---|---|---|---|
| 1 | Genesee | Flint | 124 | 124 | 02 |
| 2 | Midland | Lansing | 6 | 130 | 04 |
| 3 | Shiawassee | Lansing | 11 | 141 | 06 |
| 4 | Calhoun | Kalamazoo | 31 | 172 | 01 |
| 5 | Kent | Kalamazoo | 43 | 215 | 03 |
| 6 | Oakland | Flint | 165 | 380 | 05 |
| 7 | Ogeman | Lansing | 6 | 386 | 09 |
| 8 | Berrien | Kalamazoo | 63 | 449 | 07 |
| 9 | Inglam | Lansing | 34 | 483 | 08 |

Table II-5

Selected Police Districts*

STATE: Missouri

Sample = 100
Sample + 15% = 115

| Order Selected | Troop | F.I. Base | # Ped Accidents | Cumulative Total |
|---|---|---|---|---|
| 1 | A - Kansas City | Warrensburg | 53.3 | 53.5 |
| 2 | F - Jefferson City | Warrensburg | 63.6 | 116.9 |
| 3 | E - Poplar Bluffs | Warrensburg | 55.4 | 172.3 |
| 4 | C - St. Louis | Warrensburg | 7.5 | 247.3 |

| County | County Code | County | County Code |
|---|---|---|---|
| Audrain | 01 | Howard | 14 |
| Bates | 02 | Jackson | 15 |
| Benton | 03 | Johnson | 16 |
| Boone | 04 | Lafayette | 17 |
| Callaway | 05 | Miller | 18 |
| Camden | 06 | Moniteall | 19 |
| Carroll | 07 | Montgomery | 20 |
| Cass | 08 | Morgan | 21 |
| Clay | 09 | Osage | 22 |
| Cole | 10 | Pettis | 23 |
| Cooper | 11 | Platte | 24 |
| Gasconade | 12 | Ray | 25 |
| Henry | 13 | Saline | 26 |

*Rural pedestrian accident data were not available by county, so state police districts were used as the geographical unit in Missouri.

Table II-6

Selected Counties

STATE: North Carolina

Sample = 222
Sample + 15% = 255

| (1) Order Selected | (2) County | (3) F.I. Base | (4) # Ped Accidents | (5) Cumulative Total | (6) County Code No. |
|---|---|---|---|---|---|
| 1 | Burke | Davidson | 15.9 | 15.9 | 03 |
| 2 | Cleveland | Davidson | 17.1 | 33.0 | 05 |
| 3 | Durham | Chapel Hill | 14.0 | 46.9 | 07 |
| 4 | Guilford | Chapel Hill | 30.3 | 77.2 | 09 |
| 5 | Lincoln | Davidson | 9.1 | 86.3 | 10 |
| 6 | New Hanover | Penbrooke | 11.8 | 98.1 | 11 |
| 7 | Robeson | Penbrooke | 22.5 | 120.6 | 12 |
| 8 | Vance | Chapel Hill | 6.8 | 127.4 | 14 |
| 9 | Bladen | Penbrooke | 7.4 | 134.7 | 01 |
| 10 | Caldwell | Davidson | 14.1 | 148.9 | 04 |
| 11 | Cumberland | Penbrooke | 39.4 | 188.2 | 06 |
| 12 | Gaston | Davidson | 23.4 | 211.6 | 08 |
| 13 | Stanly | Davidson | 8.5 | 220.1 | 13 |
| 14 | Wayne | Penbrooke | 15.5 | 235.6 | 15 |
| 15 | Buncombe | Davidson | 23.5 | 259.1 | 02 |
| 16 | Catawba | Davidson | 18.2 | 277.3 | 16 |
| 17 | Davidson | Davidson | 19.6 | 296.9 | 17 |
| 18 | Wake | Chapel Hill | 37.4 | 334.3 | 18 |

Table II-7

Selected Counties

STATE: Pennsylvania

Sample = 345
Sample + 15% = 397

| (1) Order Selected | (2) County | (3) F.I. Base | (4) # Ped Accidents | (5) Cumulative Total | (6) County Code No. |
|---|---|---|---|---|---|
| 1 | Clearfield | Indiana | 30.2 | 30.2 | 06 |
| 2 | Lancaster | Ursinus | 54.8 | 85.0 | 08 |
| 3 | Susquehanna | Ursinus | 15.2 | 100.2 | 11 |
| 4 | Bedford | Indiana | 23.1 | 123.4 | 02 |
| 5 | Fayette | Indiana | 43.9 | 167.3 | 07 |
| 6 | Mercer | Indiana | 20.3 | 187.6 | 10 |
| 7 | Washington | Indiana | 38.5 | 226.0 | 12 |
| 8 | Allegheny | Indiana | 48.7 | 274.7 | 01 |
| 9 | Carbon | Ursinus | 12.9 | 287.8 | 04 |
| 10 | Lehigh | Ursinus | 36.5 | 324.1 | 09 |
| 11 | Centre | Indiana | 29.9 | 354.0 | 05 |
| 12 | Wayne | Ursinus | 15.8 | 369.8 | 13 |
| 13 | Butler | Indiana | 35.3 | 405.1 | 03 |
| 14 | Crawford | Indiana | 29.7 | 434.8 | 15 |
| 15 | Somerset | Indiana | 21.8 | 456.6 | 16 |
| 16 | Adams | Ursinus | 19.3 | 475.9 | 14 |

Table II-8

Selected Counties

STATE: Texas

Sample = 142
Sample + 15% = 164

| (1) Order Selected | (2) County | (3) F.I. Base | (4) # Ped Accidents | (5) Cumulative Total | (6) County Code No. |
|---|---|---|---|---|---|
| 1 | Comal | San Antonio | 3.0 | 3.0 | 04 |
| 2 | Guadalupe | San Antonio | 4.0 | 7.0 | 10 |
| 3 | Kleberg | Corpus Christi | 1.6 | 8.6 | 17 |
| 4 | Titus | Dallas | 1.2 | 9.8 | 23 |
| 5 | Burnett | San Antonio | 2.0 | 11.8 | 03 |
| 6 | El Paso | El Paso | 5.0 | 16.9 | 09 |
| 7 | Harris | Houston | 49.7 | 66.6 | 11 |
| 8 | Live Oak | Corpus Christi | 2.0 | 68.6 | 18 |
| 9 | Whorton | Houston | 4.0 | 72.6 | 25 |
| 10 | Burleson | San Antonio | 3.3 | 76.0 | 02 |
| 11 | Duval | Corpus Christi | 1.7 | 77.6 | 07 |
| 12 | Jefferson | Houston | 5.0 | 82.6 | 15 |
| 13 | Nueces | Corpus Christi | 5.5 | 88.1 | 20 |
| 14 | Bexar | San Antonio | 19.2 | 107.4 | 01 |
| 15 | Ellis | Dallas | 5.6 | 113.0 | 08 |
| 16 | Hill | Dallas | 4.6 | 117.6 | 12 |
| 17 | Maverick | San Antonio | .9 | 118.5 | 19 |
| 18 | Smith | Dallas | 8.8 | 127.3 | 22 |
| 19 | Hudspeth | El Paso | 2.3 | 129.6 | 13 |
| 20 | San Patricia | Corpus Christi | 5.0 | 134.6 | 21 |
| 21 | Dallas | Dallas | 8.5 | 143.1 | 05 |
| 22 | Karnes | San Antonio | 1.1 | 144.2 | 16 |
| 23 | Travis | San Antonio | 16.1 | 160.3 | 24 |
| 24 | Jasper | Houston | 3.6 | 163.9 | 14 |
| 25 | Denton | Dallas | 7.0 | 170.9 | 06 |
| 26 | Shelby | Houston | 3.6 | 174.6 | 28 |
| 27 | Hildago | Corpus Christi | 10.3 | 184.9 | 26 |
| 28 | Montgomery | Houston | 10.1 | 194.9 | 27 |


Figure II-2. California Counties Selected.

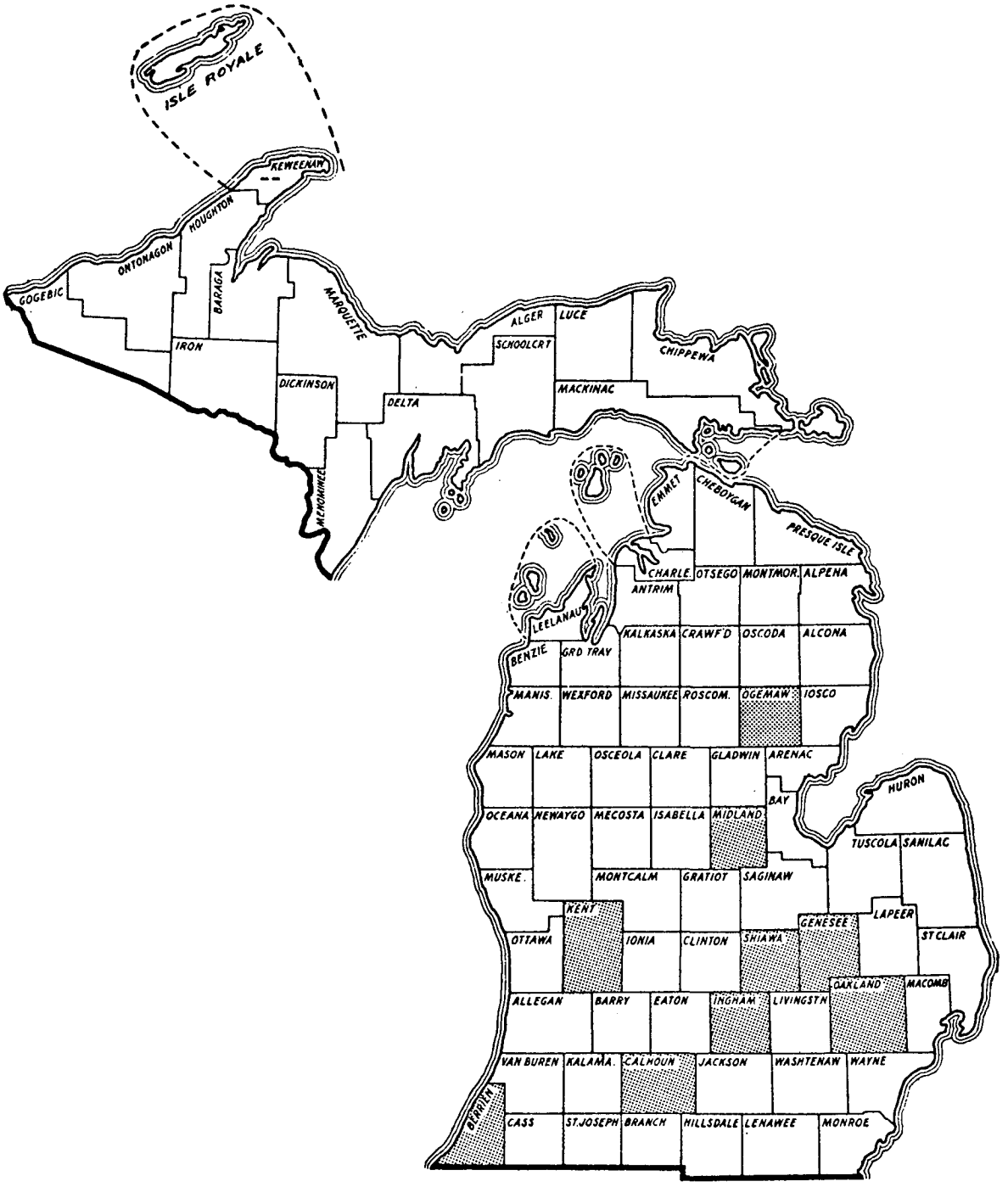



Figure II-3. Michigan Counties Selected.

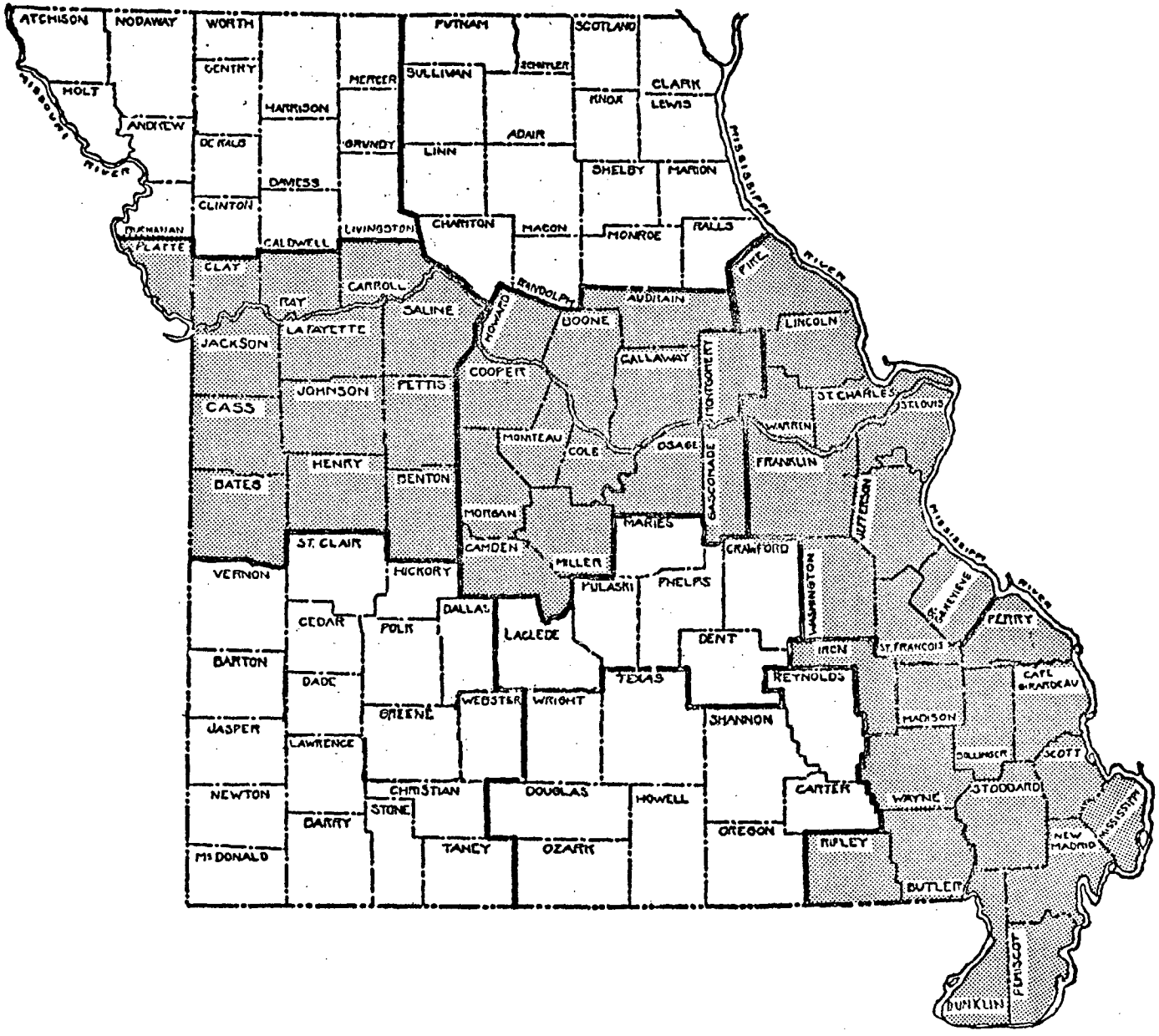



Figure II-4. Missouri Counties Selected (troop areas were sampling unit).

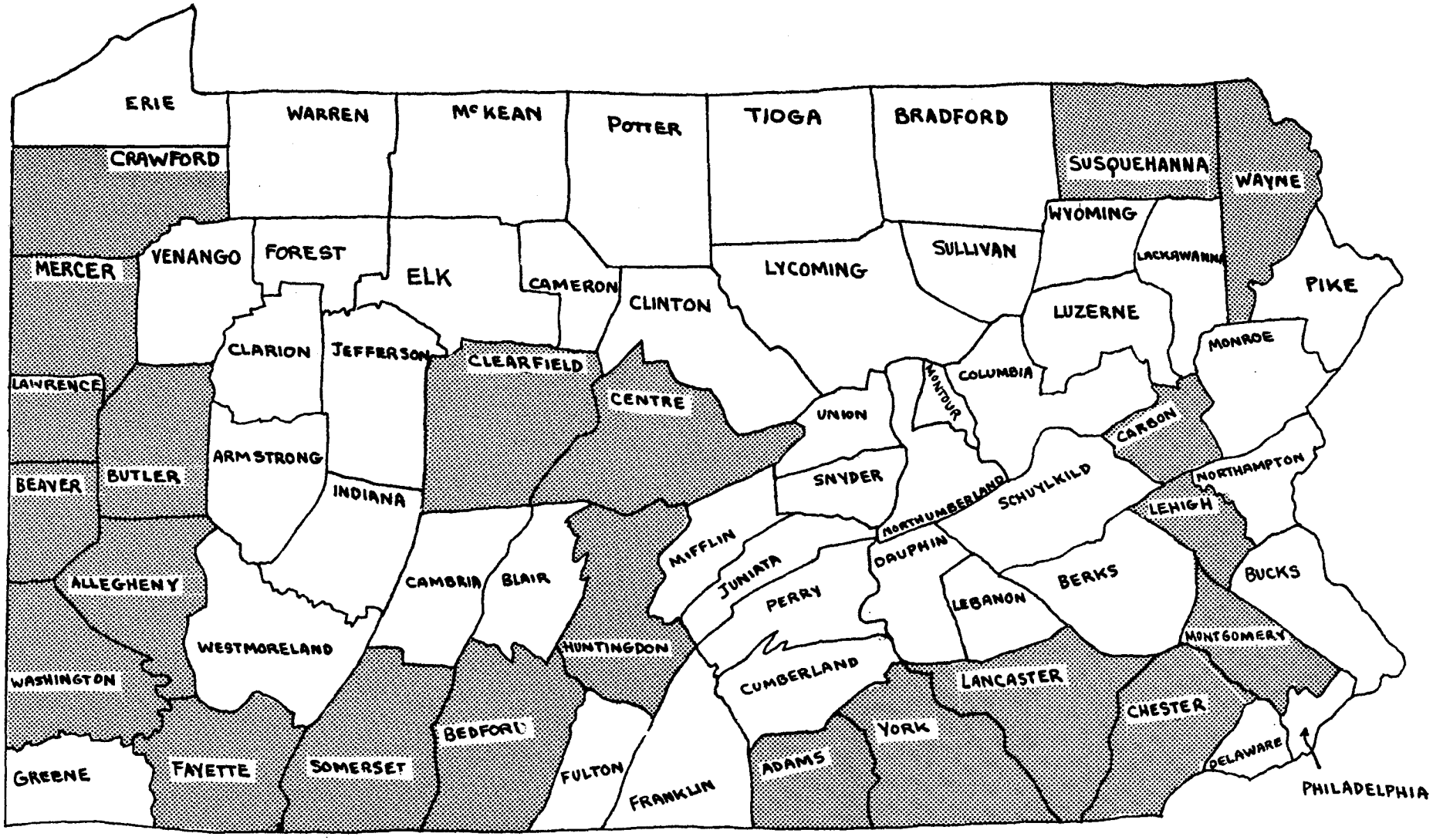



Figure II-5. Pennsylvania Counties Selected.

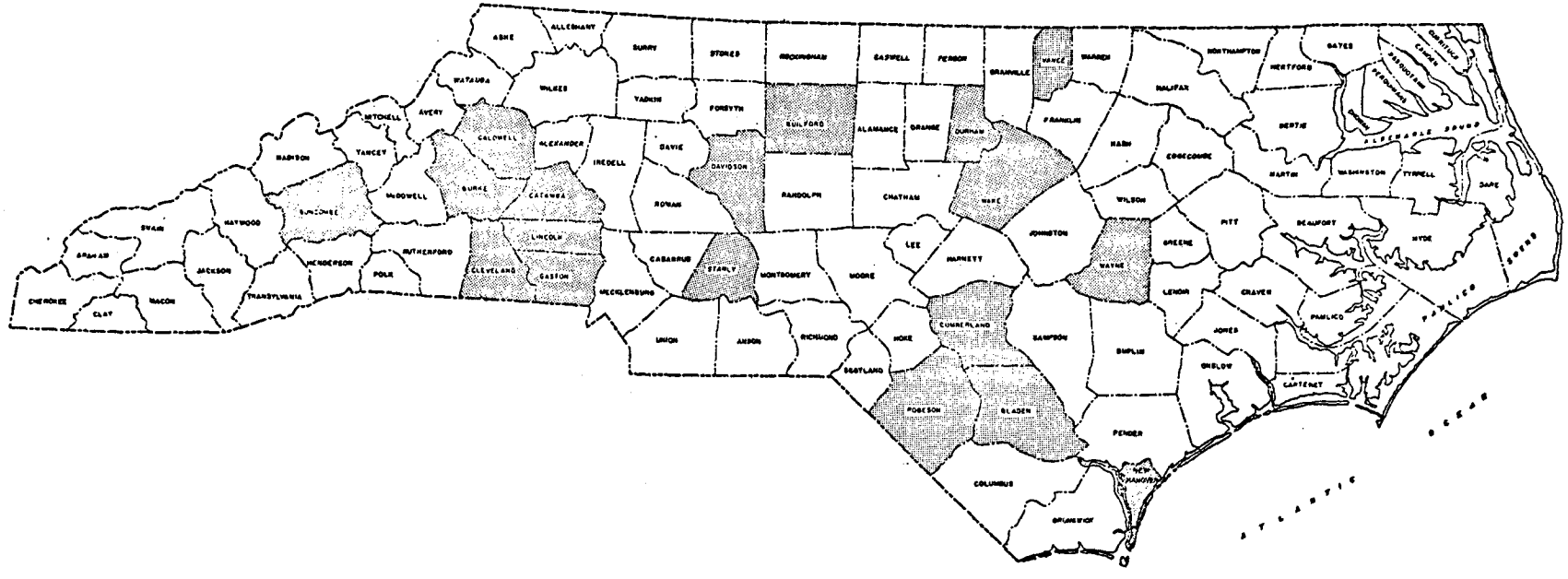



Figure II-6. North Carolina Counties Selected.

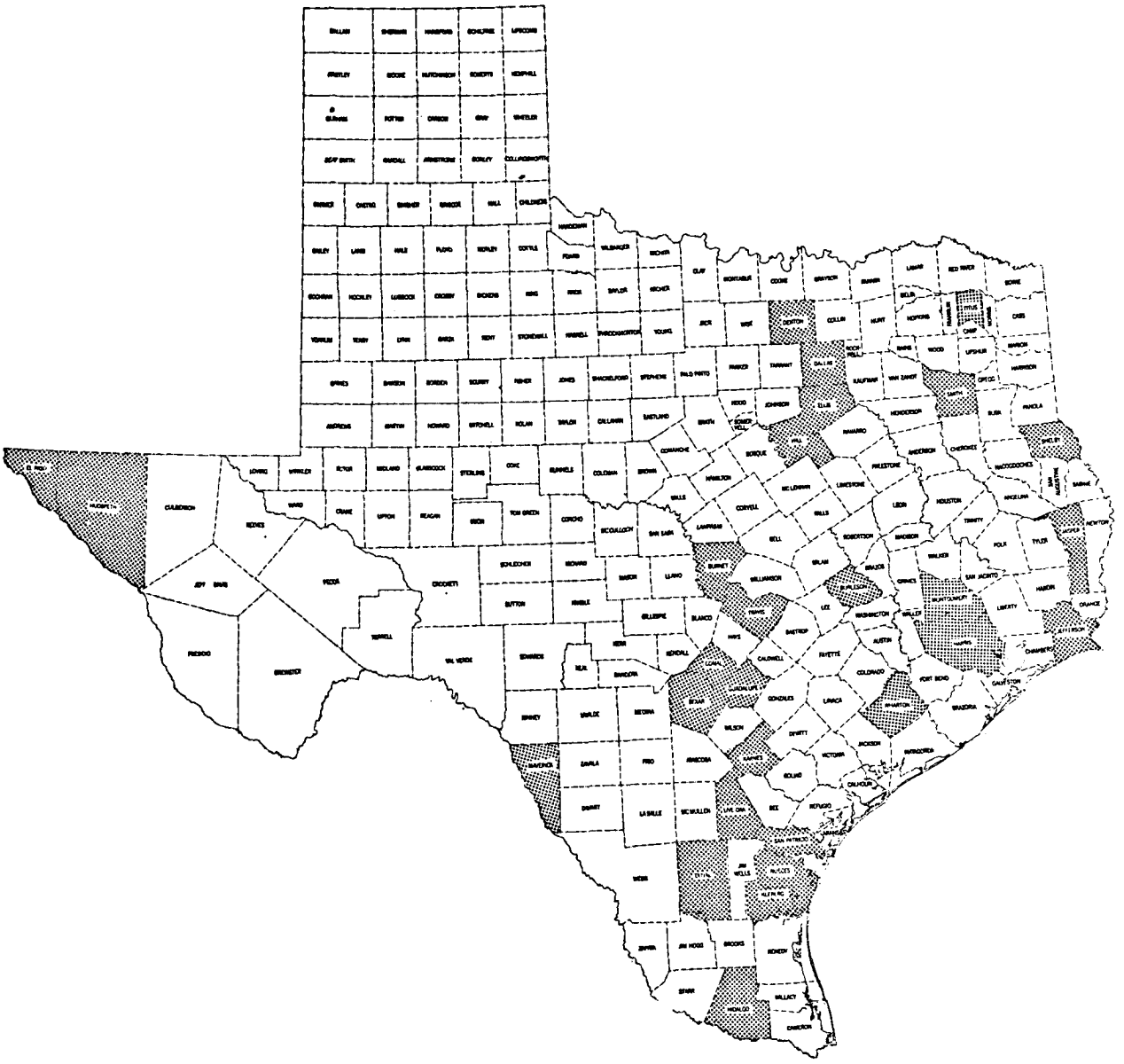


Figure II-7. Texas Counties Selected.

stratified random selection procedure. It can be seen that the selected counties represent a reasonably well-distributed geographical area, yet they tend to be concentrated in the more heavily populated areas around major urban centers.

## Identification of Data Items

Data items were selected to include sufficient information to describe the nature of the rural pedestrian accident, about which little was previously known. A three-stage process was employed in developing the data items. First, a number of state and county police officers with accident investigation experience were interviewed in order to identify the essential elements of the accident process. Second, previous accident investigation studies were reviewed and applicable data elements were identified. Third, the appropriate Government personnel were consulted to identify any additional elements and to ensure that the accident coding format was compatible with existing systems.

### Development of Data Items

The following types of data items were developed:

- Identification items. Time, place, description of accident and accident site, persons involved.
- Behavioral sequence items. Preinvolvement and collision course factors; evasive action factors; pedestrian, driver, and environmental causal factors.
- Trip characteristics and pedestrian, driver, and vehicle descriptive items. Origin/destination, physical condition, driving experience, visual appearance, vehicle characteristics, and pedestrian injuries.
- Site characteristics items. Area and roadway description, roadway geometry, traffic control devices,

observed vehicle speeds, sight distance, and site photographs.

- Baserate data items. Pedestrian volume and characteristics, traffic volume and characteristics.
- Field Investigator (FI) conclusion items. Sketch and narrative, precipitating factors, potential countermeasures.

## Sources of Data Items

The sources of information for the data items include the following:

- Police accident report form
- Pedestrian interview
- Driver interview
- Witness (or person having knowledge of accident) interview
- Field investigator's observations and measurements
- Field investigator's impressions and conclusions.

Table II-9 shows the relationship between the types of data items and the sources of information. Table II-10 lists the data categories. A copy of the data form is contained in Appendix A.

# Data Collection Procedures

## Definition of the "Rural" Pedestrian Accident Sample

Once we had determined which counties in the various states would be used, the next issue was to determine which accidents would qualify as "rural" (or, more specifically, nonurban) pedestrian accidents. This issue was largely a spurious one as each of the six states has its own definitions which it utilizes when reporting accident statistics to the various governmental agencies, as well as to the National Safety Council. For the purposes of this study, the definitions as provided by the states were used. All those pedestrian accidents from the sample counties which each state would consider rural were investigated.

## Table II-9

## Data Item Types and Sources of Information

| DATA ITEM TYPES | SOURCES OF INFORMATION | | | | | |
|---|---|---|---|---|---|---|
| | Police Accident Report | Pedestrian Interview | Driver Interview | Witness Interview | FI Observation | FI Opinion |
| Identification Items | X | | | | X | |
| Behavioral Sequence Items | | X | X | X | | X |
| Trip Charactistics, Ped and Driver Descriptions | X | X | X | X | | X |
| Site Charactistics Items | | | | | X | |
| Field Investigation Conclusion Items | X | X | X | X | X | X |
| Baserate Data Items | | | | | X | |

Table II-10

List of Data Categories

A. Identification Items
   1. Field investigator
   2. Accident number
   3. State
   4. County
   5. Accident location
   6. Time of accident
   7. Number of peds involved
   8. Age*
   9. Sex*
   10. Alcohol involved*
   11. Physical condition*
   12. Vision obscured*
   13. Pedestrian action
   14. Vehicle defect cited by investigating officer
   15. Vehicle action
   16. Weather condition**
   17. Road surface**
   18. Temperature**
   19. Lighting**
   20. Temporary hazard in roadway

B. Behavioral Sequence Items***
   1. Preinvolvement and collision course factors
      a. Activity
      b. Movement characteristics
      c. Direction of movement
      d. Location
      e. Direction of attention
      f. Object of attention: traffic
      g. Object of attention: nontraffic
   2. Evasive action factors
      a. Ped's and driver's evasive action
      b. When, where and how ped and driver recognized need for evasive action
      c. Basis of ped's and driver's decision
      d. Vehicle sequences during evasive action
   3. Conclusions
      a. Ped causal factors
      b. Driver causal factors
      c. Environmental causal factors

---

* Both pedestrian and driver.

** Both at time of accident and at time of site visit

*** Responses from ped, driver, witness and FI are recorded for each of these items.

Table II-10

List of Data Categories
(Continued)

C. Trip Characteristics and Description of Ped, Driver and Vehicle
   1. Origin/destination*
      a. Specific origin and destination of ped and driver
      b. Accident scene to origin distance
      c. Accident scene to destination distance
      d. Accident scene to home distance
      e. Time walking or driving prior to accident
      f. Number of times at accident scene in past 12 months
      g. Occupation
   2. Physical condition*
   3. Driving condition*
   4. Visual appearance (hue and intensity of ped clothing and vehicle)
   5. Vehicle factors
      a. Estimated preinvolvement speed
      b. Estimated impact speed
      c. Vehicle model year
      d. Size of vehicle
      e. Exterior condition (preinvolvement)
      f. Safety system condition (preinvolvement)
      g. Time since last official vehicle inspection
      h. Impact point
   6. Pedestrian injuries
      a. Injury severity
      b. Type of injuries
      c. Point of impact (POI) with reference to the roadway

D. Site Characteristics
   1. Area description
   2. Area density
   3. Roadway functional description
      a. Suburban, small town, city
      b. Country
   4. Number of traffic lanes
   5. Parking restrictions
   6. Ped accommodations at site
   7. Road surface material
   8. Road surface condition
   9. Median
   10. Shoulder surface
   11. Roadside features
   12. Intersection proximity
   13. Intersection type
   14. Type and location at POI
   15. Type of signal
   16. Ped crossing time
   17. Location of crosswalk

Table II-10

List of Data Categories
(Continued)

18. Roadway center markings
19. Roadway edge markings
20. Roadway lane markings
21. Special roadway markings
22. Roadway signs
23. Supervision at crossing
24. Roadway geometry
    a. Road section
    b. Elevation or slope
    c. Vertical placement
    d. Horizontal curvature
    e. Arc
25. Posted or legal speed limit
26. Observed mean vehicle speed
27. Estimated stopping distance
28. Sight distance
29. Site photographs

E. Baserate Data
1. Pedestrian
    a. Volume
    b. Age
    c. Sex
    d. Origin/destination
    e. Behavior
2. Traffic
    a. Volume
    b. Vehicle type
    c. Speed
    d. Actions

F. Field Investigator (FI) Conclusions
1. Sketch and narrative
2. Precipitating factors
    a. Ped and driver course (risk-taking) failures
    b. Ped and driver search failures
    c. Ped and driver detection (perceptual interference) failures
    d. Ped and driver detection evaluation failures
    e. Ped and driver avoidance action failures
3. Accident typology
4. Potential countermeasures
    a. Ped oriented
    b. Driver oriented
    c. Vehicle oriented
    d. Enforcement related
    e. Traffic engineering/existing procedures
    f. Traffic engineering/new or innovative procedures

Definition of "Rural" by State

| | |
|---|---|
| California | All places under the jurisdiction of the California Highway Patrol. |
| Michigan | All places with less than 2500 persons, incorporated or unincorporated. |
| Missouri | All places with less than 5000 persons, incorporated or unincorporated. |
| North Carolina | All unincorporated places and all incorporated places with less than 5000 persons. |
| Pennsylvania | All places under the jurisdiction of the Pennsylvania State Police. |
| Texas | All places with less than 2500 persons, incorporated or unincorporated. |

Two distinct reasons were apparent in selecting these definitions of "rural":

(1) By defining "rural" as essentially all "nonurban" locations, the project can address all those ramifications of the pedestrian accident problem not previously addressed by projects that concentrated on the urban pedestrian problem (Snyder and Knoblauch, 1971).

(2) The sample is truly representative of the "rural" pedestrian accident problem as defined by the reporting states and the National Safety Council.

## Obtaining Police Reports

Once the sample of six states was selected, the task remained to convince appropriate state police officials to cooperate with the research effort. High ranking state police personnel were initially contacted by letter and a follow-up visit was made to each state police headquarters. During that visit, the exact nature of our request was explained and the requirements that were to be placed on each cooperating agency were described. At that time,

the states indicated that they would be agreeable to providing us with copies of accident reports for use in our "in-depth investigation."

Additional correspondence and one more visit to each police agency resulted in the development of the necessary procedures so that copies of the appropriate accident report forms would be provided.

## Recruitment and Selection of FI's

As soon as the potential study areas were identified, recruiting efforts in those areas were initiated. The recruiting activities typically consisted of a letter to the psychology departments and placement offices of the universities in the area. The letter consisted of a description of the job opportunity and a number of brightly colored flyers that were to be posted. The flyers contained a job application of which some 300 were submitted by interested applicants. The applications were reviewed and the most qualified individuals were contacted for a telephone interview. Some of the applicants were invited to an on-site recruiting interview session conducted in each study area by a BTI professional. The most qualified individuals who attended these sessions were selected to fill the available positions.

## Personnel Characteristics of FI's

A total of 40 field investigators were hired to work in the six states. They range in age from 20 to 43 years with a median age of 25 and a mean age of 26.7 years. There are 16 graduate students and 18 undergraduates; 6 are graduates who are currently working. Their majors are distributed as follows: 7 psychology, 3 educational psychology or guidance, 5 criminal justice, 3 traffic engineering, and others in law, medicine, business, and liberal arts. Between them, they have 21 B.A. or B.S. degrees; 3 M.A.,

M.S., or M.E. degrees; and the graduate students have completed an average of 22 credits. A total of 6 of the 40 are veterans with an average of 10 years of service.

Training of FI's

After being selected, each FI was indoctrinated and trained by a member of the BTI professional staff. The indoctrination process consisted of five steps:

1. Signing a consulting agreement detailing the relationship between BTI and the FI.

2. Completing a personnel data form, including personal references.

3. Instruction in use of the FI's Daily Logs and Two-Week Summaries which are to be used in day-to-day operations to record hours worked, sites visited, interviews conducted, etc.

4. Issuing of a FI Data Collector Case to each field investigator. The equipment issued included:

Polaroid camera and film
Rolatape MM45T measuring wheel
Stopwatch
Safety vest
Music stand (pseudo ped)
Traffic accident symbols template
Northwestern traffic investigation template
Auto compass
Clipboard.

The proper use of the equipment was explained to each FI during training and explanations are also contained at appropriate points in the data collection form.

5. Taking each F.I.'s picture with a Polaroid camera. These pictures were used to make an identification badge which was later

sent to the FI to be used to properly identify himself while conducting interviews. (Copies of the various forms used are contained in Appendix F.)

After completing the indoctrination procedure, each FI was given detailed instruction in the use of the data form. The training session typically consisted of a page-by-page, item-by-item discussion of each data item and how to obtain the information.

## Specification of Data Collection Procedures

The general data collection procedure was to have the specially selected and trained field investigators perform an in-depth investigation of each accident in the sample. The investigation proceeded in a five-step process.

1. Obtaining Police Accident Report. Although the details of the procedures varied somewhat from state to state, the typical procedure was for the FI located in the state capital to pick up at the state police headquarters two or three times a week copies of the rural pedestrian accident reports that recently occurred in the sample counties. The accidents were usually sorted by state police personnel, although in one state the FI did the sorting and in another the sorting had been automated. The accidents were considered "rural" if they qualified according to the definitions used by the state. The accidents typically were from 4 to 21 days old when obtained by the field investigator in the state capital.

2. Dissemination of Accident Reports. Immediately upon receipt of the accident reports, the capital field investigator sent copies to the other FI's in the state. Each capital FI had been issued lists of the FI's assigned to each county. Although an FI was assigned to each county, the capital field investigator had been instructed to be somewhat flexible if the fluctuation in in accident frequencies so warranted.

3. Conducting Interviews. Upon receipt of an accident report, the local field investigator began arranging to interview the drivers and pedestrians involved in the accident. The FI attempted to schedule the interviews for the same day that he conducted his site observations. This, of course, was highly desirable in cases where the pedestrian and/or the driver lived or worked reasonably close to the accident site. In some cases, depending on the distances involved, scheduling problems, and the disposition of the interviewee, the field investigator conducted the interview over the telephone. Two alternate information sources were also used. These included interviews with the investigating officers and with individuals who either witnessed the accident or who lived near the accident site and might have learned some useful information from either the driver, the pedestrian, or from the witnesses.

4. Making On-Scene Observations. The field investigators visited the accident site, made observations and took measurements so that information necessary to complete the appropriate on-site data items was collected. When possible, the FI visited the site at the same time of day and day of week as the accident occurred. This was especially crucial for the vehicle and pedestrian baserate information. For nighttime accidents, the FI's were instructed to visit the site during daylight in the late afternoon to make observations and take the Polaroid pictures. If possible, they were to wait until the time the accident occurred or conduct any interviews that had been scheduled and return to the site at the time of the accident, take the baserate data and note any factors induced by darkness.

5. Field Investigators' Conclusions. Once the FI completed the field data collection, the final step of the data collection process began. The FI was asked to provide, based on his interviews and observations, his opinion of the factors involved in the accident. These ranged from the FI's interpretation of the behavioral sequence involved in the accident to his summary

conclusion on the precipitating factors. Finally, the FI provided his recommendations for potential countermeasures. The field investigators spent an average of five to six hours investigating each accident, and their opinions on the causative factors involved are a valuable product of the project.

## Data Processing and Analysis Procedures

The handling of the completed data forms maintained maximum control over the data collection effort and simultaneously permitted the kind of flexibility needed during the actual data analysis process. This subtask was somewhat arbitrarily broken into two areas: the first deals with raw data processing and the second involves analysis of the data base.

### Coding and Processing the Raw Data

The data collection form had been structured so that the vast majority of the information, with the exception of a brief narrative and the Polaroid pictures, was readily machine-codable. Each field investigator investigated several "practice" accidents taken from those occurring in December 1973. Once the feedback had been received from this exercise, the content and layout of the data form was "finalized." Finalizing the data format did not preclude the addition of response categories, additional data items, or the development of additional accident types. When experience indicated that further modification was suggested, changes were made to completed accident reports. The most current data form served as the basis for the master coding form. The coding form was used by the FI's to prepare the data so that they were received from the field in a format essentially ready for keypunching.

The fact that the data were received "ready for keypunching" did not preclude that an effective quality control check could be

performed on a submitted data form. During the first several months of the field operation, each report was carefully reviewed and a written critique sent to the FI. In some cases, the report itself was returned to the FI for correction or clarification. During the remainder of the project, there was rarely a need to return a report since most coding could be determined from the information contained in the submitted report. The FI's were kept informed of additions to or modifications in the data collection procedures through a series of FI memos.

Each submitted data form and accompanying police accident report form was carefully read by a BTI research associate. The appropriateness of each coded response was then reviewed and corrected when necessary. The report was then checked to determine if the various responses coded were internally consistent within a given form and that new response categories and new data items were properly added to old versions of the data form as needed. The research associate's final responsibility was to write a one-line (80 keypunch columns) description of the accident. These abbreviated accident descriptions summarized the pedestrian's actions, the vehicle actions, and listed any important causal or related factors.

As a final check prior to keypunching, each report was personally reviewed by the Principal Investigator. This review concentrated on the precipitating factors, causal factors, and the suitability of the one-liner.

## Keypunching and Verification Procedures

During the pilot testing of the analysis procedures, it was determined early in the project that simply keypunching and key-verifying the raw data from the data form did not produce an error-free data base. In order to insure that keypunching errors be kept to an absolute minimum, a double-verification procedure was

developed. Each data form was keypunched and key-verified by two independent firms. The resulting two decks of cards were put on magnetic tapes and the tapes were subjected to a card-by-card, column-by-column comparison. A printout was produced containing the discrepancies and a manual examination of the raw data form was used to identify the correctly keypunched column. In this way, a nearly error-free tape was produced.

Reduction of the Data Base

The analysis process involved three successive procedures, each aimed at further defining the nature of the rural pedestrian accident problem. The major thrust of the analysis effort was to determine the various accident typologies or situations and, in turn, identify their salient characteristics. It was crucial that the behavioral and descriptive characteristics of each accident type be carefully determined if appropriate countermeasures were to be identified.

The three data reduction techniques that were used included:

- Development of accident typologies
- Tabulation and cross-tabulation programs
- Various statistical techniques.

Prior to the development of the data collection forms and the implementation of the field effort, a sample of 250 police reports of rural pedestrian accidents were reviewed. A 20 percent subsample of these reports was used to pilot test the operational procedures. It was obvious that certain groups or kinds of pedestrian accidents shared common elements and characteristics. Definitions were developed of preliminary causal types. Determining the type, according to the definitions provided, was one of the FI's final responsibilities when completing the data form. During the course of the field effort, several additional types were identified and added to an appropriate place in the data form. The continuing recurrence

of many of the preliminary causal types confirmed their appropriateness. The FI's subjective accident type assignment was carefully reviewed (and changed when necessary) by both the research associate and the Principal Investigator during their review of each data form. During the early part of the data analysis operation, analytical procedures were used to determine a number of objective accident groups. Additional accident types were defined in order to include several of these new groups. In cases where there was some potential overlap between two accident types, additional accident types were generated. If a particular accident had been subjectively assigned previously to an accident type but selected data variables indicated the accident might more appropriately belong in another category, the I.D. number was determined and the data form was manually retrieved from the files and reexamined. If it was determined that the particular case should be reassigned, then the accident type was recoded and the master tape appropriately changed. Particular attention was directed to the "other" category which included cases which did not fit into one of the subjective accident types or one of the objective groups that were developed into accident types. The "other" category was reduced to 9.5 percent of the sample by developing additional types and reassigning selected cases. Appendix E contains a one-line description of these accidents, and it can be readily determined that relatively few common elements remain in this category. Often, the objective procedures would suggest that several accident types should be combined (i.e., the mailbox-related accidents are very similar to the midblock dash types). However, it was determined that countermeasure development would be more effective if certain specific causal types were retained. Conversely, the objective procedures occasionally suggested that additional very specific groups be retained. For example, the disabled vehicle-related type initially included all individuals who had become pedestrians because their vehicle became disabled. However, this group included those pedestrians who were near their disabled vehicles as well as those who were

walking to or from their disabled vehicle. Clearly, these two groups are very different from a countermeasure viewpoint, so two different accident types were developed. The specific causal types that were developed are discussed in Section III.

A series of tabulation and cross-tabulation programs were used to determine the frequency of occurrence of the variables across the entire sample of accidents and across selected subsets (i.e., accident types) of the sample. These tabulations permitted the determination of the general characteristics of the rural pedestrian accident population and of various subpopulations (accident types, locations, etc.). The results of these various tabulations and cross-tabulations are discussed in Section III.

A variety of analytical techniques were tried in an effort to detect "statistically significant" differences in the distribution of various data item responses within the general population of rural pedestrian accidents and between selected subpopulations. Among the various techniques used included factor analysis, interaction analysis, chi-square tests, and T-tests. The most fruitful of these various analyses are presented in Section III.

## Reliability of the Sample

Several overall measures of the reliability of the collected sample, in terms of making statistical inference to the population of rural pedestrian accidents, were calculated.

In 1974, there were approximately 50,000 rural pedestrian accidents in the United States, of which 6,399 occurred in the six states from which the present sample was taken. The sample of 1,531 accidents therefore represents 23.9 percent of all accidents in the six states and approximately 3.1 percent of the accidents in the entire country. Since the number in the entire population is known, the number of observations in the sample must be adjusted with the finite population correction formula:

$$n' = \frac{nN}{N - n}$$

where:

n' = adjusted sample size
n = actual sample size
N = entire population size

The adjusted sample size can then be used in calculation of confidence interval estimates which assume an infinite true population. For inference to the six state population, the adjusted sample size becomes 2,013, and for inference to the entire United States, adjustment to the sample size is negligible.

In order to determine a confidence interval for proportions found in the sample population, we can apply the formula for a significance level of .05.

$$L = 1.96\sqrt{\frac{pq}{n}}$$

where:

$\pm L$ = confidence interval for proportion p
p = proportion from the sample population
q = 1 - p
n = adjusted sample size
1.96 = critical value for a significance level of .05

The proportion mentioned is simply any proportion of the sample population exhibiting a certain characteristic. For example, to find the confidence interval around the observation that 60 percent of the accidents occurred in the daytime, we would apply the formula using the following parameters:

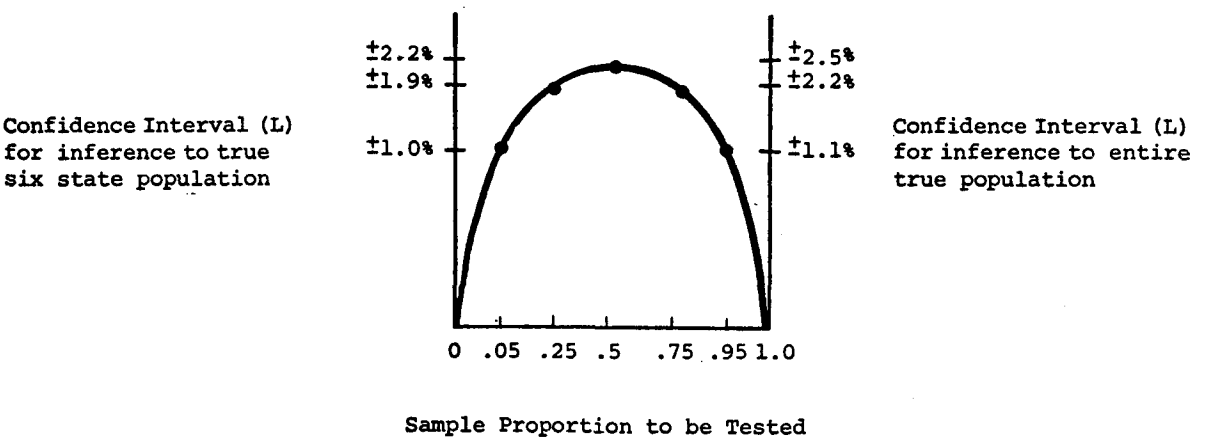
$p = .6$

$q = .4$

$n = 2013$

$$L = 1.96\sqrt{\frac{(.6)(.4)}{2013}} = .021 \text{ or } 2.1\%$$

We could then say that the proportion of accidents occurring in the daytime for the true population is 60% ± 2.1% at the .05 level of significance. It can easily be shown that the confidence interval, L, is dependent on the proportion to be tested and follows a symmetrical curve with a maximum L at a proportion of 0.5. The curve below describes the relationship between the sample proportion and confidence interval for inference to the true population:



# III. RESULTS

## Characteristics of the Sample

This section provides distributions of selected data items for the entire sample of accidents. These distributions describe the general characteristics of the rural pedestrian accident population. For the purpose of making comparisons, many of the distributions also show data from other sources for similar variables of other accident populations. Basically this section describes the rural pedestrian accident: when it occurs, where it occurs and who is involved. The following data are presented in this section:

| | |
|---|---|
| Table III-1 | STATE |
| Table III-2 | MONTH Rural/Urban |
| Table III-3 | DAY OF WEEK Rural/Urban |
| Table III-4 | TIME OF DAY Rural/Urban |
| Table III-5 | INJURY SEVERITY Rural/Urban |
| Table III-6 | PED AGE & SEX Rural/Urban |
| Table III-7 | DRIVER AGE & SEX Rural/Urban |
| Table III-8 | PED AND DRIVER PHYSICAL CONDITION |
| Table III-9 | PEDESTRIAN ACTION Rural/Statewide |
| Table III-10 | VEHICLE ACTION Rural/Urban |
| Table III-11 | VEHICLE SPEED |
| Table III-12 | WEATHER, ROAD SURFACE AND LIGHTING Rural/Urban |
| Table III-13 | TEMPORARY HAZARD IN ROADWAY |
| Table III-14 | ACCIDENT SITE AREA DESCRIPTION |
| Table III-15 | SIGHT DISTANCES |

Table III-1 shows the distribution of 1,531 accidents among the six states in the study sample. For comparison the total number of rural pedestrian accidents in each state is shown for 1972. Clearly the sampling objectives were met in that each state's percentage contribution to the sample of 1,531 accidents is very

nearly the same as each state's percentage contribution to the 1972 six state total of 6,399 accidents. The sample represents 23.9% of the six-state year total of rural pedestrian accidents. Approximately one of every four accidents in each state is included in the data base.

Table III-2 shows the distribution of the sample over the 12 months of 1974. Apparently, the sampling procedures were effective during the course of the data collection effort as the distribution of accidents is relatively uniform over the year. Also, the rural pedestrian accident does not appear to have any more monthly or seasonal variation than is found in urban pedestrian accidents.*

A distribution of the rural pedestrian accidents by the days of the week is shown in Table III-3. Rural and urban accidents appear to be distributed very similarly except that somewhat more rural accidents occur on Sundays.

The distribution by time of day in Table III-4 reveals that rural accidents have a late afternoon peak very much like the well-known urban phenomenon. However, the rural accidents appear to show a slight but consistent increase in occurrence after 6 P.M. A similar effect is also apparent in Table III-12 which shows the ambient lighting conditions at the time of the accident.

Table III-5 shows the severity of injuries sustained by the pedestrians struck in rural and urban pedestrian accidents. Although the fatality rates are nearly identical, the rural pedestrians tend to be seriously injured slightly more often than their urban counterparts. This could be a function of the higher vehicular speeds found in rural areas (see Table III-11).

Table III-6 contains the distributions of the pedestrians involved in both urban and rural accidents. The rural accidents involve 10% more pedestrians in the 10-19 age categories, yet there are 13% fewer pedestrians over 65 years of age. There are also slightly more males involved in the rural accidents.

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*Tables III-2 through III-7 show comparisons with an urban pedestrian accident data base with 3,827 cases (Knoblauch, 1975).

The distribution of the driver's age and sex is compared for urban and rural accidents in Table III-7. Somewhat like the distribution of pedestrian ages, there seem to be more young drivers (20 years and below) and fewer elderly drivers (65 and up). Despite these age differences, the sex of the drivers appears to be nearly identical for both urban and rural accidents.

Information on the physical condition of both the pedestrians and the drivers involved in rural pedestrian accidents is contained in Table III-8. Data indicate that 7.8% of the pedestrians and 4.6% of the drivers involved had impaired abilities. It should be noted that for a relatively large percentage of both the pedestrians (15.8%) and the drivers (22.3%) it was not specifically determined whether their abilities were impaired. Of the potential sources of impairment listed, "had been drinking" was indicated for 10.3% of the pedestrians and 6.3% of the drivers. It should be noted that many more individuals were indicated as having a potential source of impairment than were specifically indicated as having impaired abilities, and not all of those who had been drinking were indicated as having their abilities impaired. It would be unwise to assume that the presence of an impairment indicates that the particular accidents were caused by the impaired condition of either the driver or the pedestrian. A detailed description of the causative and precipitating factors involved, including alcohol and other human factor-related impairment, is presented later in this section.

The actions of the pedestrians struck are shown in Table III-9. More than one-third were crossing the street at a non-intersection location. Almost 14% were walking along the roadway; of these, two-thirds were walking with traffic while one-third were walking against the flow of traffic. Specific activities such as working, playing, standing and lying in the roadway account for a total of 16.5% of the accidents.

Table III-10 shows the distribution of the impacting vehicle's actions. In light of the above, it is not surprising that fewer vehicles were making turns in the rural accidents than in the urban. In spite of the greater number of categories listed for rural accidents, 5% more rural vehicles were proceeding straight ahead. A total of 9% of the rural vehicles were either "out of control," "weaving," or "driving off the roadway."

Vehicle speed factors are shown in Table III-11. Included are distributions of (1) the legal or posted speed limit at the accident site, (2) the mean vehicle speed as measured by the field investigator at the site, (3) the field investigator's estimate of the impacting vehicle's preinvolvement speed (speed prior to the time the driver saw the pedestrian), and (4) the field investigator's estimate of the impact speed. Estimates (3) and (4) were subjectively determined by the field investigator after interviewing the participants and reviewing the police accident report. The observed mean speed (mean 36.4) was found to be very close to the posted speed limit (mean 39.7). The estimated preinvolvement speed was ten miles per hour slower than the posted speed, indicating the impacting vehicles were possibly traveling, on the average, somewhat slower than other vehicles on the same roadway, or that drivers tend to underestimate their speed. The distribution of estimated impact speed as well as the mean (16.4) suggests that most of the impacting vehicles were able to slow down significantly prior to impact.

Table III-12 compares the weather, road surface and lighting conditions for urban and rural pedestrian accidents. The vast majority of both urban (88%) and rural (92%) accidents occurred during clear or cloudy weather. More than twice as many urban accidents (9%) than rural (4%) occurred when it was raining. However the road-surface was wet in both urban and rural accidents to approximately the same extent (12% versus 10%). Slightly more rural accidents happened during darkness (33% versus 27%). Of these nighttime accidents, most (19% of all accidents) occurred where there was no roadway lighting at all. Continuous roadway

lighting and spot roadway lighting accounted for 6% and 4% of nighttime accidents, respectively.

In 14.8% of the cases, there was indication of a temporary hazard in the roadway (see Table III-13). Most frequently there was a stopped vehicle (5.6%) or a disabled vehicle (3.7%). In 1.9% of the cases the accident occurred at a construction site.

Table III-14 contains the accident site area descriptive data. The sample is approximately evenly divided into three area categories: city and small town (31%), suburban (32%), and country (37%). Within these areas the most common land use categories were residential (51%), commercial (24%), and open areas (16%). Throughout this report, the term rural is used as a category descriptor only and no connotative meanings are intended or implied. In fact, only 13% of the sample occurred in areas which were considered both "country" and "open area."

In 172 cases (11.2%) the sight distance for the driver of the impacting vehicle was determined to be less than the estimated stopping distance for a vehicle approaching the point of impact at the speed limit (see Table III-15). Sight distance was defined as the number of feet along the impacting vehicle's approach to the point where the pedestrian, entering the roadway, was determined to have first become visible. In these cases a total of 240 conditions were coded as factors that reduced sight distance.

## Preinvolvement and Collision Course Factors

The information in this section was obtained during the field investigator's interviews with the driver, the pedestrian, and any witnesses or other individuals, i.e., the investigating officer. The major emphasis is on what the pedestrian and the driver were doing prior to the accident. The responses of each interviewee to each data item were coded. After interviewing all the available participants and witnesses, the field investigator (F.I.)

coded what he, in his best judgment, thought really happened. All the results described in this section deal with F.I.'s conclusions on these items.

Information was obtained during the interviews to describe the pedestrian and driver behavior during each of two periods in time. The "preinvolvement" period refers to the time before the accident was imminent. The period in which either the pedestrian or the driver made a change in the direction or the rate of travel that put the pedestrian and the vehicle on a collision course is referred to as the "Collision Course" phase. In some cases, no change in direction or rate of travel was detected. In these cases, the collision course was defined as beginning once the vehicle had passed the "point of no return," e.g., stopping distance for the posted speed (or 254 feet at 50 mph, see page 13 of the data form). In some cases, there were no differences in some of the data items between the preinvolvement and collision course phases. Responses were coded for what the pedestrian said he was doing as well as what the pedestrian said the driver was doing. Also coded was what the driver said he was doing as well as what the driver said the pedestrian was doing. Witnesses commented on both the pedestrian and driver behaviors.

Since both the preinvolvement and collision course phases span a period of time, some of the data items (i.e., activity, location, etc.) had several appropriate responses. If there was any question, the F.I. described the preinvolvement phase just before the collision course began and described the collision course phase just after it began but before any evasive action was initiated. Information on the following general categories of behavior for both the pedestrian and the driver are described in this section:

| | |
|---|---|
| Table III-16 | Activity |
| Table III-17 | Movement Characteristics |
| Table III-18 | Direction of Movement |
| Table III-19 | Location |
| Table III-20 | Direction of Attention |

| | |
|---|---|
| Table III-21 | Object of Attention: Traffic |
| Table III-22 | Object of Attention: Nontraffic |
| Table III-23 | Pedestrian and Driver Evasive Action Factors |

The preinvolvement and collision course activities of both the pedestrian and the driver are tabulated in Table III-16. About 60% of the pedestrians were attempting to cross the roadway, 40% were not attempting to cross, even during the collision course phase. Most (50.6%) of the pedestrians were going somewhere, but some of the specific responses indicated a reasonable number were also playing (13.3%), standing, waiting, not moving (5.7%), going to or from school (4.8%), working (4.0%), working on or pushing a vehicle (3.5%). When the pedestrians who were (1) going to school (2.7%), (2) coming from school (2.1%), and (3) going to or from a school bus (2.1%) are added together, a total of 6.9% of the accidents are involved. This pinpoints a potential target population for countermeasure programs. The majority of the drivers (56.5%) were proceeding with normal caution; however, more than one-quarter (26.9%) displayed a lack of proper caution after the collision course started.

Table III-17 shows the movement characteristics for both the pedestrian and the impacting vehicle. During the preinvolvement phase most of the pedestrians were either walking normally (30.7%), standing, not moving (24.6%), or running (24.6%). Once the collision course began many changes in movement characteristics became evident. Many more of the pedestrians were running (41.0% versus 24.6%) and stumbling or falling (3.1% versus 0.9%). Fewer pedestrians were walking normally (23.9% versus 30.7%) and standing, not moving (13.1% versus 24.6%). During the preinvolvement phase most of the drivers were sustaining speed (65.6%). Once the collision course began fewer vehicles were sustaining speed (35.7% versus 65.6%) or were stopped (0.6% versus 7.7%). Many more were decelerating (38.7% versus 10.5%) and out of control (6.4% versus 1.0%) once on the collision course.

The direction of movement for both the pedestrian and the impacting vehicle is shown in Table III-18. A total of 63.2% of the pedestrians were going either straight or diagonally across the road. Of the 14.8% who were going along the roadway, two-thirds (10.8%) were going in the same direction as the traffic. The majority (74.8%) of the vehicles were going straight ahead, although a surprising number were either changing lanes (3.0%) or passing other vehicles (2.3%). The information contained in this table is quite similar to that in Table III-10. However, this table represents the field investigator's conclusions after interviewing the participants and witnesses, and Table III-10 reflects vehicle action as coded on the police accident report form.

Table III-19 shows the location of the pedestrian and the vehicle during the preinvolvement phase and while on the collision course. During the collision course most of the pedestrians (70.9%) were in the roadway at a non-intersection location. Although some (5.4%) were in a marked crosswalk, even more (8.7%) were on the roadway shoulder when struck. Similarly most of the vehicles (69.7%) were on the right side of the roadway, although a reasonable number (6.3%) were on the shoulder. With the extended rear view mirrors found on some vehicles, occasionally a vehicle proceeding on the roadway would strike a pedestrian who was on the shoulder.

The direction of attention for the pedestrians and the drivers is presented in Table III-20. Although both drivers and pedestrians tended to be looking straight ahead, far more in each group claimed to be looking either right or left than claimed they were looking in both directions. Interestingly, far more drivers (15.9%) than pedestrians (3.4%) said they were engaged in general "search" activity, i.e., looking in all directions while on the collision course. During the preinvolvement phase more than one-third (35.4%) of the drivers were engaged in general "search" activity while one-tenth (11.2%) of the pedestrians were. Perhaps the pedestrians tended to be more easily distracted, or were more goal directed,

once the collision course was started. A reasonable number of the pedestrians (5.6%) were looking down once the collision course started.

Table III-21 shows the traffic-related objects to which both the pedestrian and the driver were attending. Once the collision course started most (60.1%) of the pedestrians were not attending to traffic although 20.6% were attending to the collision vehicle. Although relatively few of the drivers (8.9%) were not attending to traffic, less than half (46.4%) were attending to the pedestrian even after the collision course started. Only 9.8% of the drivers were attending to the pedestrian during the preinvolvement phase. Other moving vehicles, standing vehicles and traffic signals seemed to draw the attention of both drivers and pedestrians approximately equally.

The nontraffic-related objects of attention for both pedestrian and drivers are shown in Table III-22. Although 40.2% of the pedestrians were either not attending to nontraffic items or did not indicate that they were attending to nontraffic objects, far more drivers (63.0%) made the same indication. Both the pedestrians (18.2%) and the drivers (6.9%) were frequently distracted by other pedestrians. A total of 12.2% of the pedestrians were either working or playing and specifically indicated that they were not attending to traffic. Only 1.2% of the drivers indicated that they were attending to passengers in their own vehicle.

Table III-23 indicates the evasive actions attempted by both pedestrians and drivers. Since an accident resulted in every case, each of these attempted evasive actions was at least partially ineffective. More than half of the pedestrians (52.7%) did not even know that a collision was imminent. A surprising number (13.6%) either walked or ran into the vehicle and hence made no evasive action. Only 12.8% did not make any evasive action because of insufficient time. A total of 4.1% attempted to avoid the collision by continuing across the roadway, either running or walking. Re-

latively few either stopped and stayed in place (1.4%) or attempted to return to the edge of the roadway (1.9%). A total of 7.6% attempted to avoid the collision by jumping, dodging or otherwise attempting to get out of the way. Nearly one-quarter (23.4%) of the drivers made no evasive action because they were unaware of the need. A tenth (10.7%) had insufficient time to make an evasive action. The majority (53.9%) attempted to stop and/or swerve to avoid the pedestrian. Although only 4.7% of the drivers made no evasive action because the pedestrian walked or ran into the vehicle, this does not contradict the finding that 13.6% of the pedestrians walked or ran into the vehicle. In many cases the driver could have attempted to avoid a collision even though the pedestrian actually walked or ran into his vehicle.

## Predisposing and Precipitating Factors, Causal Conclusions

This section summarizes the predisposing factors, the precipitating factors, and the causal factors that led to the accidents investigated. Four main classes of factors were considered: the driver, the pedestrian, the vehicle, and the environment. These factors are best understood when examined in the context of the conceptual model shown in Figure III-1.

For instance, when a pedestrian crosses the roadway, he goes through a looking, seeing, deciding and doing process, and the drivers of any nearby vehicles go through similar procedures. Usually the process is successfully completed and the pedestrian manages to cross the roadway. However, in the cases being studied, something went wrong and an accident resulted.

The factors presented in this section attempt to pin down the course (location), search (looking), detection (seeing), evaluation (deciding), or action (doing) failure that precipitated or caused the accident. Obviously if it is determined that the failure occurred early in this chain, i.e., a detection failure, it is unlikely that there would also be an evaluation or action failure that would

be causally related to the accident. As an example, a pedestrian looked for approaching traffic, failed to see an approaching car, decided to cross and was struck. In this case the critical causal element was the detection failure, not an evaluation failure involving the pedestrian's decision to cross. Every effort was made to identify system failures accurately early in the sequence so that once a factor had been coded, it was not necessary to repeatedly recode it. For example, if the pedestrian detection failure "01, Parked car" was coded under Item #3 because a parked car blocked the pedestrian's vision of the collision vehicle, it was not necessary to repeat that the pedestrian failed to detect the vehicle under Item #4, Pedestrian Evaluation Failure.

Each precipitating factor or group of factors could be associated with a given case in either of two ways. A factor could be "causally" connected in that a factor, or the absence of a factor, directly contributed to causing the accident. Similarly, a factor could be merely related to the occurrence of the accident and not specifically cause the accident. Such related factors merely "predispose" the combination of pedestrian, driver, vehicle, and environmental factors to the occurrence of an accident. For example, a pedestrian's senility may not have caused an accident to occur but may have predisposed the pedestrian to search, detect, or evaluate in an unsafe manner so that a collision resulted.

The information in this section is presented in three different formats. Tables III-24 and III-25 summarize the pedestrian precipitating and predisposing factors and the driver precipitating and predisposing factors, respectively. Each table lists for each factor the number of times the factor was coded as either a precipitating (causal) or predisposing (related) element in the collision. Also included is a column that sums the total times the element was coded as either causal or related. Tables III-26, III-27, and III-28 contain the field investigator's subjective importance ranking of selected pedestrian causal factors, driver causal factors and environmental causal factors, respectively. The F.I.'s coded up to two

causal factors in each category and indicated whether the factor was of primary importance, secondary importance or merely tertiary or related. They also could code whether there were no contributory factors.

Table III-24 presents the frequency distributions of the number of times various pedestrian factors were found to have acted in a causal (precipitating) or related (predisposing) manner. Appendix D contains a similar set of tables for each of the various accident types. Detailed definitions of each factor and each response category under each of the factors are found in the F.I. Coding Manual (Appendix B).

Pedestrian course (risk-taking) failure was the most frequently identified factor. In 70.2% of the cases a pedestrian course failure was identified as a causal factor. In 53.8% such a failure was identified as a related factor. Running (37.4%), short-time exposure (30.5%) and high exposure to vehicles (25.1%) were the most frequently identified pedestrian course failures. Each of these was more frequently identified as a causal factor than as a related factor. Walking along the roadway, on the wrong side (i.e., with traffic) was found in a total of 8.2% of the cases. In nearly two-thirds of these cases (5.4%) that factor was identified as a causal factor, in the remaining one-third as a predisposing factor.

Pedestrian search failures were identified as causal factors in 57.2% of the cases and as predisposing factors in 27.2%. The most common search failures included inattention (15.9%), distraction, other pedestrians (13.7%) and distraction, play activities (12.1%). Of these factors inattention was more commonly a causal factor than a predisposing factor.

Pedestrian detection failures were identified as causal factors in 14.3% of the cases and as predisposing factors in 11.5%. The most common detection failures were parked cars (7.4%), moving

traffic (4.7%) and standing traffic (3.9%). Poor lighting and trees, brush and weeds each only accounted for detection failures in 2% of the cases.

Pedestrian evaluation failures were more common than detection failures with 24.4% of the cases having causal factors identified and 12.2% with predisposing. The most common evaluation failure involved the pedestrian making a poor prediction of the pedestrian/vehicle path (13.3%). Alcohol and/or drug impairments were identified in a total of 11.6% of the cases; however only 8.2% had this factor identified as causal. The pedestrian misperceived the driver's intentions in 8.9% of the cases.

Pedestrian avoidance action failures were the least common precipitating factor identified; 11.9% of the cases had an avoidance action failures identified as causal factors and 7.1% identified as predisposing factors. Most commonly, avoidance action failures involved an improper decision by the pedestrian (7.0%), a human factor limitation on the part of the pedestrian (5.8%) and a failure on the part of the driver and the pedestrian to match evasive action (3.9%).

Table III-25 contains the distributions of the precipitating and predisposing driver factors for the entire accident data base. Considerably fewer driver factors were identified, placing the culpability in this sample of accidents on the pedestrian in most of the cases. The most common driver factors were detection failures (N = 819), followed by search failures, evaluation failures, course failures and avoidance action failures. A total of 2,905 driver factors were identified as compared to 4,441 pedestrian factors. This means that an average of 2 driver factors and 3 pedestrian factors were identified for each case.

Driver course failures were indicated as being causally related in 22.3% of the cases and as predisposing in 11.3%. The most common driver course failure was speeding (13.3%); however this

factor was indicated as causal in only half (6.9%) of these cases. The second most common driver course failure involved the driver being out of control prior to involvement with the pedestrian. Although this factor occurred in 5.4% of the cases, its occurrence was almost always (4.6%) indicated as a causal factor.

Driver search failures were causally related to 29.9% of the cases and predisposing in 17.8%. Distractions of various kinds were the most common search failures. Traffic-related maneuvers (9.3%) and other pedestrians (5.6%) were the most common sources of distraction. The single most frequent driver factor involved an inadequate search or a failure to look carefully (15.2%). These drivers apparently looked but did not look carefully as opposed to those who were inattentive (8.5%) and were not paying attention to the driving task, although no specific distraction was mentioned.

Driver detection failures were the most common driver factors indicated; 32.5% of the cases had these factors coded as causal and 21.0% had these factors coded as precipitating. Of the causal factors indicated parked cars (6.8%), moving traffic (4.7%), standing traffic (3.5%), and trees, brush and weeds (2.3%) were the most common. Although each of these factors was frequently identified as a predisposing factor also, poor roadside lighting was the most frequently coded (5.5%) predisposing factor. A total of 9.6% of the cases had poor roadside lighting coded as either a causal or related factor. Thus, poor roadside lighting and parked cars were the two leading causes of driver perceptual interference failures.

Driver evaluation failures occurred in about as many cases (N=517) as did pedestrian evaluation failures (N=561). However, drivers more often misperceived the pedestrian's intent (15.6%) than pedestrians misperceived the driver's intent (8.9%). When this happened it was most frequently (11.9%) coded as a causal factor. Conversely the drivers tended to less frequently make a poor prediction of the pedestrian vehicle path (10.2%). Pedestrians did this in 13.3% of the cases. Driver alcohol/drug impairment

was coded in a total of 6.8% of the cases; in approximately two-thirds of these (4.7%) the impairment was listed as causal. The pedestrians were nearly twice as likely to be alcohol or drug impaired.

Driver avoidance action failures were listed as a causal factor in 13.2% and as a predisposing factor in 7.8% of the cases. Most frequently (5.7%) environmental limits such as slippery surfaces were cited; however an improper decision (4.9%) and a failure to match evasive action (4.4%) were also often coded.

Table III-26 ranks the subjective importance of selected pedestrian causal factors. In 120 cases, or 7.8% of the total, it was specifically indicated that there were no pedestrian-related causal factors. Running on or into the roadway was coded for 29.5% of the cases. In 99% of these cases the factor had either primary or secondary importance. Risk-taking by the pedestrian was noted in 23.5% of the accidents. This category included walking along the roadway, crossing a very busy roadway and other intrinsically dangerous activities. Short-time exposure was coded in 17.4% of the cases. Inadequate search and detection occurred about as frequently (17.3%). Alcohol was a factor in 10.3% of the cases; however it was considered of primary importance in only half of those accidents (5.5%).

By examining the distribution subjective importance ratings of a given factor, it is possible to determine which pedestrian factors tend to be frequently given a primary importance rating. These factors tend to be the more hazardous behaviors or activities in terms of accident causation, i.e., if the factor is present it is likely to have played a primary role in causing the accident. For example, although pedestrians rarely (0.3%) attempted to beat the car against the signal, the factor was rated as primary whenever they did. Similarly trying to beat the car (either not against the signal or with no signal present) was ranked of primary importance 69% of the times it was cited and never was rated as merely a relat-

ed factor. Conversely, slow speed on the part of a pedestrian was rarely (15%) ranked as a primary factor, since such behavior rarely directly caused the accident. Instead, this factor was most often (62%) ranked to be of secondary importance.

The subjective importance of driver causal factors is shown in Table III-27. In nearly one-third (32.4%) of the accidents the F.I. specifically indicated that there were no contributory driver factors. The most commonly cited driver causal factors included inadequate search and detection (18.2%), search or detection pattern not directed at pedestrian (15.8%), vehicle speed (11.5%) and driver misinterpretation of pedestrian's intent (10.1%). Of these factors vehicle speed was listed as being of primary importance in only 42% of the cases it was coded; this amounts to 4.8% of the sample. Alcohol was a factor in 6.0% of the drivers, as opposed to 10.3% of the pedestrians. However, as was the case with the pedestrians, the condition of the operator was considered of primary importance in about one-half of those accidents (3.2%).

Certain driver factors tended to receive higher subjective importance ratings. In 6.4% of the accidents the driver ran off the traveled way. In 86% of those cases this factor was given primary importance. Although drivers rarely ran stop signs or red lights (1%) when they did 81% of those cases had that factor as of primary importance. Conversely the driver failing to give the pedestrian the right of way, driver personal limitations, human factors, handicap, and driver stimulus overload were infrequently given a primary subjective importance ranking.

Table III-28 contains the subjective importance ranking of selected environmental causal factors. The field investigator specifically indicated that there were no contributory environmental factors in 40.7% of the cases. The most frequently mentioned environmental causal factor was no roadway lighting (11.6%). Since 4.5% of the cases were coded as having inadequate roadway light, a total of 16.1% had inadequate or no roadway lighting. However, in

only 35% of these cases were the factors assigned a primary importance ranking. The next most frequent factors cited included: driver's vision obscured by parked vehicles (8.8%), pedestrian vision obscured by parked vehicles (5.7%), no sidewalks (4.5%), driver's vision obscured by trees, roadside items (4.5%), driver's vision obscured by moving traffic (4.2%), driver's vision obscured by standing traffic (4.1%), condition of roadway, other than ice or snow (4.1%), and inadequate or no shoulder (4.0%). The environmental factors that received the highest subjective importance rankings included: condition of vehicle (71%), driver blinded by sun (67%), condition of roadway, ice or snow, (65%), driver's vision obscured by dirty, icy or snow-covered windshield (63%), driver blinded by oncoming headlights (60%). Although each of these factors tended to occur relatively infrequently, their occurrence usually (in at least 60% of the time cited) received a primary importance ranking.

Baserate and Exposure Data

As mentioned, during the visit to each accident site, the field investigator completed a series of observations. These included recording information on the pedestrians and vehicles observed at the site during a 20-minute period. These data were recorded within two hours of the time of day of the accident and on the same day of the week, whenever possible. Some of the data collected attempted to define the population at the accident scene. These baserate or exposure data included information on pedestrian age, pedestrian sex, pedestrian behavior, vehicle type, vehicle speed, and vehicle action.

By comparing the baserate data with similar variables from the accident data base, it is possible to determine how the population involved in accidents differs from the population exposed at the accident site.

Table III-29 contains the pedestrian age distributions for the baserate population and the pedestrians in the sample of accidents. Only 5.7% of the baserate population were under 5 years of age, yet they

represent 11.5% of the pedestrians involved in accidents. Similarly, 15.9% of the baserate sample were 5-9 years old, while 20.4% of the accident sample were 5-9 years. Thus, both of these age groups are significantly more involved in accidents than their presence at the scene would suggest. The reverse is true for pedestrians from 10 to 55 years, although the significance levels are not as high. Pedestrians over 56 years, like the very young pedestrians, are significantly overinvolved. Nearly 10% of the accident victims were over 55, yet only 3.7% of the pedestrians observed at the site were that age.

The sex of the pedestrians observed at the site is shown in Table III-30. The overinvolvement of males in accidents has been previously described. A comparison with the baserate data reveals that males and females are far more evenly represented at the site than their accident involvement would suggest. All of these differences are significant at the .001 level.

Table III-31 presents the distribution of selected pedestrian behaviors for the baserate data and the accident sample. Significantly fewer of the accident victims were crossing at intersections (18.3%) than were baserate population pedestrians (29.0%). Conversely, significantly more accident victims were crossing not at an intersection (39.4%) than baserate pedestrians (27.0%). Apparently, crossing at an intersection is less likely to result in an accident than crossing at a nonintersection location. Only 1.1% of the pedestrians observed crossed from behind a parked car, but 5.3% of the accident victims had exhibited that behavior. This difference is significant at the .001 level. Far more pedestrians were observed getting on or off school buses or other vehicles than were found in the accident data. Unlike crossing from behind a parked car, getting on or off vehicles was a reasonably "safe" activity. Interestingly, school buses and "other vehicles" have had quite different "hazard indexes." The hazard index was calculated by dividing the percentage of the accident data sample exhibiting a particular behavior by the comparable percentage for the baserate

data. If a particular behavior was exhibited by the baserate and accident samples in similar proportions, the hazard index would be 1.0. If more accident victims than baserate pedestrians displayed the behavior, the index would be less than 1.0. Thus, an index greater than 1.0 indicates a relatively hazardous behavior and a ratio less than 1.0 indicates a relatively safe behavior. Walking along the roadway with traffic was found to be more hazardous (0.9 versus 0.6 hazard index) than walking along the road against traffic. Working on vehicles, working on the roadway, and standing in the roadway were hazardous. Surprisingly, playing in the roadway was not particularly unsafe, with a hazard index of 0.7. The only pedestrian behavior which was not significantly different between the baserate and accident samples was walking in the roadway with traffic.

Table III-32 presents the distributions of the types of vehicles involved in the accidents as well as those observed passing through the accident site. Nearly four times the number of trucks were found in the baserate sample than were found to be involved in the accidents; this difference is significant at the .001 level.

Vehicle speed data are contained in Table III-33. For the accident sample, "at or near the posted speed" was defined as within 10 mph of the posted speed. Collision vehicles were going significantly slower than other vehicles passing the site. However, since the speed of the collision vehicle was determined somewhat subjectively (page III-4), care must be taken when interpreting this data.

Table III-34 shows the vehicle actions for the baserate and collision vehicles. Going straight ahead, turning right, and turning left are the only vehicle actions that are significantly underrepresented in the accident data and hence have a hazard index of less than 1.0. Several vehicle actions had especially high hazard ratios and can thus be considered extremely hazardous. These include: backing, passing, out of control, starting in the roadway, and changing lanes or merging. All of these differences were significant at the .001 level.

Table III-1

Accident Distribution by State

| State | 1972 Total Rural Ped Accidents | Total Accidents In Sample | Percent of Total 1972 | Percent of Total Sample |
|---|---|---|---|---|
| California | 2364 | 502 | 37 | 33 |
| Michigan | 1221 | 274 | 19 | 18 |
| Missouri | 446 | 115 | 7 | 8 |
| North Carolina | 988 | 266 | 15 | 17 |
| Pennsylvania | 747 | 170 | 12 | 11 |
| Texas | 633 | 204 | 10 | 13 |
| TOTALS | 6,399 | 1,531 | 100 | 100 |

Table III-2

Accident Distribution by Month

| Month | Rural, N | Urban, N | Rural, % | Urban,* % |
|---|---|---|---|---|
| January | 129 | 292 | 8 | 8 |
| February | 99 | 295 | 6 | 8 |
| March | 126 | 342 | 8 | 9 |
| April | 123 | 321 | 8 | 8 |
| May | 136 | 316 | 8 | 8 |
| June | 140 | 236 | 9 | 6 |
| July | 132 | 299 | 9 | 8 |
| August | 105 | 259 | 7 | 7 |
| September | 124 | 348 | 8 | 9 |
| October | 144 | 400 | 9 | 10 |
| November | 114 | 353 | 7 | 9 |
| December | 159 | 366 | 10 | 10 |
| TOTAL | 1531 | 3827 | 100 | 100 |

* Based on data from 3827 pedestrian accidents from six cities 1973 and 1974 , Knoblauch, 1975.

Table III-3

Accident Distribution by Day of Week

| Day of Week | Rural, N | Urban, N | Rural, % | Urban*, % |
|---|---|---|---|---|
| Sunday | 197 | 345 | 13 | 9 |
| Monday | 217 | 502 | 14 | 13 |
| Tuesday | 205 | 543 | 13 | 14 |
| Wednesday | 187 | 587 | 13 | 15 |
| Thursday | 243 | 586 | 16 | 15 |
| Friday | 244 | 670 | 16 | 18 |
| Saturday | 237 | 530 | 15 | 14 |
| Not stated | 1 | 64 | 0 | 2 |
| TOTAL | 1531 | 3827 | 100 | 100 |

*Based on data from 3827 pedestrian accidents from six cities 1973 and 1974, Knoblauch, 1975.

Table III-4

Accident Distribution by Time of Day

| Time Of Day | Rural, N | Urban, N | Rural, % | Urban*, % |
|---|---|---|---|---|
| 12:00-01:59 A.M. | 67 | 115 | 4 | 3 |
| 02:00-03:59 A.M. | 47 | 59 | 3 | 2 |
| 04:00-05:59 A.M. | 13 | 27 | 1 | 1 |
| 06:00-07:59 A.M. | 80 | 149 | 5 | 4 |
| 08:00-09:55 A.M. | 73 | 273 | 5 | 7 |
| 10:00-11:59 A.M. | 77 | 277 | 5 | 7 |
| 12:00 - 1:59 P.M. | 138 | 393 | 9 | 10 |
| 02:00 - 3:59 P.M. | 234 | 692 | 15 | 18 |
| 04:00 - 5:59 P.M. | 275 | 722 | 18 | 19 |
| 06:00 - 7:59 P.M. | 252 | 578 | 16 | 15 |
| 08:00 - 9:59 P.M. | 152 | 354 | 10 | 9 |
| 10:00-11:59 P.M. | 123 | 176 | 8 | 5 |
| TOTAL | 1531 | 3815 | 100 | 100 |

*Based on data from 3827 pedestrian accidents from six cities 1973 and 1974, Knoblauch, 1975.

Table III-5

Pedestrian Injury Severity

| Severity* | Rural, N | Urban, N | Rural, % | Urban**, % |
|---|---|---|---|---|
| None | 34 | 103 | 2 | 3 |
| Minor | 214 | 771 | 14 | 20 |
| Moderate | 530 | 1262 | 36 | 33 |
| Serious | 529 | 1086 | 36 | 28 |
| Fatal | 177 | 387 | 12 | 10 |
| Not Stated | 41 | 218 | 3 | 6 |
| TOTAL | 1490 | 3827 | 100 | 100 |

* Categories represent the severity of injury as indicated on the police accident reports. Nonstandard coding categories were expanded or collapsed to fit into the standard, five-position rating scale.

None - No visible injury or complaint of injury.

Minor - No visible injury, but complaint of pain, dizziness, etc.

Moderate - Visible injury, bruises, swelling, limping, abrasions, etc.

Severe - Other visible signs of injury, bleeding, distorted member, or had to be carried from scene.

** Based on data from 3827 pedestrian accidents from six cities 1973 and 1974, Knoblauch, 1975.

Table III-6

Accident Distribution by Pedestrian Age and Sex

| Pedestrian Age | Rural, N | Urban,* N | Rural, % | Urban,* % |
|---|---|---|---|---|
| 0-4 | 174 | 355 | 12 | 9 |
| 5-9 | 308 | 821 | 20 | 21 |
| 10-14 | 217 | 410 | 14 | 11 |
| 15-19 | 226 | 292 | 15 | 8 |
| 20-24 | 138 | 237 | 9 | 6 |
| 25-29 | 77 | 176 | 5 | 5 |
| 30-34 | 62 | 125 | 4 | 3 |
| 35-39 | 43 | 110 | 3 | 3 |
| 40-44 | 43 | 95 | 3 | 2 |
| 45-49 | 33 | 115 | 2 | 3 |
| 50-54 | 28 | 134 | 2 | 4 |
| 55-59 | 40 | 120 | 3 | 3 |
| 60-64 | 25 | 110 | 2 | 3 |
| 65+ | 94 | 727 | 6 | 19 |
| TOTAL | 1508 | 3827 | 100 | 100 |
| Pedestrian Sex | Rural, N | Urban, N | Rural, % | Urban, % |
| Male | 1041 | 2353 | 68 | 61 |
| Female | 490 | 1446 | 32 | 38 |
| Not stated | 1 | 28 | 0 | 1 |
| TOTAL | 1531 | 3827 | 100 | 100 |

*Based on data from 3827 pedestrian accidents from six cities 1973 and 1974, Knoblauch, 1975.

Table III-7

Accident Distribution by Driver's Age and Sex

| Driver's Age | Rural, N | Urban,* N | Rural, % | Urban,* % |
|---|---|---|---|---|
| 17 or less | 160 | 169 | 10 | 4 |
| 18-20 | 201 | 349 | 13 | 9 |
| 21-24 | 186 | 519 | 12 | 14 |
| 25-34 | 350 | 820 | 23 | 21 |
| 35-44 | 207 | 482 | 14 | 13 |
| 45-54 | 139 | 412 | 9 | 11 |
| 54-64 | 94 | 270 | 6 | 7 |
| 65+ | 60 | 190 | 4 | 5 |
| Not stated (incl. Hit&Run) | 134 | 616 | 9 | 16 |
| TOTAL | 1531 | 3827 | 100 | 100 |
| **Driver's Sex** | **Rural, N** | **Urban,* N** | **Rural, %** | **Urban,* %** |
| Male | 988 | 2517 | 65 | 66 |
| Female | 385 | 863 | 25 | 23 |
| Hit and Run | 134 | 369 | 9 | 10 |
| Driverless vehicle | 23 | ** | 2 | ** |
| Not stated | 1 | 78 | 0 | 2 |
| TOTAL | 1531 | 3827 | 100 | 100 |

* Based on data from 3827 pedestrian accidents from six cities 1973 and 1974, Knoblauch, 1975.

** No comparable data available.

Table III-8

Pedestrian and Driver Physical Condition

| Physical Condition | Pedestrian | | Driver | |
|---|---|---|---|---|
| | Number | Percent | Number | Percent |
| Specifically indicated, Apparently normal | 1169 | 76.4 | 1103 | 73.1 |
| Specifically indicated, Ability impaired | 120 | 7.8 | 69 | 4.6 |
| Unknown or not specifically indicated | 242 | 15.8 | 336 | 22.3 |
| | 1531 | 100.0 | 1508* | 100.0 |
| Potential Sources of Impairment** | | | | |
| Had been drinking | 157 | 10.3 | 99 | 6.3 |
| Had been taking hard drugs | 12 | 0.8 | 8 | 0.5 |
| Had been taking medication | 9 | 0.6 | 7 | 0.5 |
| Fatigued | 11 | 0.7 | 21 | 1.4 |
| Slight disability, uncorrected | 24 | 1.6 | 2 | 0.1 |
| Hearing disability, uncorrected | 12 | 0.8 | 3 | 0.2 |
| Wearing hearing aid | 5 | 0.3 | 4 | 0.3 |
| Limp or other ambulatory incapacitation | 7 | 0.5 | 2 | 0.1 |
| Other physical disability | 22 | 1.4 | 8 | 0.5 |

*Does not include the 23 driverless vehicle cases.

**Not mutually exclusive, i.e., do not sum to 100%.

Table III-9

Pedestrian Action

| Pedestrian Action When Struck | Number of Pedestrians, Statewide* | | Number of Pedestrians, Rural | |
|---|---|---|---|---|
| | N | % | N | % |
| Crossing at intersection | 39,300 | 30.5 | 247 | 16.1 |
| Crossing not at intersection | 50,800 | 39.5 | 531 | 34.7 |
| Coming from behind parked vehicle | ** | ** | 71 | 4.6 |
| Getting off or on school bus | ** | ** | 21 | 1.3 |
| Getting off or on other vehicle | 2,300 | 1.8 | 33 | 2.1 |
| Walking in roadway with traffic | 4,500 | 3.5 | 146 | 9.5 |
| Walking in roadway against traffic | 3,300 | 2.6 | 65 | 4.2 |
| Working on vehicle | 1,400 | 1.1 | 47 | 3.0 |
| Working in roadway | 1,200 | 0.9 | 29 | 1.9 |
| Playing in roadway | 6,900 | 5.4 | 49 | 3.2 |
| Standing in roadway | 5,300 | 4.1 | 109 | 7.1 |
| Lying in roadway | ** | ** | 21 | 1.3 |
| Not in roadway | 5,800 | 4.5 | 63 | 4.1 |
| Hitchhiking | ** | ** | 15 | 0.9 |
| Other | 7,900 | 6.1 | 81 | 5.3 |
| TOTAL | 128,700 | 100.0 | 1,528 | 100.0 |

*Source: National Safety Council, Accident Facts, 1975, based on reports from 28 state traffic authorities.

**Comparable data not available.

Table III-10

Vehicle Action

| Vehicle Action | Rural, N | Urban, N | Rural, % | Urban, % |
|---|---|---|---|---|
| Going straight ahead | 1,181 | 2756 | 77 | 72 |
| Making right turn | 35 | 180 | 2 | 5 |
| Making left turn | 34 | 257 | 2 | 7 |
| Making U turn | 5 | 6 | 0 | 0 |
| Slowing or stopping | 23 | 102 | 2 | 3 |
| Starting in roadway | 29 | 118 | 2 | 3 |
| Starting from parked position | 17 | * | 1 | * |
| Stopped in travel lane | 5 | 19 | 0 | 0 |
| Parked | 1 | * | 0 | * |
| Backing | 46 | 145 | 3 | 4 |
| Passing | 38 | * | 2 | * |
| Changing lanes or merging | 18 | * | 1 | * |
| Out of control | 42 | * | 3 | * |
| Weaving | 13 | * | 1 | * |
| Driving off roadway | 27 | * | 5 | * |
| Parking | * | 54 | * | 1 |
| Other | 15 | 117 | 1 | 3 |
| Not stated | 2 | 244 | 0 | 6 |
| TOTAL | 1,531 | 3,827 | 100 | 100 |

*No comparable category.

Table III-11

Vehicle Speed Factors

| Speed | Posted or Legal Speed Limit, % | Observed Mean Speed, % | Preinvolvement Speed, % | Impact Speed, % |
|---|---|---|---|---|
| 0— 5 | 0.0 | 0.2 | 12.5 | 26.5 |
| 6—10 | 0.2 | 0.4 | 5.6 | 10.5 |
| 11—15 | 0.6 | 1.5 | 5.2 | 9.8 |
| 16—20 | 1.8 | 7.0 | 9.9 | 10.6 |
| 21—25 | 22.8 | 12.1 | 11.2 | 7.2 |
| 26—30 | 7.5 | 14.3 | 10.9 | 7.0 |
| 31—35 | 17.5 | 14.6 | 11.1 | 8.2 |
| 36—40 | 5.5 | 14.4 | 10.3 | 7.0 |
| 41—45 | 12.4 | 12.3 | 6.3 | 3.3 |
| 46—50 | 2.1 | 7.7 | 7.0 | 4.8 |
| 51—55 | 28.4 | 5.5 | 7.6 | 3.4 |
| 56—60 | 0.2 | 5.8 | 1.2 | 0.7 |
| 61—65 | 0.4 | 2.6 | 0.7 | 0.3 |
| 66—70 | 0.2 | 0.9 | 0.0 | 0.0 |
| 71—75 | 0.0 | 0.0 | 0.2 | 0.1 |
| 76—up | 0.0 | 0.0 | 0.0 | 0.0 |
| TOTAL | 100.0 | 100.0 | 100.0 | 100.0 |
| Number | 1,488 | 1,384 | 1,487 | 1,469 |
| $\bar{X}$ = | 39.7 | 36.4 | 29.7 | 16.4 |

Table III-12

Weather, Road Surface and Lighting Conditions

| Condition | Rural, N | Urban, N | Rural, % | Urban, % |
|---|---|---|---|---|
| Weather | | | | |
| Clear | 1146 | 3369 | 75 | 88 |
| Cloudy | 257 | | 17 | |
| Raining | 68 | 346 | 4 | 9 |
| Snowing | 30 | 39 | 2 | 1 |
| Sleeting | 2 | | 0 | |
| Reduced visibility | 23 | 21 | 2 | 1 |
| Other (fog, dust) | 2 | 2 | 0 | 0 |
| Not stated | 3 | 50 | 0 | 2 |
| Road Surface | | | | |
| Dry | 1309 | 3227 | 86 | 84 |
| Wet | 159 | 478 | 10 | 12 |
| Snow | 20 | 56 | 1 | 1 |
| Ice | 33 | | 2 | |
| Slush | 1 | | 0 | |
| Other | 6 | 9 | 0 | 0 |
| Not stated | 3 | 57 | 0 | 1 |
| Lighting | | | | |
| Daylight | 923 | 2546 | 60 | 67 |
| Twilight (dawn or dusk) | 84 | 185 | 6 | 5 |
| Dark, no lighting | 294 | 1044 | 19 | 27 |
| Dark, no road light | 63 | | 4 | |
| Dark, spot road lighting | 56 | | 4 | |
| Dark, continuous light | 89 | | 6 | |
| Dark, veh left lighted zone | 6 | | 0 | |
| Dark, veh approaching lighted zone | 7 | | 0 | |
| Other | 6 | 0 | 0 | 0 |
| Not stated | 3 | 52 | 0 | 1 |
| TOTAL | 1531 | 3827 | | |

Table III-13

Temporary Hazards in the Roadway

| Hazard | Number | Percent |
|---|---|---|
| Mud | 7 | 0.4 |
| Oil | 1 | 0.0 |
| Other material | 7 | 0.4 |
| Dead animal | 1 | 0.0 |
| Live animal | 8 | 0.5 |
| Disabled vehicle | 57 | 3.7 |
| Other object | 1 | 0.0 |
| Construction site | 29 | 1.9 |
| Other | 27 | 1.7 |
| Stopped vehicle (not disabled) | 86 | 5.6 |
| None | 1292 | 85.2 |
| TOTAL | 1516 | 100.0 |

Table III-14

Accident Site Area Description

| Land Use | | Type of Area | | | | |
|---|---|---|---|---|---|---|
| | | City | Small Town | Suburban | Country | Row Total |
| Commercial | N = | 103 | 73 | 122 | 64 | 362 |
| | ROW% | 28 | 20 | 34 | 18 | 100 |
| | COL% | 42 | 32 | 25 | 11 | 24 |
| | TOT% | 7 | 5 | 8 | 4 | |
| Industrial | N = | 6 | 4 | 5 | 17 | 32 |
| | ROW% | 19 | 13 | 16 | 53 | 100 |
| | COL% | 2 | 2 | 1 | 3 | 2 |
| | TOT% | 0 | 0 | 0 | 1 | |
| Residential | N = | 94 | 118 | 290 | 272 | 774 |
| | ROW% | 12 | 15 | 37 | 35 | 100 |
| | COL% | 39 | 52 | 60 | 48 | 51 |
| | TOT% | 6 | 8 | 19 | 18 | |
| School | N = | 26 | 23 | 43 | 12 | 104 |
| | ROW% | 25 | 22 | 41 | 12 | 100 |
| | COL% | 11 | 10 | 9 | 2 | 7 |
| | TOT% | 2 | 2 | 3 | 1 | |
| Playground | N = | 2 | 2 | 0 | 8 | 12 |
| | ROW% | 17 | 17 | 0 | 67 | 100 |
| | COL% | 1 | 1 | 0 | 1 | 1 |
| | TOT% | 0 | 0 | 0 | 1 | |
| Open Area | N = | 13 | 7 | 24 | 198 | 242 |
| | ROW% | 5 | 3 | 10 | 82 | 100 |
| | COL% | 5 | 3 | 5 | 35 | 16 |
| | TOT% | 1 | 0 | 2 | 13 | |
| | COL TOT | 244 | 227 | 484 | 571 | 1526 |
| | TOT% | 16 | 15 | 32 | 37 | |

Total Number of Observations = 1526

Table III-15

Sight Distance Factors

| Sight Distance Factors | Number of Times Factor Was Coded | Percent of 172 Sight Distance Problem Cases |
|---|---|---|
| Visual obstruction; trees, brush, etc. | 18 | 10.5 |
| Visual obstruction; roadside grading, embankment | 10 | 5.8 |
| Visual obstruction; parked car present at time of accident, as determined by police report or inquiries | 66 | 38.4 |
| Roadway geometry; elevation or horizontal curvature | 44 | 23.3 |
| Weather at time of accident, specify_____ | 19 | 11.0 |
| Headlight inadequacy; induced by roadway geometry | 11 | 6.4 |
| Headlight inadequacy; induced by vehicle condition/design | 18 | 10.5 |
| Roadway surface condition and/or speed | 23 | 13.4 |
| Other | 31 | 18.0 |
| TOTAL | 240 | 100 |

## Table III-16

## Pedestrian and Driver Activity
## Preinvolvement and Collision Course Factors

| Ped Was: | Preinvolvement | Percent | Collision Course | Percent |
|---|---|---|---|---|
| Attempting to cross roadway alone | 459 | 30.1 | 773 | 50.6 |
| Attempting to cross roadway with other peds | 137 | 8.9 | 151 | 9.9 |
| Not attempting to cross roadway alone | 547 | 35.8 | 382 | 25.0 |
| Not attempting to cross roadway with other peds | 375 | 24.5 | 215 | 14.1 |
| TOTAL | 1518 | 100.0 | 1521 | 100.0 |

| Ped Was: | Preinvolvement | Percent | Collision Course | Percent |
|---|---|---|---|---|
| Enroute, going somewhere, N.F.S. | 701 | 46.3 | 766 | 50.6 |
| Going to vehicle | 32 | 2.1 | 39 | 2.5 |
| Coming from vehicle | 52 | 3.4 | 24 | 1.5 |
| Going to school | 35 | 2.3 | 41 | 2.7 |
| Coming from school | 46 | 3.0 | 33 | 2.1 |
| Going to or from vendor, ice cream truck | 22 | 1.4 | 21 | 1.3 |
| Going to or from school bus | 39 | 2.5 | 32 | 2.1 |
| Going to or from mail box or newspaper box | 19 | 1.2 | 22 | 1.4 |
| At work | 63 | 4.1 | 61 | 4.0 |
| At play | 214 | 14.1 | 201 | 13.3 |
| Hitchhiking | 23 | 1.5 | 18 | 1.1 |
| Working on or pushing vehicle | 60 | 3.9 | 53 | 3.5 |
| Getting in or out of vehicle | 42 | 2.7 | 26 | 1.7 |
| "Flagging down" vehicle | 31 | 2.0 | 30 | 1.9 |
| Standing, waiting, not moving | 88 | 5.8 | 87 | 5.7 |
| Other | 45 | 2.9 | 57 | 3.7 |
| TOTAL | 1512 | 100.0 | 1511 | 100.0 |

| Driver Was | Preinvolvement | Percent | Collision Course | Percent |
|---|---|---|---|---|
| Proceeding (normal caution) | 977 | 65.9 | 837 | 56.5 |
| Proceeding (special caution) | 160 | 10.8 | 229 | 15.4 |
| Proceeding (lack of caution) | 326 | 22.0 | 399 | 26.9 |
| TOTAL | 1463 | 100.0 | 1465 | 100.0 |

Table III-17

Pedestrian and Vehicle Movement Characteristics
Preinvolvement and Collision Course Factors

| Ped Was: | Preinvolvement | Percent | Collision Course | Percent |
|---|---|---|---|---|
| Walking normally | 464 | 30.7 | 360 | 23.9 |
| Walking slowly | 75 | 4.9 | 65 | 4.3 |
| Walking rapidly | 62 | 4.1 | 69 | 4.5 |
| Standing, not moving | 372 | 24.6 | 198 | 13.1 |
| Lying down | 17 | 1.1 | 21 | 1.3 |
| Crawling | 4 | .2 | 5 | .3 |
| Running | 371 | 24.6 | 618 | 41.0 |
| Stumbling or falling | 14 | .9 | 47 | 3.1 |
| Other | 107 | 7.1 | 110 | 7.3 |
| TOTAL | 1486 | 100.0 | 1493 | 100.0 |
| Vehicle Was: | Preinvolvement | Percent | Collision Course | Percent |
| Sustaining speed | 986 | 65.6 | 537 | 35.7 |
| Accelerating | 144 | 9.5 | 183 | 12.1 |
| Decelerating | 158 | 10.5 | 581 | 38.7 |
| Parking | 6 | .4 | 5 | .3 |
| Stopped | 116 | 7.7 | 10 | .6 |
| Speeding, excessive for conditions | 46 | 3.0 | 36 | 2.4 |
| Out of control | 16 | 1.0 | 96 | 6.4 |
| Erratic weaving | 11 | .7 | 17 | 1.1 |
| Other | 11 | .7 | 28 | 1.8 |
| TOTAL | 1494 | 100.0 | 1493 | 100.0 |

Table III-18

Pedestrian and Vehicle Direction of Movement
Preinvolvement and Collision Course Factors

| Ped Was Going: | Preinvolvement | Percent | Collision Course | Percent |
|---|---|---|---|---|
| Across roadway | 474 | 31.1 | 831 | 54.6 |
| Along roadway with traffic | 226 | 14.8 | 165 | 10.8 |
| Along roadway against traffic | 96 | 6.3 | 61 | 4.0 |
| Diagonally across roadway, towards V-1 | 24 | 1.5 | 59 | 3.8 |
| Diagonally across roadway, away from V-1 | 27 | 1.7 | 73 | 4.8 |
| Not moving | 415 | 27.2 | 253 | 16.6 |
| Towards roadway | 196 | 12.8 | 13 | .8 |
| Other | 54 | 3.5 | 63 | 4.1 |
| TOTAL | 1512 | 100.0 | 1518 | 100.0 |
| **Vehicle Was:** | **Preinvolvement** | **Percent** | **Collision Course** | **Percent** |
| Going straight ahead | 1,198 | 78.4 | 1,143 | 74.8 |
| Turning right | 23 | 1.5 | 34 | 2.2 |
| Turning left | 30 | 1.9 | 36 | 2.3 |
| Changing lanes | 24 | 1.5 | 46 | 3.0 |
| Negotiating curve | 54 | 3.5 | 37 | 2.4 |
| Passing other vehicles | 21 | 1.3 | 36 | 2.3 |
| Backing up | 30 | 1.9 | 43 | 2.8 |
| Stopped | 103 | 6.7 | 9 | .5 |
| Other | 16 | 1.0 | 49 | 3.2 |
| TOTAL | 1499 | 100.0 | 1433 | 100.0 |

Table III-19

Pedestrian and Vehicle Location
Preinvolvement and Collision Course Factors

| Ped Was: | Preinvolvement | Per-Cent | Collision Course | Per-Cent |
|---|---|---|---|---|
| On roadway, not in crosswalk | 710 | 46.4 | 1086 | 70.9 |
| On roadway, in marked crosswalk | 57 | 3.7 | 84 | 5.4 |
| On roadway, at intersection | 85 | 5.5 | 123 | 8.0 |
| On roadway shoulder | 286 | 18.7 | 134 | 8.7 |
| On sidewalk | 110 | 7.1 | 9 | .5 |
| On curb or gutter | 35 | 2.2 | 10 | .6 |
| In yard or field | 86 | 5.6 | 19 | 1.2 |
| In parking lot or private driveway | 111 | 7.2 | 41 | 2.6 |
| Other | 47 | 3.0 | 24 | 1.5 |
| TOTAL | 1527 | 100.0 | 1530 | 100.0 |
| **Vehicle Was:** | **Preinvolvement** | **Per-Cent** | **Collision Course** | **Per-Cent** |
| On right side of roadway | 1,250 | 82.0 | 1063 | 69.7 |
| On left side of roadway | 76 | 4.9 | 103 | 6.7 |
| In middle of narrow roadway | 68 | 4.4 | 76 | 4.9 |
| Straddling center line | 12 | .7 | 53 | 3.4 |
| On wrong (illegal) side of roadway | 17 | 1.1 | 38 | 2.4 |
| On sidewalk | 2 | .1 | 6 | .3 |
| On shoulder | 29 | 1.9 | 97 | 6.3 |
| On median or traffic island | 0 | 0 | 2 | .1 |
| Other | 68 | 4.4 | 86 | 5.6 |
| TOTAL | 1522 | 100.0 | 1524 | 100.0 |

Table III-20

Pedestrian and Driver Direction of Attention Preinvolvement and Collision Course Factors

| Ped Was Looking | Preinvolvement | Per-Cent | Collision Course | Per-Cent |
|---|---|---|---|---|
| Straight ahead | 856 | 59.7 | 969 | 67.5 |
| Behind | 29 | 2.0 | 43 | 3.0 |
| To both sides | 59 | 4.1 | 10 | .7 |
| Right side only | 52 | 3.6 | 70 | 4.8 |
| Left side only | 58 | 4.0 | 81 | 5.6 |
| Up | 7 | .4 | 8 | .5 |
| Down | 80 | 5.5 | 81 | 5.6 |
| General "search" activity | 161 | 11.2 | 50 | 3.4 |
| Other | 44 | 3.0 | 42 | 2.9 |
| TOTAL | 1346 | 100.0 | 1354 | 100.0 |
| Driver Was Looking | Preinvolvement | Per-Cent | Collision Course | Per-Cent |
| Straight ahead | 632 | 45.4 | 878 | 63.1 |
| Behind | 32 | 2.3 | 27 | 1.9 |
| To both sides | 17 | 1.2 | 12 | .8 |
| Right side only | 29 | 2.0 | 53 | 3.8 |
| Left side only | 31 | 2.2 | 40 | 2.8 |
| Up | 2 | .1 | 0 | 0 |
| Down | 3 | .2 | 8 | .5 |
| General "search" activity | 492 | 35.4 | 222 | 15.9 |
| Other | 23 | 1.6 | 25 | 1.8 |
| TOTAL | 1261 | 100.0 | 1265 | 100.0 |

Table III-21

Pedestrian and Driver Object of Attention: Traffic Preinvolvement and Collision Course Factors

| Ped Was Attending To | Preinvolvement | Per-Cent | Collision Course | Per-Cent |
|---|---|---|---|---|
| Specifically indicated not attending to traffic | 865 | 59.1 | 878 | 60.1 |
| The collision vehicle | 166 | 11.3 | 301 | 20.6 |
| The pedestrian | 4 | .2 | 5 | .3 |
| Moving vehicles | 191 | 13.0 | 91 | 6.2 |
| Standing vehicles | 106 | 7.2 | 69 | 4.7 |
| Bus | 15 | 1.0 | 10 | .6 |
| A traffic signal | 10 | .6 | 5 | .3 |
| Other | 31 | 2.1 | 24 | 1.6 |
| TOTAL | 1388 | 100.0 | 1383 | 100.0 |
| **Driver Was Attending To** | **Preinvolvement** | **Per-Cent** | **Collision Course** | **Per-Cent** |
| Specifically indicated not attending to traffic | 121 | 8.4 | 128 | 8.9 |
| The collision vehicle | 5 | .3 | 6 | .4 |
| The pedestrian | 140 | 9.8 | 662 | 46.4 |
| Moving vehicles | 120 | 8.4 | 71 | 4.9 |
| Standing vehicles | 71 | 4.9 | 59 | 4.1 |
| Bus | 13 | .9 | 4 | .2 |
| A traffic signal | 11 | .7 | 4 | .2 |
| Normal driving activities, not specified | 805 | 56.3 | 345 | 24.2 |
| Other | 28 | 1.9 | 38 | 2.6 |
| TOTAL | 1314 | 100.0 | 1317 | 100.0 |

## Table III-22

## Pedestrian and Driver Object of Attention: Nontraffic Preinvolvement and Collision Course Factors

| Ped Was Attending To | Preinvolvement | Percent | Collision Course | Percent |
|---|---|---|---|---|
| Specifically indicated not attending to nontraffic objects | 241 | 16.4 | 257 | 17.5 |
| No nontraffic-related objects indicated | 305 | 20.7 | 333 | 22.7 |
| General street or sidewalk ahead | 228 | 15.5 | 251 | 17.1 |
| Roadside items or street furniture | 16 | 1.0 | 14 | .9 |
| Other people or pedestrians | 328 | 22.3 | 267 | 18.2 |
| Working - not attending to traffic | 71 | 4.8 | 64 | 4.3 |
| Playing - not attending to traffic | 122 | 8.3 | 116 | 7.9 |
| Other | 86 | 5.8 | 83 | 5.6 |
| TOTAL | 1397 | 100.0 | 1385 | 100.0 |

| Driver Was Attending To | Preinvolvement | Percent | Collision Course | Percent |
|---|---|---|---|---|
| Specifically indicated not attending to nontraffic objects | 381 | 26.8 | 387 | 27.3 |
| No nontraffic-related objects indicated | 483 | 35.0 | 506 | 35.7 |
| General street or sidewalk ahead | 259 | 18.2 | 232 | 16.3 |
| Roadside items or street furniture | 8 | .5 | 6 | .4 |
| Other people or pedestrians | 105 | 7.3 | 99 | 6.9 |
| Working - not attending to traffic | 4 | .2 | 4 | .2 |
| Playing - not attending to traffic | 1 | .0 | 2 | .1 |
| Passengers in own car | 26 | 1.8 | 18 | 1.2 |
| Other | 13 | .9 | 20 | 1.4 |
| TOTAL | 1280 | 100.0 | 1274 | 100.0 |

## Table III-23

## Pedestrian and Driver Evasive Action Factors
## Preinvolvement and Collision Course Factors

| Ped's Evasive Action | Number | Percent |
|---|---|---|
| 1. None made, unaware of need | 780 | 52.7 |
| 2. None made, insufficient time | 190 | 12.8 |
| 3. None made, ped walked or ran into vehicle | 202 | 13.6 |
| 4. Jump on hood | 11 | 0.7 |
| 5. "Push-off" or "stiff-arm" vehicle | 28 | 1.8 |
| 6. Stop-remain in place | 22 | 1.4 |
| 7. Walk-continue on crossing | 12 | 0.8 |
| 8. Run-continue on crossing | 49 | 3.3 |
| 9. Walk-return to roadside | 4 | 0.2 |
| 10. Run-return to roadside | 26 | 1.7 |
| 11. Jump, lunge, or dodge vehicle | 65 | 4.4 |
| 12. Yell, scream, otherwise inform driver | 7 | 0.4 |
| 13. Combination of 12 and 4 through 19 | 5 | 0.3 |
| 19. Other | 52 | 3.5 |
| TOTAL | 1453 | 100.0 |

| Driver Evasive Action | Number | Percent |
|---|---|---|
| 1. None made, unaware of need | 343 | 23.4 |
| 2. None made, insufficient time | 157 | 10.7 |
| 3. None made, ped walked or ran into vehicle | 70 | 4.7 |
| 4. None made, assumed ped would get clear from path | 33 | 2.2 |
| 5. Attempted to stop | 400 | 27.3 |
| 6. Attempted to swerve | 78 | 5.3 |
| 7. Attempted to swerve and stop | 298 | 20.3 |
| 8. Accelerated to avoid | 0 | 0.0 |
| 9. Blew horn only | 0 | 0.0 |
| 10. Combination of 9 and 5 through 8 | 15 | 1.0 |
| 19. Other | 43 | 2.9 |
| TOTAL | 1437 | 100.0 |

# Table III-24

## All Accident Types - Precipitating Pedestrian Factors

| ALL ACCIDENT TYPES N = 1531<br>PRECIPITATING PEDESTRIAN FACTORS 100% | | CAUSAL FACTOR | | | RELATED FACTOR | | | TOTAL OF FACTORS | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | N | Percent of This Type | Percent of This Factor | N | Percent of This Type | Percent of This Factor | N | Percent of This Type | Percent of This Factor |
| 1. | **Ped Course (Risk-taking) Failures** | 1076 | 70.2 | 100.0 | 824 | 53.8 | 100.0 | 1900 | 100.0 | 100.0 |
| | 01 High exposure to vehicles | 220 | 14.4 | 100.0 | 164 | 10.7 | 100.0 | 384 | 100.0 | 100.0 |
| | 02 Poor target, slow speed | 20 | 1.3 | 100.0 | 27 | 1.8 | 100.0 | 47 | 100.0 | 100.0 |
| | 03 Poor target, short time exposure | 289 | 18.8 | 100.0 | 178 | 11.6 | 100.0 | 47 | 100.0 | 100.0 |
| | 04 Poor target, unexpected or unusual place | 80 | 5.2 | 100.0 | 111 | 7.2 | 100.0 | 191 | 100.0 | 100.0 |
| | 05 Poor target, running | 294 | 19.2 | 100.0 | 278 | 18.2 | 100.0 | 572 | 100.0 | 100.0 |
| | 06 Poor target, crossing against light | 8 | 0.5 | 100.0 | 1 | 0.1 | 100.0 | 9 | 100.0 | 100.0 |
| | 07 Walking with traffic, wrong side of road | 82 | 5.4 | 100.0 | 44 | 2.9 | 100.0 | 126 | 100.0 | 100.0 |
| | 09 Other course failures | 83 | 5.4 | 100.0 | 21 | 1.4 | 100.0 | 104 | 100.0 | 100.0 |
| 2. | **Ped Search Failures** | 876 | 57.2 | 100.0 | 417 | 27.2 | 100.0 | 1293 | 100.0 | 100.0 |
| | 01 Ped search and detection failure, (no further info.) | 268 | 17.5 | 100.0 | 23 | 1.5 | 100.0 | 291 | 100.0 | 100.0 |
| | 02 Overload | 12 | 0.8 | 100.0 | 8 | 0.5 | 100.0 | 20 | 100.0 | 100.0 |
| | 03 Distraction (no further info.) | 17 | 1.1 | 100.0 | 13 | 0.8 | 100.0 | 30 | 100.0 | 100.0 |
| | 04 Distraction, traffic signal | 4 | 0.3 | 100.0 | 3 | 0.2 | 100.0 | 7 | 100.0 | 100.0 |
| | 05 Distraction, traffic during 1st half of crossing | 32 | 2.1 | 100.0 | 14 | 0.9 | 100.0 | 46 | 100.0 | 100.0 |
| | 06 Distraction, traffic during 2nd half of crossing | 16 | 1.0 | 100.0 | 13 | 0.8 | 100.0 | 29 | 100.0 | 100.0 |
| | 07 Distraction, hostile person and/or animal | 19 | 1.2 | 100.0 | 10 | 0.6 | 100.0 | 29 | 100.0 | 100.0 |
| | 08 Distraction, play activity | 107 | 7.0 | 100.0 | 79 | 5.2 | 100.0 | 186 | 100.0 | 100.0 |
| | 09 Distraction, other pedestrians | 85 | 5.5 | 100.0 | 125 | 8.2 | 100.0 | 210 | 100.0 | 100.0 |
| | 10 Inadequate search, looked but didn't see | 76 | 5.0 | 100.0 | 24 | 1.6 | 100.0 | 100 | 100.0 | 100.0 |
| | 11 Inattention, didn't look, day dreaming, etc. | 170 | 11.1 | 100.0 | 73 | 4.8 | 100.0 | 243 | 100.0 | 100.0 |
| | 19 Other search failures | 70 | 4.6 | 100.0 | 32 | 2.1 | 100.0 | 102 | 100.0 | 100.0 |
| 3. | **Ped Detection (Perceptual Interference) Failures** | 219 | 14.3 | 100.0 | 176 | 11.5 | 100.0 | 395 | 100.0 | 100.0 |
| | 01 Not explainable, adequate search but detection failure | 17 | 1.1 | 100.0 | 4 | 0.3 | 100.0 | 21 | 100.0 | 100.0 |
| | 02 Parked car | 66 | 4.3 | 100.0 | 47 | 3.1 | 100.0 | 113 | 100.0 | 100.0 |
| | 03 Moving traffic | 43 | 2.8 | 100.0 | 29 | 1.9 | 100.0 | 72 | 100.0 | 100.0 |
| | 04 Standing traffic | 30 | 2.0 | 100.0 | 30 | 2.0 | 100.0 | 60 | 100.0 | 100.0 |
| | 05 Stopped bus | 12 | 0.8 | 100.0 | 9 | 0.6 | 100.0 | 21 | 100.0 | 100.0 |
| | 06 Poor lighting | 9 | 0.6 | 100.0 | 21 | 1.4 | 100.0 | 30 | 100.0 | 100.0 |
| | 07 Sun | 1 | 0.1 | 100.0 | 3 | 0.2 | 100.0 | 4 | 100.0 | 100.0 |
| | 08 Building, posts, street furniture, etc. | 2 | 0.1 | 100.0 | 3 | 0.2 | 100.0 | 5 | 100.0 | 100.0 |
| | 09 Trees, brush, weeds, etc. | 18 | 1.2 | 100.0 | 12 | 0.8 | 100.0 | 30 | 100.0 | 100.0 |
| | 19 Other detection failures | 21 | 1.4 | 100.0 | 18 | 1.2 | 100.0 | 39 | 100.0 | 100.0 |
| 4. | **Ped Evaluation Failures** | 374 | 24.4 | 100.0 | 187 | 12.2 | 100.0 | 561 | 100.0 | 100.0 |
| | 01 Misperception of driver's intent | 98 | 6.4 | 100.0 | 38 | 2.5 | 100.0 | 136 | 100.0 | 100.0 |
| | 02 Poor prediction of pedestrian/vehicle path | 120 | 7.8 | 100.0 | 84 | 5.5 | 100.0 | 204 | 100.0 | 100.0 |
| | 03 Alcohol/drug impairment | 126 | 8.2 | 100.0 | 51 | 3.3 | 100.0 | 177 | 100.0 | 100.0 |
| | 09 Other evaluation failures | 29 | 1.9 | 100.0 | 13 | 0.8 | 100.0 | 42 | 100.0 | 100.0 |
| 5. | **Ped Avoidance Action Failures** | 183 | 11.9 | 100.0 | 109 | 7.1 | 100.0 | 292 | 100.0 | 100.0 |
| | 01 Improper decision | 82 | 5.4 | 100.0 | 25 | 1.6 | 100.0 | 107 | 100.0 | 100.0 |
| | 02 Environmental limits | 13 | 0.8 | 100.0 | 9 | 0.6 | 100.0 | 22 | 100.0 | 100.0 |
| | 03 Human factors limits | 50 | 3.3 | 100.0 | 39 | 2.5 | 100.0 | 89 | 100.0 | 100.0 |
| | 04 Pedestrian and driver interaction, failed to match evasive actions | 29 | 1.9 | 100.0 | 31 | 2.0 | 100.0 | 60 | 100.0 | 100.0 |
| | 09 Other avoidance action failures | 8 | 0.5 | 100.0 | 5 | 0.3 | 100.0 | 13 | 100.0 | 100.0 |

# Table III-25

## All Accident Types - Precipitating Driver Factors

| ALL ACCIDENT TYPES N = 1531<br>PRECIPITATING DRIVER FACTORS 100% | CAUSAL FACTOR | | | RELATED FACTOR | | | TOTAL OF FACTORS | | |
|---|---|---|---|---|---|---|---|---|---|
| | N | Percent of This Type | Percent of This Factor | N | Percent of This Type | Percent of This Factor | N | Percent of This Type | Percent of This Factor |
| **6. Driver Course (Risk-taking) Failures** | 342 | 22.3 | 100.0 | 173 | 11.3 | 100.0 | 515 | 100.0 | 100.0 |
| 01 Limitation of avoidance response, speeding | 105 | 6.9 | 100.0 | 98 | 6.4 | 100.0 | 203 | 100.0 | 100.0 |
| 02 Limitation of avoidance response, weather | 20 | 1.3 | 100.0 | 26 | 1.7 | 100.0 | 46 | 100.0 | 100.0 |
| 03 Unexpected course, attempt to beat light | 0 | 0.0 | 100.0 | 1 | 0.1 | 100.0 | 1 | 100.0 | 100.0 |
| 04 Unexpected course, run red light | 7 | 0.5 | 100.0 | 1 | 0.1 | 100.0 | 8 | 100.0 | 100.0 |
| 05 Unexpected course, run stop sign | 5 | 0.3 | 100.0 | 0 | 0.0 | 100.0 | 5 | 100.0 | 100.0 |
| 06 Unexpected course, wrong side of road | 25 | 1.6 | 100.0 | 13 | 0.8 | 100.0 | 38 | 100.0 | 100.0 |
| 07 Out of control, prior to involvement with pedestrian | 70 | 4.6 | 100.0 | 12 | 0.8 | 100.0 | 82 | 100.0 | 100.0 |
| 09 Other course failures | 109 | 7.1 | 100.0 | 22 | 1.4 | 100.0 | 131 | 100.0 | 100.0 |
| **7. Driver Search Failures** | 458 | 29.9 | 100.0 | 273 | 17.8 | 100.0 | 731 | 100.0 | 100.0 |
| 01 Overload, too many activities | 19 | 1.2 | 100.0 | 15 | 1.0 | 100.0 | 34 | 100.0 | 100.0 |
| 02 Distraction; traffic-related maneuver | 96 | 6.3 | 100.0 | 47 | 3.1 | 100.0 | 143 | 100.0 | 100.0 |
| 03 Distraction; other pedestrians | 51 | 3.3 | 100.0 | 35 | 2.3 | 100.0 | 86 | 100.0 | 100.0 |
| 04 Distraction; passenger in car | 14 | 0.9 | 100.0 | 24 | 1.6 | 100.0 | 38 | 100.0 | 100.0 |
| 05 Distraction; adjusting car, clothing or load | 3 | 0.2 | 100.0 | 4 | 0.3 | 100.0 | 7 | 100.0 | 100.0 |
| 06 Distraction; other | 33 | 2.2 | 100.0 | 15 | 1.0 | 100.0 | 48 | 100.0 | 100.0 |
| 07 Inattention, not attending to driving, no specific distraction | 97 | 6.3 | 100.0 | 33 | 2.2 | 100.0 | 130 | 100.0 | 100.0 |
| 08 Inadequate search, did not look carefully | 138 | 9.0 | 100.0 | 95 | 6.2 | 100.0 | 233 | 100.0 | 100.0 |
| 09 Other search failures | 6 | 0.4 | 100.0 | 4 | 0.3 | 100.0 | 10 | 100.0 | 100.0 |
| **8. Driver Detection (Perceptual Interference) Failures** | 498 | 32.5 | 100.0 | 321 | 21.0 | 100.0 | 819 | 100.0 | 100.0 |
| 01 Not explainable, apparently adequate search but detection failure | 45 | 2.9 | 100.0 | 16 | 1.0 | 100.0 | 61 | 100.0 | 100.0 |
| 02 Parked cars | 104 | 6.8 | 100.0 | 45 | 2.9 | 100.0 | 149 | 100.0 | 100.0 |
| 03 Moving traffic | 72 | 4.7 | 100.0 | 45 | 2.9 | 100.0 | 117 | 100.0 | 100.0 |
| 04 Standing traffic | 53 | 3.5 | 100.0 | 18 | 1.2 | 100.0 | 71 | 100.0 | 100.0 |
| 05 Stopped bus | 19 | 1.2 | 100.0 | 2 | 0.1 | 100.0 | 21 | 100.0 | 100.0 |
| 06 Poor lighting (roadside) | 62 | 4.0 | 100.0 | 85 | 5.5 | 100.0 | 147 | 100.0 | 100.0 |
| 07 Poor lighting (vehicular) | 5 | 0.3 | 100.0 | 4 | 0.3 | 100.0 | 9 | 100.0 | 100.0 |
| 08 Sun blinding | 15 | 1.0 | 100.0 | 8 | 0.5 | 100.0 | 23 | 100.0 | 100.0 |
| 09 Headlight blinding | 26 | 1.7 | 100.0 | 17 | 1.1 | 100.0 | 43 | 100.0 | 100.0 |
| 10 Buildings, posts, street furniture, etc. | 1 | 0.1 | 100.0 | 5 | 0.3 | 100.0 | 6 | 100.0 | 100.0 |
| 11 Windshield dirty or obscured | 5 | 0.3 | 100.0 | 4 | 0.3 | 100.0 | 9 | 100.0 | 100.0 |
| 12 Trees, brush, weeds, etc. | 35 | 2.3 | 100.0 | 26 | 1.7 | 100.0 | 61 | 100.0 | 100.0 |
| 13 Weather conditions | 23 | 1.5 | 100.0 | 18 | 1.2 | 100.0 | 41 | 100.0 | 100.0 |
| 19 Other detection failures | 33 | 2.2 | 100.0 | 27 | 1.8 | 100.0 | 60 | 100.0 | 100.0 |
| **9. Driver Evaluation Failures** | 361 | 23.6 | 100.0 | 156 | 10.2 | 100.0 | 517 | 100.0 | 100.0 |
| 01 Misperception of pedestrian's intent | 182 | 11.9 | 100.0 | 57 | 3.7 | 100.0 | 239 | 100.0 | 100.0 |
| 02 Poor prediction of pedestrian/vehicle path | 98 | 6.4 | 100.0 | 58 | 3.8 | 100.0 | 156 | 100.0 | 100.0 |
| 03 Alcohol/drug impairment | 72 | 4.7 | 100.0 | 32 | 2.1 | 100.0 | 104 | 100.0 | 100.0 |
| 09 Other evaluation failures | 8 | 0.5 | 100.0 | 8 | 0.5 | 100.0 | 16 | 100.0 | 100.0 |
| **10. Driver Avoidance Action Failures** | 203 | 13.2 | 100.0 | 120 | 7.8 | 100.0 | 323 | 100.0 | 100.0 |
| 01 Improper decision | 51 | 3.3 | 100.0 | 24 | 1.6 | 100.0 | 75 | 100.0 | 100.0 |
| 02 Environmental limits, i.e., slippery surface | 54 | 3.5 | 100.0 | 33 | 2.2 | 100.0 | 87 | 100.0 | 100.0 |
| 03 Lost control of vehicle, after avoidance action started | 22 | 1.4 | 100.0 | 16 | 1.0 | 100.0 | 38 | 100.0 | 100.0 |
| 04 Pedestrian and driver interaction, failure to match evasive action | 43 | 2.8 | 100.0 | 24 | 1.6 | 100.0 | 67 | 100.0 | 100.0 |
| 05 Vehicular limits, inadequate brakes or steering | 14 | 0.9 | 100.0 | 10 | 0.6 | 100.0 | 24 | 100.0 | 100.0 |
| 09 Other avoidance action failures | 16 | 1.0 | 100.0 | 12 | 0.8 | 100.0 | 28 | 100.0 | 100.0 |

Table III-26

Pedestrian Causal Factors, Subjective Importance

| Pedestrian Causal Factors | Subjective Importance | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Primary | | Secondary | | Related | | Total | |
| | N | %* | N | %* | N | %* | N | %** |
| Specifically indicated no contributory pedestrian factors | | | | | | | 120 | 7.8 |
| Pedestrian course (risk-taking) | 211 | 59 | 135 | 37 | 14 | 4 | 360 | 23.5 |
| Pedestrian illegal action (jaywalking) | 10 | 40 | 15 | 60 | 0 | 0 | 25 | 1.6 |
| Condition of pedestrian (alcohol) | 84 | 53 | 67 | 42 | 7 | 4 | 158 | 10.3 |
| Slow speed of pedestrian | 2 | 15 | 8 | 62 | 3 | 23 | 13 | 0.8 |
| Short time exposure of pedestrian | 158 | 57 | 115 | 42 | 3 | 1 | 276 | 17.4 |
| Unexpected/unusual place for pedestrian | 54 | 39 | 71 | 52 | 12 | 9 | 137 | 8.9 |
| Running on or into roadway | 244 | 54 | 202 | 45 | 6 | 1 | 452 | 29.5 |
| Pedestrian inadequate search and detection | 157 | 59 | 101 | 38 | 8 | 3 | 266 | 17.3 |
| Search or detection pattern misdirected | 94 | 46 | 99 | 49 | 10 | 5 | 203 | 13.2 |
| Stimulus overload | 11 | 41 | 16 | 59 | 0 | 0 | 27 | 1.7 |
| Distraction | 97 | 55 | 72 | 41 | 8 | 5 | 177 | 11.5 |
| Inattention | 66 | 50 | 62 | 47 | 4 | 3 | 132 | 8.6 |
| Pedestrian misinterpretation of driver's intent | 56 | 62 | 33 | 37 | 1 | 1 | 90 | 5.8 |
| Poor prediction of vehicle/pedestrian path | 40 | 42 | 50 | 52 | 6 | 6 | 96 | 6.2 |
| Personal limitation - human factors, handicap | 38 | 55 | 27 | 39 | 4 | 6 | 69 | 4.2 |
| Trying to beat car | 27 | 69 | 12 | 31 | 0 | 0 | 39 | 2.3 |
| Trying to beat car against signal | 5 | 100 | 0 | 0 | 0 | 0 | 5 | 0.3 |
| Other | 42 | 70 | 13 | 22 | 5 | 8 | 60 | 3.6 |

*Percentage each factor was assigned this subjective importance.

**Percentage of accidents where each factor was cited: N = 1,531

Table III-27

Driver Causal Factors, Subjective Importance

| Driver Causal Factors | Subjective Importance | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Primary | | Secondary | | Related | | Total | |
| | N | %* | N | %* | N | %* | N | %** |
| Specifically indicated no contributory driver factors | | | | | | | 497 | 32.4 |
| Driver course (risk-taking) | 36 | 60 | 21 | 35 | 3 | 5 | 60 | 3.9 |
| Vehicle speed | 74 | 42 | 77 | 44 | 26 | 15 | 177 | 11.5 |
| Condition of driver (alcohol) | 49 | 53 | 40 | 43 | 4 | 4 | 93 | 6.0 |
| Illegal act - run stop sign or traffic light | 13 | 81 | 2 | 13 | 1 | 6 | 16 | 1.0 |
| Driver inadequate search and detection | 167 | 60 | 94 | 34 | 18 | 6 | 279 | 18.2 |
| Search or detection pattern not directed at pedestrian | 132 | 55 | 90 | 37 | 20 | 8 | 242 | 15.8 |
| Stimulus overload | 17 | 37 | 19 | 41 | 10 | 22 | 46 | 3.0 |
| Distraction | 34 | 55 | 26 | 42 | 2 | 3 | 62 | 4.0 |
| Driver misinterpretation of pedestrian intent | 79 | 51 | 71 | 46 | 6 | 4 | 156 | 10.1 |
| Personal limitations - human factors, handicap | 8 | 33 | 13 | 54 | 3 | 12 | 24 | 1.5 |
| Poor prediction vehicle/pedestrian path | 61 | 62 | 28 | 28 | 10 | 10 | 99 | 6.4 |
| Driver in a hurry | 17 | 40 | 22 | 52 | 3 | 7 | 42 | 2.7 |
| Driver failed to give pedestrian right of way | 14 | 31 | 26 | 58 | 5 | 11 | 45 | 2.9 |
| Driver ran off traveled way | 84 | 86 | 13 | 13 | 1 | 1 | 98 | 6.4 |
| Other | 47 | 65 | 18 | 25 | 7 | 10 | 72 | 4.7 |

*Percentage each factor was assigned this subjective importance

**Percentage of accidents where each factor was cited: N = 1,531

## Table III-28

## Environmental Causal Factors, Subjective Importance

| Environmental Causal Factors | Subjective Importance | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Primary | | Secondary | | Related | | Total | |
| | N | %* | N | %* | N | %* | N | %** |
| Specifically indicated no contributory environmental factors | | | | | | | 624 | 40.7 |
| Condition of vehicle | 20 | 71 | 5 | 18 | 3 | 11 | 28 | 1.8 |
| Inadequate roadway lighting | 22 | 32 | 33 | 48 | 14 | 20 | 69 | 4.5 |
| No roadway lighting | 64 | 36 | 81 | 46 | 33 | 19 | 178 | 11.6 |
| No sidewalks | 32 | 46 | 26 | 37 | 12 | 17 | 70 | 4.5 |
| Inadequate or no shoulder | 28 | 45 | 25 | 40 | 9 | 15 | 62 | 4.0 |
| Roadway curvature | 18 | 39 | 18 | 39 | 10 | 22 | 46 | 3.0 |
| Pedestrian blinded by sun | 3 | 60 | 1 | 20 | 1 | 20 | 5 | 0.3 |
| Driver blinded by sun | 14 | 67 | 5 | 24 | 2 | 10 | 21 | 1.3 |
| Driver blinded by oncoming headlights | 21 | 60 | 9 | 26 | 5 | 14 | 35 | 2.2 |
| Driver vision obscured by dirty, icy, or snow covered windshield | 5 | 63 | 3 | 38 | 0 | 0 | 8 | 0.5 |
| Pedestrian vision obscured by parked vehicle | 29 | 33 | 48 | 55 | 11 | 12 | 88 | 5.7 |
| Pedestrian vision obscured by moving traffic | 14 | 54 | 8 | 31 | 4 | 15 | 26 | 1.7 |
| Pedestrian vision obscured by standing traffic | 21 | 41 | 24 | 47 | 6 | 12 | 51 | 3.3 |
| Pedestrian vision obscured by trees, roadside items | 11 | 37 | 13 | 43 | 6 | 20 | 30 | 1.9 |
| Driver vision obscured by parked vehicles | 70 | 52 | 52 | 39 | 13 | 10 | 135 | 8.8 |
| Driver vision obscured by moving traffic | 30 | 46 | 27 | 42 | 8 | 12 | 65 | 4.2 |
| Driver vision obscured by standing traffic | 33 | 52 | 24 | 38 | 6 | 10 | 63 | 4.1 |
| Driver vision obscured by trees, roadside items | 35 | 51 | 26 | 38 | 8 | 12 | 69 | 4.5 |
| Other | 31 | 43 | 22 | 31 | 19 | 26 | 72 | 4.7 |
| Pedestrian and/or driver vision impaired by weather | 27 | 59 | 14 | 30 | 5 | 11 | 46 | 3.0 |
| Condition of roadway: ice or snow | 33 | 65 | 13 | 25 | 5 | 10 | 51 | 3.3 |
| Condition of roadway: other | 20 | 31 | 32 | 50 | 12 | 19 | 64 | 4.1 |

* Percentage each factor was assigned this subjective importance.

** Percentage of accidents where each factor was cited: N = 1531.

Table III-29

Pedestrian Age for Baserate Data and Accident Data

| Pedestrian Age | Baserate Data | | Accident Data | |
|---|---|---|---|---|
| | Total | Percent | Total | Percent |
| 0 - 4 | 437 | 5.7 | 174 | 11.5*** |
| 5 - 9 | 1231 | 15.9 | 308 | 20.4*** |
| 10 - 14 | 1702 | 22.0 | 217 | 14.4*** |
| 15 - 19 | 1375 | 17.8 | 226 | 15.0** |
| 20 - 24 | 602 | 7.8 | 138 | 9.2 |
| 25 - 35 | 1187 | 15.3 | 151 | 10.0*** |
| 36 - 55 | 914 | 11.8 | 144 | 9.5* |
| 56 - 65 | 168 | 2.2 | 62 | 4.1*** |
| Over 65 | 117 | 1.5 | 88 | 5.8*** |
| TOTAL | 7733 | 100.0 | 1508 | 100.0 |

Z-test significance levels, differences are not significant if not indicated.

* .05
** .01
*** .001

Table III-30

Pedestrian Sex for Baserate Data and Accident Data

| Pedestrian Sex | Baserate Data | | Accident Data | |
|---|---|---|---|---|
| | Total | Percent | Total | Percent |
| Male | 4374 | 56.6 | 1041 | 68.0*** |
| Female | 3271 | 42.3 | 490 | 32.0*** |
| Unknown | 79 | 1.0 | 0 | 0.0** |
| TOTAL | 7724 | 100.0 | 1531 | 100.0 |

Z-test significance levels, differences are not significant if not indicated.

* .05

** .01

*** .001

Table III-31

Pedestrian Behavior for
Baserate Data and Accident Data

| Selected Pedestrian Behaviors | Baserate Date | | Accident Data | | Hazard Index[a] |
|---|---|---|---|---|---|
| | Total | Percent | Total | Percent | |
| Crossing at intersection | 1295 | 29.0 | 247 | 18.3*** | 0.6 |
| Crossing not at intersection | 1205 | 27.0 | 531 | 39.4*** | 1.5 |
| Coming from behind parked vehicle | 50 | 1.1 | 71 | 5.3*** | 4.8 |
| Getting on or off school bus | 160 | 3.6 | 21 | 1.6*** | 0.4 |
| Getting on or off other vehicle | 443 | 9.9 | 33 | 2.4*** | 0.2 |
| Walking in roadway with traffic | 548 | 12.3 | 146 | 10.8 | 0.9 |
| Walking in roadway against traffic | 355 | 8.0 | 65 | 4.8*** | 0.6 |
| Working on vehicle | 82 | 1.8 | 47 | 3.5*** | 1.9 |
| Working on roadway | 34 | .8 | 29 | 2.2*** | 2.8 |
| Playing in roadway | 219 | 4.9 | 49 | 3.6* | 0.7 |
| Standing in roadway | 67 | 1.5 | 109 | 8.1*** | 5.4 |
| TOTAL | 4458 | 100.0 | 1348 | 100.0 | |

[a] The Hazard Index is the ratio of Accident Data to Baserate Data. If Hazard Index is 1.0, the particular behavior was more frequently found in the accident data than in the baserate data.

Z-test significance levels, differences are not significant if not indicated.

* .05
** .01
*** .001

Table III-32

Vehicle Type for Baserate Data and Accident Data

| Vehicle Type | Baserate Data | | Accident Data | |
|---|---|---|---|---|
| | Total | Percent | Total | Percent |
| Passenger car, van, pickup | 24,181 | 90.2 | 1,315 | 93.9*** |
| Truck | 2,019 | 7.5 | 26 | 1.9*** |
| Bus | 325 | 1.2 | 20 | 1.4 |
| Other, tractor, etc. | 285 | 1.1 | 40 | 2.9*** |
| TOTAL | 26,810 | 100.0 | 1,401 | 100.0 |

Z-test significance levels, differences are not significant if not indicated

* .05
** .01
*** .001

Table III-33

Vehicle Speeds for Baserate Data and Accident Data

| Vehicle Speed | Baserate Data | | Accident Data | |
|---|---|---|---|---|
| | Total | Percent | Total | Percent |
| Near or at posted speed | 18,761 | 70.3 | 916 | 63.9*** |
| Apparently faster than posted speed | 3,078 | 11.5 | 40 | 2.8*** |
| Significantly slower than posted speed | 4,843 | 18.2 | 477 | 33.3*** |
| TOTAL | 26,682 | 100.0 | 1,433 | 100.0 |

Z-test significance levels, differences are not significant if not indicated.

* .05
** .01
*** .001

Table III-34

Vehicle Action for Baserate Data and Accident Data

| Vehicle Action | Baserate Data | | Accident Data | | Hazard Index[a] |
|---|---|---|---|---|---|
| | Total | Percent | Total | Percent | |
| Going straight ahead | 22,749 | 85.1 | 1,181 | 77.2*** | 0.9 |
| Making right turn | 1,355 | 5.1 | 35 | 2.3*** | 0.5 |
| Making left turn | 1,402 | 5.2 | 34 | 2.2*** | 0.4 |
| Making U turn | 52 | 0.2 | 5 | 0.3 | 1.5 |
| Slowing or stopping | 513 | 1.9 | 23 | 1.5 | 0.8 |
| Starting in roadway | 129 | 0.5 | 29 | 1.9*** | 3.8 |
| Starting from parked position | 192 | 0.7 | 17 | 1.1 | 1.6 |
| Stopped in travel lane | 86 | 0.3 | 5 | 0.3 | 1.0 |
| Parked | 31 | 0.1 | 1 | 0.1 | 1.0 |
| Backing | 37 | 0.1 | 46 | 3.0*** | 3.0 |
| Passing | 32 | 0.1 | 38 | 2.5*** | 2.5 |
| Changing lanes or merging | 111 | 0.4 | 18 | 1.2*** | 3.0 |
| Out of control | 0 | 0.0 | 42 | 2.7*** | |
| Other | 46 | 0.2 | 55 | 3.6*** | 1.8 |
| TOTAL | 26,735 | 100.0 | 1,529 | 100.0 | |

[a] The Hazard Index is the ratio of Accident Data to Baserate Data. If Hazard Index is 1.0, the particular behavior was more frequently found in the accident data than in the baserate data.

Z-test significance levels, differences are not significant if not indicated.

* .05
** .01
*** .001

## Accident Type Summary Data

This section supports the accident typology development that occurred during the course of the data collection and data analysis activities. During the data collection and data analysis operations, a number of accident types were developed. Most frequently, a particular accident type is distinguished by the presence or absence of one or more critical descriptors. For example, dart-outs must involve short-time exposure on the part of a pedestrian crossing midblock; the pedestrian must appear suddenly in the path of the vehicle. In order to adequately describe each type and, in turn, develop effective countermeasures, it was also necessary to identify other salient characteristics of the various accident types, as listed below:

Accident Type: Critical Descriptors

01 Dart-Out, First Half: Not at an intersection, ped appeared suddenly, crossed less than halfway

02 Dart-Out, Second Half: Same as Dart-Out, First Half, except ped crossed more than halfway

03 Midblock Dash: Not at intersection, ped running but not short-time exposure (i.e., not 01)

11 Intersection Dash: At intersection, short-time exposure or running

12 Vehicle Turn/Merge with Attention Conflict: Driver turning and attending to traffic, not pedestrian

13 Turning Vehicle: Ped, not running (i.e., not 11), struck by turning vehicle, attention conflict not documented

14 Trapped: At signalized intersection, ped hit when light changed and traffic started moving (not 22)

22 Multiple Threat: Ped struck by vehicle traveling in same direction as other cars that had stopped for ped

23 Backing-Up: Ped struck by backing-up vehicle but ped not clearly aware of the vehicle movement

24 Ped Not in Roadway: Ped struck while not in the roadway (not 23, 33, 34, or 25)

25 Walking Along Roadway: Ped struck while walking along the edge of the roadway or on the shoulder, can be either walking with traffic or facing traffic

26 Hitchhiking: Ped struck while attempting to thumb a ride

31 Bus Stop-Related: Ped struck while crossing in front of a bus standing at a bus stop located on the "near side" of the intersection

32 Vendor/Ice Cream Truck-Related: Ped struck going to or from a vendor in a vehicle on the street

33 Disabled Vehicle-Related: Ped struck while working on or next to a disabled vehicle

34 Result of Auto-Auto Crash: Ped struck by vehicle(s) as a result of an auto-auto accident

35 Working on Roadway: Ped, a flagman or other construction worker, struck while working on the roadway or shoulder

36 School Bus-Related: Ped struck while going to or from a school bus

37 Mailbox-Related: Ped struck while going to or from a mailbox or newspaper box

38 Emergency/Police Vehicle-Related: Ped struck while in the vicinity of emergency or police vehicle

39 Result of Vehicle Going Out of Control: Ped struck by a vehicle that had lost control prior to becoming involved with the pedestrian

40 Walking To or From Disabled Vehicle: Ped struck while walking to or from a disabled vehicle

97 Other: Unusual circumstances, countermeasure corrective

98 Weird: Unusual circumstances, not countermeasure corrective

99 Limited Information: Not able to specify accident type

The first part of this section contains a discussion of the summary data sheet for the entire data base. A discussion of each accident type follows. The following format will be used in discussing each type:

- Descriptive narrative
- Supplementary data
- Countermeasure concepts.

The descriptive narrative is intended to create the tone for a typical example of the type being discussed. The supplementary data discussion is intended to highlight the most interesting or salient features of the accident type as contained in the summary

data sheet as well as the results of other selected variable distributions. Following each supplementary data item listed, in parentheses, is the variable number and response code for the data item. Finally, countermeasure concepts are listed for each accident type. Countermeasure concepts are not intended to be specific countermeasures or treatments. Instead, the intent is to list the desired effect that should be achieved by a countermeasure if the occurrence of the particular accident type is to be reduced. At the end of this section, there is a summary data form for the entire accident sample and for each specific accident type. By comparing the characteristics of each type to certain other accident types, we can identify the elements that discriminate between types and identify similarities between certain types. In turn, countermeasure concepts can be developed to treat the various precipitating and predisposing factors associated with each type. The effectiveness of a given countermeasure on reducing the occurrence of a particular type, or group of types, could be estimated once the effectiveness of the countermeasure at modifying the causal factors is assessed.

The summary data sheet contains the following information for each accident type:

- Pedestrian age
- Time of day
- Area (accident site area characteristics)
- Roadway type for suburban, small town, and city locations
- Roadway type for country locations
- Selected site factors
- Pedestrian activity
- Vehicle activity
- Pedestrian causal factors
- Driver causal factors
- Environmental causal factors
- Selected interview items
- Selected pedestrian precipitating factors
- Selected driver precipitating factors.

The information in the first five categories contains the distributions for each of the responses coded; therefore, the percentage figures given for a given category sum to 100%. The remaining nine categories contain the percentage distributions for selected responses; the responses selected for inclusion in the table were typically the most frequent responses indicated. Hence, since not all of the responses are listed, the percentage figures within a given category do not necessarily sum to 100%.

The following accident types were developed and identified in the sample. However, the types marked with an asterisk will not be discussed due to the relatively small N.

Accident Typology

| | | Number | Percent |
|---|---|---|---|
| 01 | Dart-out, first half | 166 | 10.8 |
| 02 | Dart-out, second half | 157 | 10.3 |
| 03 | Midblock dash | 152 | 9.9 |
| 11 | Intersection dash | 152 | 9.9 |
| 12 | Vehicle turn/merge with attention conflict | 20 | 1.3 |
| 13 | Turning vehicle | 29 | 1.9 |
| 14 | Trapped* | 3 | 0.2 |
| 22 | Multiple threat | 26 | 1.7 |
| 23 | Backing up | 26 | 1.7 |
| 24 | Pedestrian not in roadway | 22 | 1.4 |
| 25 | Walking along roadway | 178 | 11.6 |
| 26 | Hitchhiking | 23 | 1.5 |
| 31 | Bus stop-related* | 2 | 0.1 |
| 32 | Vendor-ice cream truck | 21 | 1.4 |
| 33 | Disabled vehicle-related | 86 | 5.6 |
| 34 | Result of auto-auto crash | 14 | 0.9 |
| 35 | Working on roadway | 26 | 1.7 |
| 36 | School bus-related | 46 | 3.0 |
| 37 | Mailbox-related | 21 | 1.4 |
| 38 | Emergency/police vehicle-related | 9 | 0.6 |
| 39 | Result of vehicle out of control | 58 | 3.7 |
| 40 | Walking to or from disabled vehicle | 11 | 0.7 |
| 97 | Other | 145 | 9.5 |
| 98 | Unusual circumstances | 114 | 7.5 |
| 99 | Limited information | 24 | 1.6 |
| | Total | 1531 | 100.0 |

Type 14, Trapped, included accidents that occurred at a signalized intersection when the light changed, traffic started moving, and the pedestrian was hit. Type 31, Bus stop-related, included cases where the pedestrian was struck while crossing in front of a bus standing at a bus stop located on the "near side" of the intersection.

Figures III-1 through III-24 present summary information for all accident types discussed.

## 01
## DART-OUT, FIRST HALF
## (N=166, 10.8% of sample)

Descriptive Narrative

The dart-out, first half, typically involves a child running into a two-lane local residential street not at an intersection during the late afternoon. The driver is almost always proceeding straight, but the most important condition is that the pedestrian appears suddenly in the path of the vehicle. Frequently, he is running from behind a parked car.

Supplementary Data

- 65.7% of the pedestrians were 9 years old or younger (28)*
- 57.1% occurred between 3-7 P.M. (14 + 15)
- 74.7% occurred in city, small town, or suburban locations (269-0, 1 + 2)
- 62.6% of the sites were residential (270-3). 9.0% occurred near schools (270-4)
- 52.9% of the drivers had a detection failure precipitated by parked cars or trees, brush or weeds (404, 405-02 and 12)
- 77.7% of sites were two-lane roadways (281)
- 48.2% occurred on local streets (277-5)
- 74.1% of the pedestrians were male (30-1)
- 72.6% of the pedestrians were running on the collision course (84-7) although running was coded as a causal factor in only 56.6% (186 + 192 - 08)
- 57.8% of the pedestrians were en route, going somewhere (80-1)
- 7.6% of the pedestrians were going to or from school (218, 220-06)

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*Numbers in parentheses following Supplementary Data items refer to the variable number or the variable number and the response code referenced. See Appendix A for data form and listing of variable numbers.

- 33.7% of the pedestrians were playing before being struck (77-2)
- 78.2% of the pedestrians specifically indicated that they were not attending to traffic while on the collision course (144-1)
- 9.3% of the drivers made no evasive action because they were unaware of the need (154-1); 14.2% made no evasive action because they had insufficient time (154-2)
- 58.9% of the pedestrians were within 0.1 mile of their home (226)
- 65.5% of the sites had parking permitted on both sides (284-1); 14.6% had parking prohibited on both sides (284-4); 14.6% had no posted restriction but the width of the roadway restricted parking (284-9)
- 47.9% of the sites had curbs (285-1+8); 38.8% had sidewalks (285-1+2); 27.9% had shoulders suitable for pedestrian travel (285-3+4)
- 30.3% were more than 500 feet from an intersection (292-1); 7.9% were within 50 feet of a nonsignalized intersection (294-2); none were within 50 feet of a signalized intersection (294-1)
- 42.2% had no roadway center marking (298-1)
- Mean of 38.2 pedestrians per hour at site (standard deviation, SD = 23.028) (325)
- Mean of 309.5 vehicles per hour at site (SD = 185.3) (366)
- Mean posted speed limit 35.9 mph (SD = 11.7) (318)

Countermeasures Concepts

- Reduce running into the roadway and inattention particularly by pedestrians playing near their homes through educational and enforcement campaigns; target group to be children under 9 years of age.
- Reduce short-time exposure by improving lateral clearance and sight distance by relocating parked cars and removing trees, brush, or weeds.
- Warn drivers of potentially high-risk areas by advisory signing or warning lights. School zone signs could be actuated for longer periods, particularly in the afternoon.
- Provide pedestrian barriers at known play areas, not necessarily just playgrounds, to prevent playing children from running directly into the roadway.

02
DART-OUT, SECOND HALF
(N=157, 10.3% of sample)

Descriptive Narrative

The dart-out, second half, typically involves a child running across a local two-lane residential street not near an intersection. The major distinction between the dart-out, first half and this type is that the pedestrian is successful in crossing the first half of the roadway. There are several other subtle differences between first-half and second-half dart-outs. The second-half dart-out:

- Involves slightly older children
- Is less prevalent in the 3-7 p.m. time period
- Occurs in less uniform locations
- Has much less visual interference from parked vehicles
- Has moving vehicles as the most common visual obstruction
- Is more likely to involve a running pedestrian, especially on crossing the roadway diagonally.

Supplementary Data

- 46.5% of the pedestrians were 9 or under; 66.9% were under 15 years (28)
- 45.9% occurred between 3-7 p.m. (14, 15)
- 62.5% occurred in city, small town, or suburban locations (269-0, 1+2)
- 52.9% occurred in residential areas (270-3)
- 80.2% of the roadways had two lanes (281)
- 28.7% were local streets (277-5)
- 17.2% of drivers had a detection failure precipitated by moving traffic (404, 405-3)
- 15.3% of drivers had a detection failure precipitated by parked cars
- 18.5% of the pedestrians were playing (77-2)
- 64.3% of the pedestrians were en route, going somewhere (80-1)

- 12.4% of the pedestrians were going to or from school (218, 220-06)
- 78.3% of the pedestrians were running while on the collision course (78-3)
- 98.7% of the pedestrians were crossing the road (112-1+4+5); of these 11.5% were crossing diagonally away from the impacting vehicle (112-5)
- 61.1% of the pedestrians specifically indicated that they were not attending to traffic while on the collision course (144-1)
- 11.0% of the drivers were unaware of the need for evasive action (154-1); 15.6% had insufficient time for evasive action (154-2)
- 55.7% of the pedestrians were within 0.1 mile of home (226)
- 59.2% of the sites had parking permitted on both sides (284-1); 14.0% had parking prohibited on both sides (284-4); 20.4% had no posted restriction but the roadway width limited parking (284-9)
- 33.1% of sites had curbs (285-1+8); 24.2% had sidewalks (285-1+2); 47.8% had shoulders suitable for pedestrian travel (285-3+4)
- 39.5% were more than 500 feet from an intersection (292-1); 6.4% were within 50 feet of a nonsignalized intersection; 0.6% were within 50 feet of a signalized intersection (294-1)
- 33.1% had no roadway center marking (298-1); 22.9% had double solid center line (298-2); and 21.0% had single dashed center line (298-8)
- Mean posted speed limit was 40.0 mph (318)
- Mean of 29.0 pedestrians per hour at site (SD=23.975) (325)
- Mean of (123.55x3) 370.7 vehicles per hour at site (SD=185.386) (366)
- 11.5% of the roadways had medians, all of which were at least four feet wide (308)

Countermeasure Concepts

Countermeasure concepts applicable to dart-out, first half, would be largely applicable, plus:

- Reduce inattention and running across the roadway, especially diagonally across, through education and enforcement, target group 0-14 years of age.
- Stop pedestrians from crossing midblock by installing median barriers where possible (11.5% of cases had medians).

03
MIDBLOCK DASH
(N=152, 9.9% of sample)

Descriptive Narrative

The midblock dash typically involves a child running across a two-lane road midblock in a residential area. The driver is usually aware of the pedestrian before the collision is imminent but frequently misinterprets the pedestrian's intentions. Thus, unlike the dart-out, the pedestrian does not appear suddenly in the path of the vehicle.

Supplementary Data

- 63.7% of the pedestrians were 0-9 years old, another 21.0% were 10-14 (28)
- 50.6% occurred between 3-7 p.m. (14+15)
- 62.3% occurred in city, small town, or suburban locations (269-1+2+3)
- 66.4% were residential areas (270.3)
- 84.9% of sites were two-lane roadways (281)
- 28.9% occurred on local streets (277-5)
- 94.7% of the pedestrians were running or walking rapidly (84-3+7)
- 25.7% of the pedestrians were playing (78-2)
- 58.6% of the pedestrians were en route, going somewhere (80-1)
- 25.2% of the drivers were coded as proceeding with a lack of caution, as compared to 15.5% in the all-accidents sample (82-2)
- 58.6% of the drivers were decelerating while on the collision course as compared to 38.7% in the all-accidents sample (86-3)
- 100% of the pedestrians were crossing the roadway; 82.2% were going straight across (112-1); 8.6% were going diagonally across toward the impacting vehicle (112-4); and 9.2% were going diagonally across away from the vehicle (112-5)

- None of the pedestrians were in a marked crosswalk (116-1)
- 72.5% of the pedestrians were looking straight ahead (120-1); none were looking to both sides (120-3); 16.1% were looking right or left (120-4 5); only 2.0% were engaged in general search activity (120-8)
- 78.5% of the pedestrians specifically indicated that they were not attending to traffic (144-1); 16.8% were attending to the collision vehicle once on the collision course (144-2)
- 70.1% of the drivers were attending to the pedestrian once the collision course began (146-1); only 46.4% of the drivers were attending to the pedestrian in the all-accidents sample (146-1)
- 2.0% of the drivers were unaware of the need for evasive action (154-1); 8.0% had insufficient time for evasive action (154-2); the remaining 90.0% made some attempt at evasive action (154-3 to 19)
- 50.7% of the pedestrians were within 0.1 mile of their home (226)
- 29.6% of the drivers were within 1 mile of their home (227)
- 57.3% of the sites had parking permitted on both sides (284-1); 9.9% had parking prohibited on both sides (284-4); 26.5% had no posted restriction but the roadway width restricted parking (284-9)
- 28.3% of the sidewalks had curbs (285-1+8); 25.7% had sidewalks (285-1+2); 47.4% had shoulders suitable for pedestrian travel (285-3+4)
- 40.4% were more than 500 feet from an intersection (292-1); 3.3% were within 50 feet of a signalized intersection (294-1)
- 37.8% had no roadway center markings (298-1)
- 66.2% had no pavement edge marking (299-1)
- 8.0% had a median, all medians were wider than 4 feet (308)
- Mean posted speed limit was 38.8 mph (SD=11.6) (318)
- Mean of 27.1 pedestrians per hour at site (SD=9.03) (325)
- Mean of (102.4x3) 307.2 vehicles per hour at site (SD= 145.2) (366)

Countermeasure Concepts

- Educate drivers to be aware of unpredictable pedestrian actions, especially inattentive young pedestrians running across the roadway.
- Educate pedestrians not to run across the roadway, especially without searching adequately.
- Young pedestrians must be taught that drivers are frequently unaware of what they, the pedestrian, are about to do. Thus, even though the pedestrian knows that the driver sees him, he must not assume that the driver will be able to react properly to sudden movements.

11
INTERSECTION DASH
(N=152, 9.9% of sample)

Descriptive Narrative

The intersection dash typically involves a child running across the roadway at an intersection in a residential or commercial area. Although running and short-time exposure by the pedestrian are very frequent, the driver is also often aware of the pedestrian and misinterprets his intentions. The vehicle is near or in a nonsignalized intersection and is almost always going straight ahead.

Supplementary Data

- 42.8% of the pedestrians were 0-9 years old; another 31.0% were 10-19 (28)
- 38.8% occurred between 3-7 p.m. (14+15)
- 90.2% occurred in city, small town, and suburban locations
- 18.2% occurred at or near schools (270-4)
- Occurred almost equally on major arterials (28.9%), collector distributors (25.6%), and local streets (33.5%) (277)
- Of the 25.7% that occurred after dark, 11.2% had continuous lighting; this was twice as many continuously lighted sites as in the all-accidents sample (47). Also,11.2% occurred after dark but had no roadway lighting at all (47 - 3 + 4)
- 82.1% of the pedestrians were attempting to cross the roadway alone; 17.2% were with other pedestrians (76-1+2)
- 62.5% of the pedestrians were en route (80-1); only 12.5% were playing (78-2)
- 69.5% of the pedestrians were running (84-7); 17.2% were walking normally (84-1)
- 37.3% of the vehicles were sustaining speed (86-1); 49.3% were decelerating (86-3)
- 87.5% of the pedestrians were crossing; 4.0% were crossing diagonally toward the impacting vehicle; 7.9% were crossing diagonally away from the vehicle (112)

- 42.1% of the pedestrians were on the roadway not in a crosswalk (116-1); 18.4% were in a marked crosswalk (116-2); 39.5% were at the intersection (116-3)
- 89.4% of the vehicles were on the right side of the roadway (118-1)
- 74.3% of the pedestrians were specifically not attending to traffic (144-1); 12.2% were attending to the collision vehicle during collision course activities (144-2)
- 6.9% of the drivers were attending to the pedestrian during preinvolvement (145-3); 55.2% were during the collision course (146-3)
- 10.7% of the drivers were unaware of the need for evasive action (154-1); 8.7% had insufficient time (154-2); the pedestrian walked or ran into the vehicle in 12.0% of the cases (154-3)
- 34.3% of the pedestrians were within 0.1 mile of their home, mean=1.57 mile from home (226)
- 52.3% occurred in the last half of the pedestrian's crossing (268)
- 9.2% had a signalized intersection within 50 feet; 86.2% had nonsignalized intersection within 50 feet; 55.3% of the intersections were "T"s; 32.2% were 4-leg (293+294)
- Six of the 14 (42.9%) signalized intersections had pedestrian signals
- Mean posted speed limit at site was 35.1 mph (SD=9.251)
- Mean of 69.8 pedestrians per hour at the site (SD=39.1) (325)
- Mean of 620.8 vehicles per hour passed the site (SD=242.8) (366)

Countermeasure Concepts

- Improve existing or provide roadway lighting.
- Institute educational programs designed to reduce running into the roadway, inadequate search and detection and short-time exposure.
- Drivers must become aware of the dangers of inadequate search and detection behavior and misinterpreting the pedestrian's intent.
- Provide adequately signed and illuminated marked crosswalks where warranted.

## 12
## VEHICLE TURN/MERGE WITH ATTENTION CONFLICT
## (N=20, 1.3% of sample)

Descriptive Narrative

This type involves a vehicle turning, preparing to turn or just completing a turning or merging maneuver. The driver is attending to oncoming traffic and does not see the pedestrian. Frequently an older pedestrian misinterprets the driver's intention or does not realize that he will be struck by the vehicle while the driver is unaware of the pedestrian crossing a nonsignalized interesection in a commercial area.

Supplementary Data

- 75% of this type occurred in California (3-1)
- 50% of the pedestrians were over 50 years old (28)
- 70% occurred in city and small town locations (269-0,1)
- 75% occurred in commercial areas (270-1)
- 55% of the roadways had three or more lanes (281)
- 50% of the pedestrians were struck in the first lane entered (283)
- 50% of the vehicles were leaving the intersection (292-4)
- 45% of the vehicles were turning left; 40% were turning right (144-2,3)
- 35% of the pedestrians misinterpreted the driver's intent (186, 192, -14)
- 85% of the drivers were not specifically attending to the pedestrian (198, 204-07)
- 60% of the cases had no environmental causal factors indicated (210-01)
- 85% of the pedestrians were en route (80-1)
- 45% of the drivers were indicated as proceeding with a lack of caution (82-3)
- 70% of the pedestrians were walking normally; 10% were walking slowly; 10% were running (84-1,2,7)

- 85% of the drivers were accelerating (86-2)
- 75% of the pedestrians were looking straight ahead (120-1)
- 30% of the drivers were looking straight ahead (122-1); 35% were looking left only (122-5); 15% were looking right only (122-4)
- 50% of the pedestrians were specifically indicated as not attending to traffic (144-1); 30% were attending to the collision vehicle (144-2)
- The drivers were attending to: the pedestrian ,25% (146-3); moving vehicles, 35% (146-4); standing vehicles, 10% (146-5); normal driving activities, 25% (146-8)
- 55% of the pedestrians were unaware of the need for evasive action (153-1)
- 35% of the drivers were unaware of the need for evasive action (154-1); another 20% were aware of the need but had insufficient time (154-2)
- 50% were at a nonsignalized intersection (294-2); 35% were at a signalized intersection (294-1); of the seven accidents at signalized intersections, three had pedestrian signals (295-6+8)
- Of the seven accidents occurring at signalized intersections, two involved vehicles making a right turn on a red signal. Both pedestrians were crossing with the light from the vehicle's right.
- 50% were in a marked crosswalk (116-2)
- Mean posted legal speed was 32.2 mph (SD = 7.9) (318)
- 53.8 pedestrians per hour observed at the site (SD = 15.886) (325)
- 474.2 vehicles per hour observed at the site (SD = 203.528) (366)

Countermeasure Concepts

- Drivers must be taught to be more aware of danger to pedestrians and others when they let a single driving task, like turning, distract them from the total driving task.
- Pedestrians must learn that drivers have complex tasks and cannot always be on the lookout for pedestrians.
- High occurrence in California has implications for pedestrian right-of-way regulations; pedestrians are assuming that the driver sees them and will yield the right-of-way as they are required to do.
- Since 40% of the vehicles were turning right and 35% of the intersections were signalized, the pedestrian safety implications of right-turn-on-red needs further investigation.

13
TURNING VEHICLE
(N=29, 1.9% of sample)

Descriptive Narrative

This type usually involves a turning vehicle striking a pedestrian who is walking across the roadway at an intersection. The driver's attention conflict is not documented as in the case of the Vehicle Turn/Merge With Attention Conflict type. The accidents tend to occur at very busy intersections on multi-lane highways. Nearly one-third involved hit and run drivers who were frequently unaware that they had struck a pedestrian.

Supplementary Data

- 93.1% of this type occurred in California (3-1)
- Most age groups are represented (28)
- Tended to occur during morning and evening rush-hour peaks (14,15)
- 72.4% occurred in city and small town locations (269-0,1)
- 72.4% occurred in commercial areas (270-1)
- 72.4% occurred on major arterials or collector distributor roadways (277,-3,4)
- 62.1% of the roadways had three or more traveled lanes (281)
- 86.2% of the pedestrians were struck before crossing two lanes
- 75.9% of the intersections were 4-leg (293-2)
- 89.7% of the pedestrians were crossing at an intersection (38-1)
- 48.3% of the drivers were turning right (40-2)
- 34.5% of the drivers were turning left (40-3)
- In 31.0% of the cases, no pedestrian causal factors were indicated (186-01)
- 55.2% of the drivers were indicated as having inadequate search and detection (198,204-06)

- 44.8% of the drivers had misdirected search and detection patterns (198,204-07)
- In 72.4% of the cases, no environmental causal factors were indicated (210-01)
- 31.0% of the pedestrians misinterpreted the driver's intent (396,397-01)
- 51.7% of the drivers were distracted by a traffic-related maneuver (402,403-02)
- 65.5% of the pedestrians were female (30-2)
- 31.0% of the drivers were hit and run (31-3)
- 85.2% of the pedestrians were en route, going somewhere (80-1)
- 55.2% of the drivers were proceeding with a lack of caution (82-3)
- 85.7% of the pedestrians were walking normally (84-1)
- 35.7% of the vehicles were sustaining speed (86-1)
- 55.2% of the vehicles were accelerating (86-3)
- 62.1% of the pedestrians were in a marked crosswalk (116-2)
- 34.6% of the pedestrians were looking straight ahead (120-1)
- 57.5% of the pedestrians were not attending to traffic (144-1)
- 30.8% of the drivers were not attending to traffic (146-1)
- 30.8% of the drivers were attending to normal driving activities (146-8)
- Only 3.9% of the drivers were attending to the pedestrian (146-3)
- 46.2% of the pedestrians were unaware of the need for evasive action (153-1)
- 19.2% had insufficient time for evasive action (153-2)
- 46.4% of the drivers were unaware of the need for evasive action
- 32.1% of the drivers attempted to stop (154-5)
- 71.4% were at signalized intersections (294-1)
- 31.0% were at signalized intersections with pedestrian signals (295-6,8)

- 28.6% were at nonsignalized intersections
- Mean posted speed 29.0 mph (SD=6.5) (318)
- 150.3 pedestrians per hour were observed at the site (SD=51.2) (325)
- 892.1 vehicles per hour were observed at the site (SD= 328.0) (366)
- Of the 34.4% turning right at signalized intersections, half of the vehicles were turning right on red, half were turning right on green. 80% of the turning-right-on-red vehicles struck a pedestrian approaching from the right before they started the turn. (One case involved a pedestrian crossing from the left against the light being struck by the vehicle after the turn was completed.)
- Of the 17.2% involving vehicles turning right on green, 80% struck pedestrian approaching from the right, and 20% approaching from the left.

Countermeasure Concepts

- Drivers need to be careful while turning especially in relatively complex intersection situations.
- High incidence in California has implications relative to the safety-related effectiveness of pedestrian right-of-way regulations and right turn on red regulations.
- Pedestrian signalization and pedestrian interpretation of the meaning of existing signals need to be improved.

22
MULTIPLE THREAT
(N=26, 1.7% of sample)

Descriptive Narrative

The multiple threat situation occurs when one vehicle stops to let a pedestrian cross and the pedestrian is struck by another vehicle traveling in the same direction as the first vehicle.

Supplementary Data

- 46.2% of the pedestrians were under 15 years old (28)
- Tended to occur around noon and in the afternoon (14+15)
- 69.1% were at intersections (6)
- 61.5% occurred in cities or small towns (269.-0,1)
- 92.3% had four or more lanes
- Standing traffic served as a visual obstruction in the vast majority of the cases (210,216-14+18)
- 30.7% of the pedestrians were attempting to cross the roadway with other pedestrians (76-2)
- 92.0% of the pedestrians were en route (80-1)
- 50.0% of the pedestrians were walking normally (84-1)
- 42.3% of the pedestrians were running (84-7)
- 46.2% of the vehicles were sustaining speed (86-1); 42.3% were decelerating (86-3)
- 53.9% of the pedestrians were in a marked crosswalk (116-2)
- 73.1% of the pedestrians were looking straight ahead (120-1)
- 56% of the pedestrians were not attending to traffic (144-1); 24% were attending to the collision vehicle (144-2)
- 76.9% occurred in California (3-1)
- In 36.0% of the cases, the driver of the overtaking vehicle was attending to the standing vehicle that had stopped for the pedestrian (144-5)

- 57.7% occurred at nonsignalized intersections (294-2)
- Mean posted legal speed was 36.4 mph (SD=6.1) (318)
- 93.5 pedestrians per hour observed at the site (SD=49.2) (325)
- 1282.5 vehicles per hour observed at the site (SD=280.7) (366)

Countermeasure Concepts

- High incidence in California suggests that pedestrian right-of-way regulations may actually be counterproductive in certain situations, such as the multiple threat.
- Involvement of nonsignalized marked crosswalk may make their value on very busy commercial streets questionable.
- Drivers should be made aware of the multiple threat situation so that they will be duly cautious when passing a stopped vehicle.

23
BACKING UP
(N=26, 1.7% of sample)

Narrative Description

The backing up accident type involves a pedestrian being struck by a vehicle that is backing up and the pedestrian is not aware that the collision vehicle is backing up.

Supplementary Data

- 42.3% of the pedestrians were under 5 years or over 65 years old (28)
- Most occurred in the late morning and early afternoon (14+15)
- Occurred in all locations and all areas (269, 270)
- 65.4% of the pedestrians were not attempting to cross the roadway (76-3)
- 30.8% of the pedestrians were playing (78-2); 38.5% were en route, going somewhere (80-1)
- 38.5% of the pedestrians were walking normally (84-1); 19.2% were standing, not moving (84-4); 11.5% were running (84-7)
- 38.5% of the pedestrians were on the roadway, not in crosswalk (116-1); 15.4% were on the shoulder (116-4); 26.9% were in a parking lot or driveway (116-8)
- Although all of the vehicles were backing up, only 36.0% of the drivers were looking backward (122-2)
- 19.2% of the pedestrians were attending to the collision vehicle (144-2)
- 69.2% of the pedestrians were unaware of the need for evasive action (153-1)
- 92.3% of the drivers were unaware of the need for evasive action (154-1)
- Mean impact speed was 4.5 mph (SD=2.7) (257)

Countermeasure Concepts

- Age of involved pedestrians, their unawareness of the vehicle's direction of travel, and the incidence of pedestrian causal factors suggest backup warning devices (buzzers, etc.) may be appropriate.

## 24
## PED NOT IN ROADWAY
## (N=22, 1.4% of sample)

Descriptive Narrative

This type involves pedestrians who were not in the roadway when struck. Excluded are backing-up, disabled vehicle-related, result of auto-auto crash, or walking along roadway types.

Supplementary Data

- Most occurred in late afternoon and early evening (14,15)
- 45.5% occurred at country locations (269-3)
- Pedestrian activities were 22.7% working (78-1); 18.2% playing (78-2); 22.7% standing, not moving (78-7); 22.7% en route (80-1)
- Pedestrian locations included 27.3% on roadway shoulder (116-4); 13.6% in a yard or field (116-7); 54.6% in parking lot or private drive (116-8)
- 36.4% of cases had no pedestrian causal factors indicated (198-01)
- 40.9% had driver inadequate search and detection (198, 204-06)
- 22.7% of the accidents had vehicle speed coded as a causal factor (198,204-03)
- 27.3% of drivers ran off the traveled way (198,204-15)
- 18.2% had driver alcohol involvement indicated as a precipitating factor (406,407-03)
- 45.4% had no environmental causal factors indicated (210-01)

Countermeasure Concepts

- Variability within this type suggests that no specific countermeasure would be universally effective.
- Controlling speeding vehicles and preventing them from running off the traveled way would affect nearly one-half of the cases.
- Improving driver search and detection activities in parking lots and private driveways would impact on somewhat fewer than half of the cases.

25

## WALKING ALONG THE ROADWAY

(N=178, 11.6% of sample)

### Descriptive Narrative

This, the largest type identified, involves a pedestrian usually between 10-24 years old, walking along a two-lane roadway in a residential, country location. They frequently occur with the pedestrian walking with traffic at night.

### Supplementary Data

- 62.4% of the pedestrians were 10-24 years old (28)
- 55% occurred after dark (47-3 through 9)
- 33.7% had inadequate or no roadway lighting coded as a causal factor (210, 216-03+04)
- The pedestrians were most frequently dressed in dark clothes; 52.2% had dark upper garments; 48.2% had dark lower garments (248-3, 252-3). Blue was the most frequently worn color; 27.1% were wearing blue upper garments (250-1); 46.3% were wearing blue lower garments (254-1)
- 19.1% had inadequate or no shoulder coded as a causal factor (210, 216-06)
- 64.6% of the pedestrians were walking in the road with traffic (38-06)
- 23.6% of the pedestrians were walking in the road against traffic (38-07)
- 76.9% of the accidents were precipitated by search or detection failure by the pedestrian (392, 393-01)
- 38.2% of the accidents occurred at sites that were dark and had no lighting (47-3)
- 82% of the pedestrians were en route, going somewhere (80-1)
- 6.2% of the pedestrians were going to or from school (80-4+5)
- Pedestrian movement characteristics while on the collision course included 66.5% walking normally (84-1), 10.8% walking slowly (84-2), 5.7% walking rapidly (84-3),4% standing (84-4), 4.6% running (84-7), 5.1% stumbling or falling (84-8)
- 40.8% of the vehicles were sustaining speed (86-1); 35.1% were decelerating (86-3)

- 69.7% of the collisions occurred on the roadway (116-1 +3); 27.0% occurred on the shoulder
- 78.2% of the pedestrians were looking straight ahead (120-1)
- 62.3% of the drivers were looking straight ahead (122-1)
- 72.4% of the pedestrians were unaware of the need for evasive action (153-01)
- 35.3% of the drivers were unaware of the need for evasive action (154-01)
- 30.3% of the pedestrians were within 0.1 mile of home; 67.2% were within 1 mile of home (224)
- 47.5% of the pedestrians were struck by the right front corner of the vehicle (263-5)
- 25.9% of the vehicles were pickups or vans (259-5)
- Pedestrian accommodations at the site included 2.8% sidewalk with curb (285-1); 18.6% improved shoulder suitable for pedestrian travel (285-3); 35.6% unimproved shoulder suitable for pedestrian travel (285-4); 7.9% improved shoulder unsuitable for pedestrian travel (285-5); 20.9% unimproved shoulder unsuitable for pedestrian travel (285-6); 9.6% no shoulder, pedestrians must walk on traveled way (285-7); 4.5% curb only, no sidewalk (285-8)
- 58.4% of the pedestrians were alone (76-1+3); 41.6% of the pedestrians were with other pedestrians (76-2+4)
- 66.1% of the sites had no pavement edge markings (299-1); 31.6% had a painted edge marking (299-2)
- Average shoulder width was 5.3 feet (SD=4.1) (304)
- 63.8% of the accidents occurred on level roadway (314-1); 14.7% were on a downgrade (314-5)
- Mean posted speed limit was 41.8 mph (SD=12.0) (318)
- 4.6% pedestrians per hour observed at site (SD=15.2) (325)
- 75.7% vehicles per hour observed at site (SD=134.3) (366)

Countermeasure Concepts

- Improve or provide roadway lighting.
- Improve vehicular lighting.
- Encourage lighter clothing or reflectorized material.
- Encourage walking against traffic as opposed to walking with traffic. Slogans should encourage walking on the left, to the left of the pavement edge line. The base-rate data (page III-19) also supports the relative safety associated with walking in the roadway with traffic.
- Provide pavement edge marking to improve pedestrian/vehicle separation.
- Increase desirability of shoulder as a walkway.
- Provide sidewalks or other pedestrian walkways to increase pedestrian/vehicle separation.

## 26
## HITCHHIKING
## (N=23, 1.5% of sample)

Narrative Description

This type involves pedestrians who were struck while hitchhiking along the side of the roadway. The majority of the accidents occur at night, nearly one-third of the hitchhikers had been drinking, and the roadway was wet more than one-third of the time.

Supplementary Data

- 69.5% of the pedestrians were 15 to 24 years old (28)
- 82.6% were males (30)
- 87% occurred at night (47-3 through 9); 43.5% occurred where there was no roadway lighting (47-3).
- Inadequate or no roadway lighting was coded as a causal factor in 39.1% of the cases (210, 216-03+04)
- 26.1% of the hitchhikers were wearing dark colored upper clothing.
- 34.8% of the hitchhikers were wearing dark colored lower clothing.
- Majority occurred on relatively major roadways in open areas of suburban and country locations.
- Alcohol was listed as a pedestrian causal factor in 30.4% of the cases (186, 192-04)
- Alcohol was listed as a driver causal factor in 4.4% of the cases (198, 204-04)
- It was raining 17.4% of the hitchhiking cases (versus 4.5% for the entire sample) (41-3); the roadway was wet 34.8% of the time (versus 10.4% for the entire sample) (43-2)
- 26.1% of the hitchhikers were with other pedestrians (76-4)
- 94.4% of the pedestrians were hitchhiking (78-3); 5.6% were more actively "flagging down" the vehicle to solicit a ride (78-6)
- 42.1% of the pedestrians were walking (83-1+2) while 47.8% were standing, not moving (83-4); of the pedestrians who were walking, 26.1% were starting across the roadway (112-1)

- 73.9% of the collisions occurred on the shoulder or the edge of the traveled way (268-8); 21.8% occurred on the roadway while the hitchhiker was attempting to cross the roadway (268-2+4)
- The driver running off the traveled way was listed as a causal factor in 13% of the cases (198,204-15). The vehicle was out of control in only 4.4% of the cases (400, 401-07)
- 8.7% of the cases involved the driver misinterpreting the pedestrian's intent as a causal factor (198, 204-10)
- 16.4% of the cases involved the pedestrian misinterpreting the driver's intent as a causal factor (186, 192-14)
- 28.6% of the pedestrians were attending to the collision vehicle (144-2); 33.3% were not attending to traffic (144-1); 19% were attending to other moving vehicles
- 59.1% of the pedestrians were unaware of the need for evasive action (153-1); 27.3% were aware of the need but had insufficient time to react (153-2); 9.1% of the pedestrians walked or ran into the vehicle
- 40.1% of the drivers were unaware of the need for evasive action (154-1) while 27.3% attempted to swerve and stop in order to avoid (154-7)
- The average outside shoulder width was 7.7 feet wider than all but one other accident type (304)
- 65.2% of the accident sites had shoulders that were 6 feet or wider.
- 43.5% of the sites had no pavement edge marking (299-1)
- The 73.9% of the pedestrians who were hit on the shoulder or edge of the traveled way were nearly evenly divided between actually on the shoulder (43.5%) and on the edge of the traveled way (34.8%). 88.9% of the pedestrians hit on the shoulder were at sites with pavement edge markings. 37.5% of the pedestrians hit on the edge of the traveled way were hit at sites with pavement edge markings (special cross-tabulation).

Countermeasure Concepts

- Analysis does not suggest that hitchhiking is necessarily intrinsically dangerous, especially when the relative low incidence of occurrence is considered. What is needed are ways to reduce accidents that occur at night, in the rain, with drinking hitchhikers. Possibly restrict hitchhiking to better lighted areas where vehicles can be safely pulled off the traveled way.

32
VENDOR/ICE CREAM TRUCK
(N=21, 1.4% of sample)

Narrative Description

The vendor/ice cream truck accident involves a child running into a residential, two-lane roadway on his/her way to or from a street vendor. The accident occurs on local streets in the late afternoon and is basically a variation of the dart-out except that the pedestrian's origin or destination is specifically a street vendor. Sudden appearance of the pedestrian and visual obstruction by parked cars are frequently associated with this type.

Supplementary Data

- 71.4% of the pedestrians are under 10 years of age (28)
- 100% of the accidents occurred in residential or school areas (270-3+4)
- 90.5% occurred on local two-lane streets (277-5, 281) usually with no parking restrictions on either side of the roadway (284-1)
- Parked cars blocking the driver's view was listed as a precipitating factor in 71.4% of the cases (404, 405-2)
- All of the accidents occurred during clear, dry weather conditions (41-1+2, 43-1)
- 95.2% of the pedestrians were attempting to cross the roadway alone (76-1); 4.8% were with another pedestrian (76-2)
- 90.5% of the pedestrians were running (84-7)
- Most (52.4%) of the drivers were proceeding with normal caution (82-1); 28.6% were proceeding with special caution (82-2)
- 57.1% of the vehicles were sustaining speed while on the collision course (86-1); 33.3% were decelerating
- All of the pedestrians were not in a crosswalk (116-1)
- 61.9% of the vehicles were on the right side of the road (117-1); 23.8% were in the middle part of a narrow roadway with no painted centerline (117-3)

- 95.2% of the pedestrians were looking straight ahead (20-1)
- 61.9% of the pedestrians did not make an evasive action because they were unaware of the need (153-1)
- 4.8% of the drivers were unaware of the need for evasive action (154-1); 14.3% had insufficient time (154-2); 14.3% made no evasive action because the pedestrian walked or ran into the vehicle; the remainder (66.6%) of the drivers attempted to swerve or stop or otherwise avoid the pedestrian
- 82.4% of the pedestrians were within 0.1 mile of home
- Mean preinvolvement speed was 20.9 mph (256), mean impact speed was 11.7 mph (257), mean posted speed limit was 26.9 mph (381)
- 20% of the pedestrians received minor injuries (264-2) while 55% received moderate injuries (264-3)
- Areas where accidents occurred rarely had commercial or industrial buildings, apartments, schools or playgrounds (271, 272, 274, 275, 276) yet 90.5% of the sites had more than nine single-family residential units within 250 feet in both directions from the P.O.I.
- 76.2% of the pedestrians approached from the vehicle's right (282-1)
- 66.7% of the pedestrians were struck in the first lane entered
- 90.5% of the sites had parking permitted on both sides of the roadway (284-1)
- 76.2% of the sites had sidewalks (285-1+2); 19.0% had improved shoulders suitable for pedestrian travel (285-4)
- 19.1% of the accidents were more than 500 feet from an intersection (292-1); 95.2% were more than 50 feet from an intersection (294-1, 2 through 7)
- 30.2 pedestrians per hour were observed at the site (325)
- 87.2 vehicles per hour were observed at the site (366)

Countermeasure Concepts

- Although there is good evidence that the driver is generally being reasonably careful while driving past the vendor truck, perhaps vendor warning lights would increase the vendor's conspicuity and urge greater caution.
- Enact enforcement-related regulations specifying a maximum speed or perhaps even require the vehicle to stop before passing a street vendor.
- Require vendors to stop where there are no parked vehicles.

33
DISABLED VEHICLE-RELATED
(N=86, 5.6% of sample)

Descriptive Narrative

This type typically involves a young man working on or standing next to a disabled vehicle at night on a secondary or primary highway in an open, country location. The collision most frequently occurs on the edge of the traveled way although the vehicle occasionally runs off the traveled way and strikes the pedestrian. Rain, icy streets, and out-of-control collision vehicles are often involved.

Supplementary Data

- 55.8% of the pedestrians were 15-29 years old (28)
- 69.8% were males (30-1)
- 65.1% occurred after dark (47-2 through 9); 47.4% were at unlit locations
- 66.3% occurred in country locations (269-3); 52.3% occurred in open areas (270-6)
- Occurred on all types of roadways although primary highways (20.9%) and secondary highways (18.6%) were most common (278-3, 4)
- Raining in 8.2%; snowing in 7.1% of the cases (41-3, 4)
- The roadway was wet in 15.1% (43-2); snow covered in 5.8% (43-3); and icy in 10.5% (43-4)
- Only 2.3% of the pedestrians were attempting to cross the roadway (76-1); 48.8% were not attempting to cross the roadway alone (76-3); 48.8% were not attempting to cross the roadway with other pedestrians (76-4)
- 57.1% were working on or pushing a vehicle (78-4); 27.3% were standing, waiting, not moving (78-7)
- 46.3% of the drivers were proceeding with a lack of caution (82-3); 41.5% were proceeding with normal caution (82-1)

- While on the collision course, 34.1% of the vehicles were sustaining speed (86-1); 30.6% were decelerating (86-3); and 16.5% were out of control (86-7)
- 32.9% of the pedestrians were not on the roadway (116-2 through 9)
- 52.4% of the pedestrians were unaware of the need for evasive action (153-1); 24.4% had insufficient time (153-2)
- 36.7% of the drivers were unaware of the need for evasive action (154-1); 8.9% had insufficient time (154-2)
- Mean posted speed was 49.1 mph (318)
- Mean preinvolvement speed was 37.1 mph (256)
- Mean impact speed was 32.2 mph (257)
- 44.2% of the sites had no shoulders or shoulders unsuitable for pedestrian travel (285-5+6); 36.0% had shoulders suitable for pedestrian travel (285-3+4); 17.5% had curbs (285-1+8)
- 45.4% of the sites had parking prohibited on both sides (284-4); 31.4% had parking permitted (284-1); 20.9% had no posted restriction but the roadway width restricted parking
- 68.6% of the sites had no median (288-1)
- 52.3% of the sites had no pavement edge marking (299-1); 18.6% had no roadway center markings (298-1)
- 7.5 pedestrians per hour observed at site (325); 436.5 vehicles per hour observed (366)
- Only 26.8% of the disabled vehicles displayed both lights and flashers. Nearly half (48.7%) of the vehicles had neither lights nor flashers.

| | No Lights or Flashers | Lights Only | Flashers Only | Both Lights and Flashers | TOTAL |
|---|---|---|---|---|---|
| Daytime | 30.2 | 0.0 | 8.2 | 0.0 | 38.4 |
| Nighttime | 18.5 | 16.3 | 0.0 | 26.8 | 61.6 |
| TOTAL | 48.7 | 16.1 | 8.2 | 26.8 | 100.0 |

- Only 5.8% of the vehicles had run out of gas, the remainder were disabled because of a mechanical problem or as the result of a previous accident.

Countermeasure Concepts

- Improve visibility, at night and in the rain, of disabled vehicles (i.e., flashers, flares, roadway lighting).
- Keep vehicles on traveled way, prevent them from veering onto the shoulder (i.e., pavement edge markings).
- Urge pedestrians to get their disabled vehicles off the roadway.
- Provide disabled motorist aid system (call boxes, roadway patrols, etc.).

34

RESULT OF AUTO-AUTO

(N=14, .9% of sample)

Descriptive Narrative

This type involves a pedestrian who was struck as a result of an auto-auto accident. Although in many respects similar to the disabled vehicle type, the auto-auto accident frequently involves an out-of-control vehicle, a driver under the influence of alcohol and/or excessive vehicle speed. The pedestrian was injured after one vehicle struck another vehicle.

Supplementary Data

- 85.7% of the pedestrians were not attempting to cross the roadway (76-3+4)
- 36.4% of the pedestrians were working on a vehicle (78-4); 27.3% were standing, not moving (78-7)
- 15.4% of the vehicles were out of control while on the collision course (86-7)
- 64.3% of the pedestrians were on the roadway (116-1+2+3); 21.4% were on the shoulder (116-4)
- 7.7% of the drivers were attending to the pedestrian while on the collision course (146-3)
- 42.9% of the pedestrians were unaware of the need for evasive action (153-1); 28.6% had insufficient time (153-2)
- 42.8% of the drivers were unaware of the need for evasive action (154-1); 7.1% had insufficient time (154-2)
- 53.9% of the pedestrians were seriously injured (264-4); 15.4% were fatally injured (264-5)
- 46.2% occurred in 55 mph speed zones (318)

Countermeasure Concepts

- Prevent the first auto-auto collision, control drinking drivers and speeding.

35
WORKING ON ROADWAY
(N=26, 1.7% of sample)

Descriptive Narrative

This type involves a pedestrian, usually a flagman or other construction worker, who is struck while working on the roadway.

Supplementary Data

- 100% of the pedestrians were male (30-1)
- The weather was clear or cloudy in 96.0% (41-1+2) and the roadway was dry in 88.5% (43-1), wet in 7.7% (43-2), and icy in 3.9% (43-4) of the cases
- 92.3% occurred during daylight (47-1)
- 80.8% occurred in a construction site (49-8)
- 92.3% of the pedestrians were not attempting to cross the roadway (76-3+4)
- 73.1% of the pedestrians were standing (83-4); 15.4% were walking normally (83-1)
- 19.2% of the pedestrians were on the shoulder (116-4)
- 23.1% of the pedestrians were attending to the collision vehicle
- 48.0% of the drivers were proceeding with a lack of caution (82-3)
- 24.0% of the drivers were attending to the pedestrian (146-3)
- 61.5% of the pedestrians were unaware of the need for evasive action (153-1); 11.5% had insufficient time (153-2)
- 60.0% of the drivers were unaware of the need for evasive action (154-1); 4.0% had insufficient time (154-2)
- 31.6% of the pedestrians had orange upper clothing (250-4)

Countermeasure Concepts

- Improve roadway construction site safety by installing advisory signing, barriers, etc.
- Enact regulations requiring all roadway construction workers and supervisory personnel to wear high visibility clothing.
- Reduce vehicle speed and increase driver vigilance in construction areas.

36
SCHOOL BUS-RELATED
(N=46, 3.0% of sample)

Descriptive Narrative

This type involves a pedestrian being struck while going to or from a school bus or a school bus stop, usually in a residential, country location along a secondary highway.

Supplementary Data

- 97.8% of the pedestrians were under 19 years old (28)
- 73.9% occurred during daylight (47-1); 6.5% during twilight (47-2); 13.0% during darkness with no lighting (47-3); 2.2% during darkness with backlighting from abutting properties (47-4); 4.4% during darkness with spot lighting at the accident site (47-5)
- 56.5% of the pedestrians were attempting to cross the roadway alone (76-1); 21.7% were with other pedestrians attempting to cross (76-2); 13.0% were not attempting to cross alone (76-3); 8.7% were not attempting to cross with other pedestrians (76-4)
- 52.2% of the pedestrians were walking (83-1,2+3); 19.6% were standing (83-4); 26.1% were running (83-7)
- 37.0% of the vehicles were proceeding with a lack of caution (82-3)
- 51.1% of the pedestrians were unaware of the need for evasive action (153-1); 17.8% had insufficient time for evasive action (153-2)
- 35.6% of the drivers were unaware of the need for evasive action (154-1); 17.8% had insufficient time
- 22.2% of the collision vehicles were buses (259-7)
- The pedestrians were an average of 0.18 mile from their homes; 68.9% were within 0.1 mile (226)
- 34.8% of the pedestrian trip origins were school bus stops (218-15); 54.8% of the origins were home (218-1)
- 26.1% of the pedestrian trip destinations were school bus stops (220-15); 46.0% of the destinations were home (220-1)
- 8.7% of the pedestrians were walking along the roadway (112-2,13)

Countermeasure Concepts

- Locate bus stops so that students do not cross roadway until at the bus stop when bus flashers are present, particularly on secondary and primary roadways.
- Enact regulations to increase penalties to drivers who go past buses with flashers on; stricter enforcement of these regulations.
- Signs/signals for hazardous school bus stops and/or along pupils' routes to school bus stops.

37

MAILBOX-RELATED

(N=21, 1.4% of sample)

Descriptive Narrative

This type involves a pedestrian who was struck going to or from a mailbox or newspaper box. Usually a young child runs into a high-speed, two-lane roadway in a residential country location during the day.

Supplementary Data

- 61.9% of the pedestrians were under 9 years old (28)
- 90.5% of the pedestrians were attempting to cross the roadway alone (76-1); only 4.8% were not attempting to cross (76-3)
- 38.1% of the pedestrians were walking (84-1,2+3); 4.8% were standing (84-4); 52.4% were running (84-7)
- 71.4% of the pedestrians were not attending to traffic (144-1)
- 76.2% of the drivers were attending to the pedestrian while on the collision course
- 52.4% of the pedestrians were unaware of the need for evasive action (153-1); 4.8% had insufficient time
- None of the drivers were unaware of the need for evasive action (154-1); 4.8% made no evasive action because they assumed that the pedestrian would get clear (154-4); the remainder (95.2%) attempted to swerve, stop, or otherwise avoid the pedestrian (154-5,7+19)
- 85.7% of the pedestrians were within 0.1 mile of home (226); mean distance: .057 mile
- Mean posted speed was 50.0 mph (318)
- Mean preinvolvement speed was 40.0 mph (256)
- Mean impact speed was 26.2 mph (257)
- 61.9% of the pedestrians were seriously injured (264-4); 14.3% were killed (264-5)
- Mean of 4.5 single-family residential units within 250 feet in both driections from P.O.I. (274)

- 61.9% of the sites had shoulders suitable for pedestrian travel (285-3+4); mean shoulder width was 4.3 feet (304)
- 66.7% of the sites had no roadway edge marking (299.1)

Countermeasure Concepts

- Relocate mailboxes so that residents do not have to cross the roadway.
- Educate parents of the dangers of sending young children after the mail or paper.

38

## EMERGENCY/POLICE VEHICLE-RELATED

(N=9, 0.6% of sample)

### Descriptive Narrative

This type involves a pedestrian who was struck while in the vicinity of emergency or police vehicles. The pedestrian is typically an adult male standing, at work, and on the shoulder or edge of the traveled way, at night. The pedestrian is nearly always aware of the impending collision; the driver rarely is. Vehicle speed, driver alcohol involvement, and vehicle running off the traveled way were among the causal factors that were isolated.

### Supplementary Data

- 100% of the pedestrians were between 25 and 59 years old (28)
- 88.9% of the pedestrians were male (30-1)
- 11.1% of the sites had wet road surface (43-2); 11.1% had snow covering the roadway (43-3)
- 44.4% occurred at dark locations with no lighting (47-3); 33.3% occurred at dark locations with continuous roadway lighting
- 55.6% of the pedestrians were not attempting to cross the roadway alone (76-3); 22.2% were not attempting to cross with other pedestrians (76-4); 22.2% were attempting to cross along (76-1)
- 55.6% of the pedestrians were working (78-1); 11.1% were getting in or out of a vehicle; 11.1% were flagging down a vehicle
- 55.6% of the vehicles were proceeding with a lack of caution (82-3); 44.4% were proceeding with special caution (82-2)
- 55.6% of the pedestrians were standing, not moving (84-4); 33.3% were walking normally (84-1)
- 22.2% of the vehicles were weaving erratically while on the collision course

- 66.6% of the pedestrians were on the roadway (116-1); 33.3% were on the shoulder (116-4) while on the collision course
- 44.4% of the impacts occurred along the shoulder or edge of the traveled way (268-8)
- 55.6% of the pedestrians were attending to the collision vehicle while on the collision course (144-2); 11.1% of the drivers were attending to the pedestrian at the time (146-3)
- 11.1% of the pedestrians were unaware of the need for evasive action (153-1); 22.2% had insufficient time
- 77.8% of the drivers were unaware of the need for evasive action (154-1)
- 33.3% of the pedestrians were wearing blue upper garments; 33.3% were wearing brown (250-1,6)
- 43.3 mph was the mean posted speed (318); 30.0 mph was the mean estimated preinvolvement speed (256); 21.5 mph was the mean estimated impact speed (257)

Countermeasure Concepts

- Improve conspicuity of personnel working in the vicinity of police or emergency vehicles.
- Increase awareness of police and emergency vehicle personnel that they are not necessarily visible to drivers when near flashing emergency lights.

39

## RESULT OF VEHICLE GOING OUT OF CONTROL

(N=57, 3.7% of sample)

### Descriptive Narrative

This type involves a pedestrian being struck by a vehicle that had lost control prior to becoming involved with the pedestrian. Pedestrians of all ages, at any time of day, in any location on almost any type of roadway, are involved. Nearly all these accidents occur off the roadway, on the shoulder, or along the edge of the traveled way. These accidents might simply have been a single-vehicle accident except that a pedestrian also happened to have been struck.

### Supplementary Data

- Road surface conditions were 73.2% dry (43-1); 8.9% wet (43-2); 3.6% snow (43-3); 12.5% icy (43-4)
- 5.3% of the pedestrians were attempting to cross the roadway (76-1+2); 54.4% were not attempting to cross alone (76-3); 40.4% were not attempting to cross with other pedestrians (76-4)
- 29.8% of the pedestrians were standing, not moving (84-4); 37.8% were walking (84-1,2+3); 15.8% were running (84-7) while on the collision course
- 31.6% of the pedestrians were on the shoulder (116-4); 15.8% were in a yard or field (116-7); 12.3% were in a parking lot or private driveway; 28.1% were on the roadway (116-1,2+3) while on the collision course
- 45.5% of the pedestrians were unaware of the need for evasive action (153-1); 18.2% had insufficient time (153-2)
- 27.3% of the drivers were unaware of the need for evasive action (154-1); 6.8% had insufficient time (154-2)
- 33.3% of the collisions occurred not on the roadway (268-6); 42.1% occurred along the shoulder or edge of the traveled way (286-8)
- 79.3% of the sites had no pavement edge markings
- 37.1 mph was the mean posted speed limit (318)

- 29.5 mph was the mean estimated preinvolvement speed (256)
- 24.0 mph was the mean estimated impact speed (257)

Countermeasure Concepts

- Keep vehicles from going out of control by:
  - -- improving roadway maintenance, ice control;
  - -- controlling drinking drivers;
  - -- improving safety condition of vehicles; and
  - -- controlling speeding.

40

## WALKING TO OR FROM A DISABLED VEHICLE

(N=11, 0.7% of sample)

### Descriptive Narrative

This type involves a pedestrian walking to or from a disabled vehicle in an open, country location, frequently at night on major highways. Poor roadway lighting, poor weather conditions, and alcohol consumption by the pedestrian are frequently causal factors.

### Supplementary Data

- Weather conditions were 45.5% clear (41-1); 9.1% cloudy (41-2); 18.2% raining (41-3)
- Road surface condition was 63.6% dry (43-1); 27.3% wet (43-2); 9.1% snow (43-3)
- Lighting condition was 18.2% daylight (47-1); 54.6% dark, no light (47-3); 9.1% dark, back light only (47-4); 9.1% dark, spot light (47-5); 9.1% dark, continuous lighting (47-6)
- 63.6% of the pedestrians were walking (83-1); 9.1% were standing (83-4); 9.1% were running (83-7)
- 72.7% of the pedestrians were going across the roadway (112-1); 18.2% were going along the roadway with traffic (112-2); 9.1% were not moving (112-6)
- 80.0% of the pedestrians were unaware of the need for evasive action (153-1)
- 40.0% of the drivers were unaware of the need (154-1); 30.0% had insufficient time (154-2) for evasive action
- 27.3% of the accidents occurred along the shoulder or edge of the traveled way (268-8)
- 18.2% of the sites had no pavement edge markings

Countermeasure Concepts

- Provide motorist aid services so that disabled motorists do not desert their vehicles.
- Provide roadway lighting.

97

## OTHER

(N=145, 9.5% of sample)

This type includes other unusual accident situations which were not one of the more specific accident types previously described, but which were thought to be countermeasure-corrective. Since they are not grouped together because of selected conceptual similarities, a detailed discussion of their composite attributes is not particularly meaningful. A one-line description of each accident in this type is found in Appendix E.

- 60.1% were attempting to cross the roadway (76-1+2); 39.2% were not attempting to cross.
- 44.8% of the pedestrians were en route (80-1); 22.1% were at play (18-2); 13.8% were standing, waiting (78-7).
- 58.3% of the pedestrians were unaware of the need for evasive action (153-1); 10.1% had insufficient time.
- 24.6% of the drivers were unaware of the need (154-1); 11.6% had insufficient time for evasive action.

Countermeasure Concepts

- Control drinking pedestrians.
- Improve pedestrian and driver searching behavior.
- Improve roadway lighting.

98
WEIRD
(N=114, 7.4% of sample)

This type involves accidents that occur under unusual circumstances and were generally believed not to be countermeasure-corrective. The "weird" category included cases that were especially unusual or unique in the predisposing and precipitating factors. Because of this, it was unlikely that the same set of causal factors would occur again and hence, the accidents in this category were not considered to be amenable to treatment by countermeasures. A one-line description of each of the 114 accidents assigned to this category is contained in Appendix E.

Countermeasure Concepts

Because of the nature of these accidents, they are not generally amenable to countermeasures.

99

## LIMITED INFORMATION

(N=24, 1.6% of sample)

This category contains cases about which relatively little information was available. Thus, it was not possible to determine which accident type was appropriate.

- 37.5% of the cases involved hit and run drivers (31-3)
- 47.6% of the cases involved fatally injured pedestrians (164-5)

### Countermeasure Concepts

Because of the limited information available in this category, the development of solid countermeasure concepts is difficult; however, several elements are apparent:

- Drinking on the part of pedestrian (16.7%) and drivers (4.2%)
- Improving roadway lighting
- Controlling vehicle speed

## All Accident Types N = 1531

| Pedestrian Age* | 0-4 | 5-9 | 10-14 | 15-19 | 20-24 | 25-29 | 30-34 | 35-39 | 40-44 | 45-49 | 50-54 | 55-59 | 60-65 | Over 65 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| N = 1508 | 11 | 20 | 14 | 15 | 9 | 5 | 4 | 3 | 3 | 2 | 2 | 3 | 2 | 8 |

| Time of Day* | 1 AM | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 PM | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| N = 1531 | 2 | 2 | 1 | 1 | 0 | 1 | 5 | 3 | 2 | 2 | 3 | 4 | 5 | 6 | 9 | 8 | 10 | 9 | 7 | 6 | 4 | 5 | 3 | 3 |

| Area | Intersection | Non-Intersection | City | Small Town | Suburban | Country | Commercial | Industrial | Residential | School | Playground | Open Area |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| N = 1526 | 25.9 | 71.3 | 15.9 | 14.8 | 31.6 | 31.6 | 23.6 | 2.1 | 50.6 | 6.8 | 0.8 | 15.8 |

| Roadway Type: Suburban, | Limited Access | Controlled Access | Major Arterial Highway | Collector-Distributor | Local Street | Frontage or Service Road | Other |
|---|---|---|---|---|---|---|---|
| Small Town, City N = 964 | 2.5 | 0.5 | 16.6 | 12.5 | 27.6 | 0.6 | 1.9 |

| Roadway Type | Limited Access | Controlled Access | Primary Highway | Secondary Highway | Improved Highway | Unimproved Highway | Frontage or Service Road | Other |
|---|---|---|---|---|---|---|---|---|
| Country N = 573 | 3.1 | 0.9 | 9.6 | 14.6 | 7.0 | 0.4 | 0.3 | 1.4 |

| Selected Site Factors | | | |
|---|---|---|---|
| Total traveled lanes<br>71.1 two lanes<br>13.2 four lanes | Impact occurred:<br>19.5 Shoulder or edge. **18.0**<br>of trvld way 3rd quarter | Shoulder surface:<br>41.1 **No shoulder**<br>15.2 Gravel,shale | Roadside features:<br>22.4 Driveway<br>15.7 Ditch |

| Pedestrian Activity N = 1528 | | | | |
|---|---|---|---|---|
| Crossing not at intersection 34.7 | Crossing at intersection 16.1 | Walking in road w/traffic 9.5 | Standing in roadway 7.1 | |

| Vehicle Activity N = 1529 | | |
|---|---|---|
| Going straight ahead 74.7 | Backing 3.0 | Passing 2.5 |

| Ped Causal Factors N = 1531 | | | |
|---|---|---|---|
| Running into roadway 29.5 | Ped course (risk taking) 23.5 | Short time exposure 17.4 | Inadequate search and detection 17.3 |

| Driver Causal Factors N = 1531 | | |
|---|---|---|
| Specifically indicated none 32.4 | Inadequate search and detection 18.2 | Search and detection pattern not directed at ped 15.8 |

| Environmental Causal Factors N = 1531 | | |
|---|---|---|
| Specifically indicated none 40.7 | No roadway light 11.6 | Driver vision obscured by parked vehicles 8.8 |

| Selected Interview Items | | | | | |
|---|---|---|---|---|---|
| | | | | | |

| Selected Pedestrian Precipitating Factors | | | | |
|---|---|---|---|---|
| High exposure to vehicles 25.1 | Inattention, day dreaming 15.9 | Distraction, other peds. 13.7 | Poor prediction of ped/vehicle path 13.3 | Distraction, play activity 13.7 |

| Selected Driver Precipitating Factors | | |
|---|---|---|
| Misperception of ped intent 15.6 | Limitation of avoidance response, speeding 13.3 | Poor prediction of ped/vehicle path 10.2 |

*Rounded to nearest percent.

Figure III-1. All Accident Types Summary Data

Type 01: Dart-Out, 1st Half N = 166

| Pedestrian Age* | 0-4 | 5-9 | 10-14 | 15-19 | 20-24 | 25-29 | 30-34 | 35-39 | 40-44 | 45-49 | 50-54 | 55-59 | 60-65 | Over 65 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| N = 165 | 29 | 37 | 7 | 10 | 3 | 24 | 1 | 1 | 2 | 2 | 1 | 1 | 1 | 2 |

| Time of Day* | 1 AM | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 PM | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| N = 166 | 2 | 0 | 0 | 0 | 0 | 0 | 2 | 2 | 2 | 2 | 3 | 6 | 7 | 4 | 11 | 7 | 16 | 13 | 10 | 5 | 3 | 3 | 3 | 2 |

| Area | Intersection | Non-Intersection | City | Small Town | Suburban | Country | Commercial | Industrial | Residential | School | Playground | Open Area |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| N = 165 | 7.8 | 91.6 | 22.9 | 18.1 | 33.7 | 25.3 | 20.5 | 0.6 | 62.6 | 9.0 | 0.6 | 6.6 |

| Roadway Type: Suburban, Small Town, City N = 125 | Limited Access | Controlled Access | Major Arterial Highway | Collector-Distributor | Local Street | Frontage or Service Road | Other |
|---|---|---|---|---|---|---|---|
| | 1.2 | 0.0 | 10.8 | 14.5 | 48.2 | 0.0 | 0.0 |

| Roadway Type | Limited Access | Controlled Access | Primary Highway | Secondary Highway | Improved Highway | Unimproved Highway | Frontage or Service Road | Other |
|---|---|---|---|---|---|---|---|---|
| Country N = 42 | 4.2 | 0.0 | 7.8 | 9.6 | 3.0 | 0.0 | 0.0 | 0.6 |

| Selected Site Factors | | | |
|---|---|---|---|
| Impact occurred:<br>39.8 1st quarter<br>36.8 2nd quarter | 16.9 as entered trvld way | Total number of trvld lanes:<br>77.7 two lanes | 14.5 four lanes | Roadway center markings:<br>42.2 none<br>18.1 double solid center |

| Pedestrian Activity N = 166 | | |
|---|---|---|
| Crossing not at intersection 67.5 | Coming from behind parked vehicle 18.7 | |

| Vehicle Activity N = | |
|---|---|
| Straight ahead 96.4 | |

| Ped Causal Factors N = 166 | | | |
|---|---|---|---|
| Risk taking 13.8 | Inadequate search and detection 12.0 | Inattention 12.0 | Alcohol 8.4 |

| Driver Causal Factors N = 166 | | |
|---|---|---|
| Specifically indicated none 57.8 | Search or detect pattern misdirected 14.5 | Vehicle speed 13.9 |

| Environmental Causal Factors N = 166 | | |
|---|---|---|
| Driver visual obstruction parked cars 38.0 | Ped visual obstruction parked cars 25.3 | Specifically indicated none 21.1 |

| Selected Interview Items | |
|---|---|
| | |

| Selected Pedestrian Precipitating Factors | | | | |
|---|---|---|---|---|
| Short time exposure 94.6 | Running 69.8 | Search and detect failure N.F.S. 33.8 | Parked car 30.1 | Play activity 27.1 |

| Selected Driver Precipitating Factors | | | | |
|---|---|---|---|---|
| Parked cars 39.1 | Trees, brush, weeds 13.8 | Inadequate search 13.8 | Distraction other peds 10.2 | Poor light 8.4 |

*Rounded to nearest percent.

Figure III-2. Dart-Out, First Half Summary Data: Type 01

## Type 02: Dart-Out, 2nd Half N = 157

| | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Pedestrian Age* | 0-4 | | 5-9 | | 10-14 | | 15-19 | | 20-24 | | 25-29 | | 30-34 | | 35-39 | | 40-44 | | 45-49 | | 50-54 | | 55-59 | | 60-65 | | Over 65 | |
| N = 157 | 16 | | 31 | | 20 | | 7 | | 1 | | 2 | | 4 | | 3 | | 3 | | 1 | | 2 | | 2 | | 2 | | 7 | |
| Time of Day* | 1 AM | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 PM | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | | | | |
| N = 157 | 1 | 1 | 2 | 0 | 0 | 1 | 2 | 3 | 0 | 0 | 1 | 4 | 4 | 6 | 7 | 13 | 13 | 12 | 11 | 6 | 5 | 6 | 2 | 1 | | | | |
| Area | Intersection | | Non-intersection | | | City | | Small Town | | Suburban | | Country | | Commercial | | Industrial | | Residential | | School | | Playground | | Open Area | | | | |
| N = 157 | 7.0 | | 93.0 | | | 8.3 | | 16.0 | | 38.2 | | 37.6 | | 25.5 | | 0.6 | | 52.9 | | 6.4 | | 0.6 | | 14.0 | | | | |
| Roadway Type: Suburban, Small Town, City N = 99 | Limited Access | | Controlled Access | | | Major Arterial Highway | | | | Collector-Distributor | | | | | Local Street | | | Frontage or Service Road | | | | Other | | | | | |
| | 0.6 | | 1.9 | | | 17.2 | | | | 13.4 | | | | | 28.7 | | | 0.6 | | | | 0.0 | | | | | |
| Roadway Type Country N = 59 | Limited Access | | Controlled Access | | | Primary Highway | | | Secondary Highway | | | | Improved Highway | | | Unimproved Highway | | | Frontage or Service Road | | | | Other | | | | | |
| | 0.6 | | 0.6 | | | 10.2 | | | 19.7 | | | | 5.7 | | | 0.0 | | | 0.6 | | | | 0.0 | | | | | |
| Selected Site Factors | Impact occurred: 63.1 3rd quarter 31.2 4th quarter | | | | | Total number of trvld lanes: 80.2 two 10.8 four | | | | | | | Roadway center markings: 33.1 none 22.9 double solid center line | | | | | | | | | | | | | | | | |
| Pedestrian Activity N = 157 | Crossing not at intersection 84.7 | | | | | Coming from behind parked vehicle 8.3 | | | | | | | | | | | | | | | | | | | | | | | |
| Vehicle Activity N = | Straight ahead 90.4 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Ped Causal Factors N = 157 | Alcohol 12.1 | | Search and detection pattern misdirected 10.2 | | | | | | | | | | Distraction, traffic 7.6 | | | | | | | | | | | | | | | |
| Driver Causal Factors N = 157 | Specifically indicated none 51.0 | | | | | | | | Search or detection pattern misdirected 18.5 | | | | | | Inadequate search and detection 15.9 | | | | | | | | | | | | | |
| Environmental Causal Factors N = 157 | Specifically indicated none 28.0 | | | | | | | | Driver visual obstruction parked cars 15.3 | | | | | | Driver visual obstruction moving traffic 14.0 | | | | | | | | | | | | | |
| Selected Interview Items | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Selected Pedestrian Precipitating Factors | Short time exposure 78.9 | | | | | Running 74.5 | | | Search and detection failure NFS 24.2 | | | | | | Moving traffic 16.6 | | | | | | High exposure to vehicles 16.6 | | | | | | | |
| Selected Driver Precipitating Factors | Moving traffic 17.2 | | | | | Parked cars 15.3 | | | Speeding 13.4 | | | | Distraction other peds 12.7 | | | | | | | | Poor light 11.5 | | | | | | | |

*Rounded to nearest percent.

Figure III-3. Dart-Out, Second Half Summary Data: Type 02

Type 03: Midblock Dash N = 152

| | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Pedestrian Age* | 0-4 | 5-9 | 10-14 | 15-19 | 20-24 | 25-29 | 30-34 | 35-39 | 40-44 | 45-49 | 50-54 | 55-59 | 60-65 | Over 65 | | | | | | | | | | |
| N = 150 | 21 | 43 | 21 | 5 | 1 | 3 | 0 | 2 | 1 | 0 | 1 | 1 | 0 | 1 | | | | | | | | | | |
| Time of Day* | 1 AM | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 PM | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| N = 152 | 1 | 1 | 0 | 0 | 0 | 0 | 3 | 4 | 0 | 0 | 3 | 7 | 5 | 11 | 15 | 7 | 14 | 15 | 10 | 3 | 1 | 1 | 1 | 0 |
| Area 150 151 N = 151 | Intersection | Non-Intersection | City | Small Town | Suburban | Country | Commercial | Industrial | Residential | School | Playground | Open Area | | | | | | | | | | | | |
| | 3.3 | 95.4 | 18.4 | 14.5 | 30.3 | 36.2 | 18.4 | 0.7 | 66.4 | 8.5 | 0.0 | 5.3 | | | | | | | | | | | | |
| Roadway Type: Suburban, Small Town, City N = 97 | Limited Access | Controlled Access | Major Arterial Highway | Collector-Distributor | Local Street | Frontage or Service Road | Other | | | | | | | | | | | | | | | | | |
| | 0.7 | 0.7 | 15.8 | 17.1 | 28.9 | 0.0 | 0.0 | | | | | | | | | | | | | | | | | |
| Roadway Type Country N = 55 | Limited Access | Controlled Access | Primary Highway | Secondary Highway | Improved Highway | Unimproved Highway | Frontage or Service Road | Other | | | | | | | | | | | | | | | | |
| | 0.0 | 0.0 | 7.2 | 16.4 | 12.5 | 0.0 | 0.0 | 0.0 | | | | | | | | | | | | | | | | |
| Selected Site Factors | Impact occurred: 33.5 3rd quarter 21.0 1st quarter | Total trvld lanes: 84.9 two 5.9 four | Roadway center markings: 37.5 none 22.3 double solid center line 22.3 single dashed center line | | | | | | | | | | | | | | | | | | | | | |
| Pedestrian Activity N = 152 | Crossing not at intersection 82.2 | Playing in roadway 5.3 | | | | | | | | | | | | | | | | | | | | | | |
| Vehicle Activity N = | Straight ahead 95.4 | | | | | | | | | | | | | | | | | | | | | | | |
| Ped Causal Factors N = 152 | Running into roadway 77.0 | Inadequate search and detection 21.7 | Distraction, traffic 19.0 | | | | | | | | | | | | | | | | | | | | | |
| Driver Causal Factors N = 152 | Specifically indicated none 45.4 | Misinter. ped intent 30.3 | Inadequate search and detection 10.5 | | | | | | | | | | | | | | | | | | | | | |
| Environmental Causal Factors N = 152 | Specifically indicated none 70.4 | No sidewalks 4.6 | Ped visual obstruction parked cars 3.9 | | | | | | | | | | | | | | | | | | | | | |
| Selected Interview Items | | | | | | | | | | | | | | | | | | | | | | | | |
| Selected Pedestrian Precipitating Factors | Play activity 25.7 | High exposure to vehicles 21.7 | Poor path prediction 19.7 | Distraction other peds 18.4 | Search and detection failure N.F.S. 17.8 | | | | | | | | | | | | | | | | | | | |
| Selected Driver Precipitating Factors | Speeding 10.5 | Failure to match evasive action 9.8 | Distraction other peds 8.5 | Inattention 7.2 | Poor path prediction 6.6 | | | | | | | | | | | | | | | | | | | |

*Rounded to nearest percent.

Figure III-4. Midblock Dash Summary Data: Type 03

## Type 11: Intersection Dash N = 152

| Pedestrian Age* | 0-4 | 5-9 | 10-14 | 15-19 | 20-24 | 25-29 | 30-34 | 35-39 | 40-44 | 45-49 | 50-54 | 55-59 | 60-65 | Over 65 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| N = 152 | 10 | 33 | 18 | 13 | 1 | 2 | 3 | 2 | 2 | 1 | 2 | 3 | 3 | 5 |

| Time of Day* | 1 AM | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 PM | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| N = 152 | 1 | 1 | 0 | 0 | 0 | 1 | 6 | 4 | 1 | 1 | 2 | 5 | 7 | 8 | 9 | 7 | 12 | 11 | 9 | 6 | 3 | 3 | 3 | 0 |

| Area 152 / 152 / N = 152 | Intersection | Non-Intersection | City | Small Town | Suburban | Country | Commercial | Industrial | Residential | School | Playground | Open Area |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 95.4 | 4.6 | 23.7 | 22.4 | 44.1 | 9.9 | 37.5 | 0.0 | 43.4 | 18.2 | 0.7 | 0.0 |

| Roadway Type: Suburban, Small Town, City N = 137 | Limited Access | Controlled Access | Major Arterial Highway | Collector-Distributor | Local Street | Frontage or Service Road | Other |
|---|---|---|---|---|---|---|---|
| | 0.7 | 0.0 | 28.9 | 25.6 | 33.5 | 1.3 | 0.0 |

| Roadway Type Country N = 15 | Limited Access | Controlled Access | Primary Highway | Secondary Highway | Improved Highway | Unimproved Highway | Frontage or Service Road | Other |
|---|---|---|---|---|---|---|---|---|
| | 0.0 | 0.7 | 5.9 | 1.3 | 2.0 | 0.0 | 0.0 | 0.0 |

| Selected Site Factors | | | |
|---|---|---|---|
| Total trvld lanes: 61.8 two 19.1 four | Roadside features: 19.7 sidewalks 19.7 curbs | Intersection type: 55.3 "T" intersec. 32.2 4-leg | Type of location at POI 86.2 non-signal intersec 50' 9.2 signal intersec 50' |

| Pedestrian Activity N = 152 | | |
|---|---|---|
| Crossing at intersection 81.6 | Crossing not within 50 ft. from intersection 11.8 | |

| Vehicle Activity N = 15 | | |
|---|---|---|
| Straight ahead 89.5 | Making left turn 3.3 | Starting in roadway 3.3 |

| Ped Causal Factors N = 152 | | |
|---|---|---|
| Running into roadway 56.6 | Inadequate search and detection 32.2 | Search and detect pattern misdirected 14.5 |

| Driver Causal Factors N = 152 | | |
|---|---|---|
| Specifically indicated none 40.1 | Misinterp ped intent 16.4 | Search or detect pattern misdirected 14.6 |

| Environmental Causal Factors N = 152 | | |
|---|---|---|
| Specifically indicated none 54.6 | Inadequate or no roadway light 13.2 | Driver visual obstruction, moving and standing traffic 11.8 |

| Selected Interview Items | | | | | |
|---|---|---|---|---|---|
| Selected Pedestrian Precipitating Factors | Short time exposure 41.4 | High exposure to vehicles 24.3 | Inattention, day dreaming 23.7 | Search and detect failure NFS 22.3 | Distraction other peds 17.1 |
| Selected Driver Precipitating Factors | Misinterp. ped intent 22.4 | Inadequate search 17.8 | Speeding 12.5 | Moving traffic 9.9 | Inattention 8.5 |

*Rounded to nearest percent.

Figure III-5. Intersection Dash Summary Data: Type 11

## Type 12: Vehicle Turn/Merge with Attention Conflict N = 20

| | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Pedestrian Age* | 0-4 | | 5-9 | | 10-14 | | 15-19 | | 20-24 | | 25-29 | | 30-34 | | 35-39 | | 40-44 | | 45-49 | | 50-54 | | 55-59 | |
| N = 20 | 5 | | 0 | | 10 | | 15 | | 15 | | 0 | | 5 | | 0 | | 0 | | 0 | | 0 | | 10 | |
| | 60-65 | | Over 65 | | | | | | | | | | | | | | | | | | | | | |
| | 0 | | 40 | | | | | | | | | | | | | | | | | | | | | |
| Time of Day* | 1 AM | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 PM | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| N = 20 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 5 | 5 | 15 | 0 | 10 | 5 | 5 | 0 | 15 | 10 | 5 | 5 | 10 | 0 | 5 | 0 | 0 |
| Area 18<br>20<br>N = 20 | Intersection | | Non-Intersection | | | | City | | Small Town | | Suburban | | Country | | Commercial | | Industrial | | Residential | | School | | Playground | Open Area |
| | 85.0 | | 15.0 | | | | 40.0 | | 30.0 | | 25.0 | | 5.0 | | 75.0 | | 0.0 | | 20.0 | | 5.0 | | 0.0 | 0.0 |
| Roadway Type: Suburban, Small Town, City N = 19 | Limited Access | | Controlled Access | | | | Major Arterial Highway | | | | | | Collector-Distributor | | | | Local Street | | Frontage or Service Road | | | | Other | |
| | 0.0 | | 0.0 | | | | 20.0 | | | | | | 35.0 | | | | 25.0 | | 5.0 | | | | 10.0 | |
| Roadway Type<br>Country N = 1 | Limited Access | | Controlled Access | | | | Primary Highway | | | | Secondary Highway | | | | Improved Highway | | | | Unimproved Highway | | | | Frontage or Service Road | Other |
| | 0.0 | | 0.0 | | | | 0.0 | | | | 0.0 | | | | 0.0 | | | | 0.0 | | | | 0.0 | 5.0 |
| Selected Site Factors | Total trvld lanes:<br>45.0 - Two<br>35.0 - Five | | | | | | Ped struck in lane:<br>50.0 - 1st<br>15.0 - 2nd | | | | | | Intersection proximity:<br>50.0 V leaving 50' of intersec.<br>35.0 V. approach 50' of intersec. | | | | | | | | Type of intersection:<br>55.0 - 4-leg<br>25.0 - "T" type | | | |
| Pedestrian Activity<br>N = 20 | Crossing at intersection<br>85.0 | | | | Not in roadway<br>10.0 | | | | Other<br>5.0 | | | | | | | | | | | | | | | |
| Vehicle Activity<br>N = | Making left turn<br>45.0 | | | | Making right turn<br>30.0 | | | | Straight ahead<br>10.0 | | | | | | Making U turn<br>5.0 | | | | Changing lanes or merging<br>5.0 | | | | | |
| Ped Causal Factors<br>N = 20 | Misinterp driver intent<br>35.0 | | | | Distraction (from traffic)<br>20.0 | | | | Poor path prediction<br>20.0 | | | | | | | | | | | | | | | |
| Driver Causal Factors<br>N = 20 | Search or detect pattern misdirected<br>85.0 | | | | | | | | Distraction (from traffic)<br>20.0 | | | | | | | | Failed to give ped right of way<br>15.0 | | | | | | | |
| Environmental Causal Factors<br>N = 20 | Specifically indicated none<br>60.0 | | | | | | | | Driver visual obstruction, trees, roadside items<br>10.0 | | | | | | | | | | Other<br>5.0 | | | | | |
| Selected Interview Items | | | | | | | | | | | | | | | | | | | | | | | | |
| Selected Pedestrian Precipitating Factors | Distraction other peds<br>15.0 | | | | Inattention, daydreaming<br>10.0 | | | | Short time exposure<br>10.0 | | | | Inadequate search<br>10.0 | | | | High exposure to vehicles<br>10.0 | | | | | | | |
| Selected Driver Precipitating Factors | Traffic-related maneuver<br>90.0 | | | | Inadequate search<br>50.0 | | | | Standing traffic<br>20.0 | | | | Poor path prediction<br>10.0 | | | | Moving traffic<br>10.0 | | | | | | | |

*Rounded to nearest percent.

Figure III-6. Vehicle Turn/Merge with Attention Conflict Summary Data: Type 12

## Type 13: Turning Vehicle N =29

| | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Pedestrian Age* | 0-4 | 5-9 | 10-14 | 15-19 | 20-24 | 25-29 | 30-34 | 35-39 | 40-44 | 45-49 | 50-54 | 55-59 | 60-65 | Over 65 | | | | | | | | | | |
| N= 29 | 3 | 10 | 14 | 21 | 10 | 0 | 3 | 3 | 0 | 7 | 3 | 3 | 3 | 17 | | | | | | | | | | |
| Time of Day* | 1 AM | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 PM | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| N= 29 | 0 | 0 | 0 | 0 | 0 | 3 | 14 | 14 | 7 | 7 | 0 | 0 | 7 | 7 | 7 | 7 | 7 | 10 | 7 | 0 | 3 | 0 | 0 | 0 |
| Area 28 29 | Intersection | Non-Intersection | | City | Small Town | | Suburban | | Country | | Commercial | | Industrial | | Residential | | School | | Playground | | Open Area | | | |
| N= 29 | 96.6 | 0.0 | | 69.0 | 3.4 | | 27.6 | | 0.0 | | 72.4 | | 0.0 | | 24.1 | | 3.4 | | 0.0 | | 0.0 | | | |
| Roadway Type: Suburban, Small Town, City N=29 | Limited Access | Controlled Access | | Major Arterial Highway | | | Collector-Distributor | | | | Local Street | | Frontage or Service Road | | | | Other | | | | | | | |
| | 0.0 | 0.0 | | 48.3 | | | 24.1 | | | | 24.1 | | 3.4 | | | | 0.0 | | | | | | | |
| Roadway Type | Limited Access | Controlled Access | | Primary Highway | | Secondary Highway | | | Improved Highway | | Unimproved Highway | | Frontage or Service Road | | | | Other | | | | | | | |
| Country N= 0 | 0.0 | 0.0 | | 0.0 | | 0.0 | | | 0.0 | | 0.0 | | 0.0 | | | | 0.0 | | | | | | | |
| Selected Site Factors | Total trvld lanes: 37.9 - Two 37.9 - Four | | | Ped struck in lane: 55.2 - 1st lane 31.0 - 2nd lane | | | Intersec proximity: 65.5 V leaving 50' of intersec 31.0 V approach 50' of intersec | | | | Type of intersection: 75.9 - 4 leg 13.8 - "T" type | | | | | | | | | | | | | |
| Pedestrian Activity N= 29 | Crossing at intersection 89.7 | | | Getting on or off another vehicle 3.4 | | | Walking in roadway with traffic 3.4 | | | | Playing in roadway 3.4 | | | | | | | | | | | | | |
| Vehicle Activity N= | Making right turn 48.3 | | | Making left turn 34.5 | | | Going straight ahead 6.9 | | | | Making U turn 3.4 | | Starting in roadway 3.4 | | | | Starting from parked position 3.4 | | | | | | | |
| Ped Causal Factors N= 29 | Specifically indicated none 31.0 | | | Search or detection pattern misdirected 17.2 | | | Risk taking 13.8 | | | | | | | | | | | | | | | | | |
| Driver Causal Factors N= 29 | Inadequate search and detection 55.2 | | | Search or detection pattern misdirected 44.8 | | | Failed to give ped right of way 24.1 | | | | | | | | | | | | | | | | | |
| Environmental Causal Factors N= 29 | Specifically indicated none 72.4 | | | Other 10.3 | | | Driver blinded by sun 6.9 | | | | | | | | | | | | | | | | | |
| Selected Interview Items | | | | | | | | | | | | | | | | | | | | | | | | |
| Selected Pedestrian Precipitating Factors | Misinterp driver intent 31.0 | | | High exposure to vehicles 27.6 | | | Search and detection failure NFS 17.2 | | | | Distraction, traffic signal 13.8 | | | | Poor path prediction 13.8 | | | | | | | | | |
| Selected Driver Precipitating Factors | Traffic related maneuver 51.7 | | | Speeding 20.7 | | | Other course failures 17.2 | | | | Misinterp ped intent 13.8 | | | | Inattention 13.8 | | | | | | | | | |

*Rounded to nearest percent.

Figure III-7. Turning Vehicle Summary Data: Type 13

Type 22: Multiple Threat N = 26

| Pedestrian Age* | 0-4 | 5-9 | 10-14 | 15-19 | 20-24 | 25-29 | 30-34 | 35-39 | 40-44 | 45-49 | 50-54 | 55-59 | 60-65 | Over 65 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| N = 26 | 0 | 31 | 15 | 4 | 8 | 4 | 8 | 8 | 0 | 8 | 4 | 0 | 4 | 8 |

| Time of Day* | 1 AM | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 PM | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| N = 26 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 8 | 8 | 4 | 8 | 8 | 12 | 15 | 4 | 15 | 4 | 0 | 8 | 0 | 4 | 0 | 0 |

| Area 26 / N = 26 | Intersection | Non-Intersection | City | Small Town | Suburban | Country | Commercial | Industrial | Residential | School | Playground | Open Area |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 69.1 | 30.7 | 53.8 | 7.7 | 38.5 | 0.0 | 73.1 | 3.8 | 15.4 | 7.7 | 0.0 | 0.0 |

| Roadway Type: Suburban, Small Town, City N = 26 | Limited Access | Controlled Access | Major Arterial Highway | Collector-Distributor | Local Street | Frontage or Service Road | Other |
|---|---|---|---|---|---|---|---|
| | 0.0 | 0.0 | 65.4 | 30.8 | 3.8 | 0.0 | 0.0 |

| Roadway Type Country N = 0 | Limited Access | Controlled Access | Primary Highway | Secondary Highway | Improved Highway | Unimproved Highway | Frontage or Service Road | Other |
|---|---|---|---|---|---|---|---|---|
| | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |

| Selected Site Factors | | | |
|---|---|---|---|
| Total trvld lanes:<br>46.1 - Four<br>30.8 - Five | Ped struck in lane:<br>50.0 - 2nd<br>19.2 - 4th | Intersection proximity:<br>42.3 V approach 50' of intersect.<br>26.9 V leaving 50' of intersect. | Intersection type:<br>50.0 - "T" type<br>34.6 - 4-leg |

| Pedestrian Activity N = 26 | | |
|---|---|---|
| Crossing at intersection<br>78.1 | Crossing not at intersection<br>26.9 | |

| Vehicle Activity N = | | |
|---|---|---|
| Straight ahead<br>84.6 | Passing<br>7.7 | Changing lanes or merging<br>7.7 |

| Ped Causal Factors N = 26 | | |
|---|---|---|
| Search or detection pattern misdirected<br>34.6 | Inadequate search and detection<br>26.9 | Human factors<br>15.4 |

| Driver Causal Factors N = 26 | | |
|---|---|---|
| Inadequate search and detection<br>34.6 | Failed to give ped right of way<br>30.8 | Specifically indicated none<br>23.1 |

| Environmental Causal Factors N = 26 | | |
|---|---|---|
| Driver visual obstruction, standing traffic<br>88.5 | Ped visual obstruction, standing traffic<br>76.9 | Specifically indicated none<br>7.7 |

| Selected Interview Items | | | | | |
|---|---|---|---|---|---|
| Selected Pedestrian Precipitating Factors | Standing traffic<br>76.9 | High exposure to vehicles<br>53.8 | Short time exposure<br>38.4 | Running<br>34.6 | Distraction, traffic 2nd half<br>11.5 |
| Selected Driver Precipitating Factors | Standing traffic<br>88.5 | Inattention<br>23.1 | Other course failures<br>19.2 | Traffic related maneuver<br>15.4 | Speeding<br>11.5 |

*Rounded to nearest percent.

Figure III-8. Multiple Threat Summary Data: Type 22

Type 23: Backing Up N =26

| | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Pedestrian Age* | 0-4 | | 5-9 | | 10-14 | | 15-19 | | 20-24 | | 25-29 | | 30-34 | | 35-39 | | 40-44 | | 45-49 | | 50-54 | | 55-59 | | 60-65 | | Over 65 | |
| N = 26 | 23 | | 12 | | 15 | | 0 | | 15 | | 0 | | 0 | | 8 | | 0 | | 0 | | 0 | | 0 | | 8 | | 19 | |
| Time of Day* | 1 AM | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 PM | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| N = 26 | 4 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 4 | 12 | 15 | 4 | 4 | 12 | 12 | 4 | 8 | 0 | 15 | 0 | 0 | 0 | 0 |
| Area 18 26 | Intersection | | Non-Intersection | | City | | Small Town | | Suburban | | Country | | Commercial | | Industrial | | Residential | | School | | Playground | | Open Area | |
| N = 26 | 7.7 | | 61.5 | | 23.1 | | 7.7 | | 38.5 | | 30.8 | | 26.9 | | 3.8 | | 61.5 | | 3.8 | | 3.8 | | 0.0 | |
| Roadway Type: Suburban, | Limited Access | | Controlled Access | | Major Arterial Highway | | | | Collector-Distributor | | | | Local Street | | Frontage or Service Road | | | | Other | | | | | |
| Small Town, City N = 19 | 0.0 | | 0.0 | | 3.8 | | | | 15.4 | | | | 23.1 | | 0.0 | | | | 26.9 | | | | | |
| Roadway Type | Limited Access | | Controlled Access | | Primary Highway | | Secondary Highway | | Improved Highway | | | | Unimproved Highway | | Frontage or Service Road | | | | Other | | | | | |
| Country N = 8 | 0.0 | | 0.0 | | 0.0 | | 3.8 | | 11.5 | | | | 0.0 | | 0.0 | | | | 15.4 | | | | | |
| Selected Site Factors | Total trvld lanes: 53.8 - two 7.7 - one | | | | Roadside features: 30.8 Driveway 23.1 Ditch | | | | Ped struck in lane: 42.3 - 1st 15.4 - not struck in rdwy. | | | | | | | | | | | | | | | | | |
| Pedestrian Activity N = 26 | Not in roadway 26.9 | | | | Walking in rdwy against traffic 15.4 | | | | Crossing not at intersection 11.5 | | | | Playing in roadway 11.5 | | Standing in roadway 11.5 | | | | Other 11.5 | | | | | |
| Vehicle Activity N = | Backing 100.0 | | | | | | | | | | | | | | | | | | | | | | | |
| Ped Causal Factors N = 26 | Human factors 26.9 | | | | Inattention 19.2 | | | | Distraction from traffic 19.2 | | | | | | | | | | | | | | | |
| Driver Causal Factors N = 26 | Search and detection pattern misdirected 42.3 | | | | Driver in a hurry 15.4 | | | | Ran off trvld way 7.7 | | | | | | | | | | | | | | | |
| Environmental Causal Factors N = 26 | Specifically indicated none 73.1 | | | | No sidewalks 7.7 | | | | Driver visual obstruction parked cars 3.8 | | | | | | | | | | | | | | | |
| Selected Interview Items | | | | | | | | | | | | | | | | | | | | | | | | |
| Selected Pedestrian Precipitating Factors | Misinterpretation driver's intent 34.6 | | | | Distraction play activity 26.9 | | | | Search and detect failure NFS 19.2 | | | | Distraction other peds 19.2 | | Running 15.4 | | | | | | | | | |
| Selected Driver Precipitating Factors | Inadequate search 80.8 | | | | Inattention 26.9 | | | | Other course failures 19.2 | | | | Not explained, adeq. search but detect. failure 15.4 | | | | Other detection failures 15.4 | | | | | | | |

*Rounded to nearest percent.

Figure III-9. Backing Up Summary Data: Type 23

## Type 24: Ped Not in Roadway N = 22

| Pedestrian Age* | 0-4 | 5-9 | 10-14 | 15-19 | 20-24 | 25-29 | 30-34 | 35-39 | 40-44 | 45-49 | 50-54 | 55-59 | 60-65 | Over 65 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| N = 22 | 18 | 9 | 18 | 14 | 0 | 9 | 5 | 0 | 5 | 0 | 0 | 14 | 5 | 5 |

| Time of Day* | 1 AM | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 PM | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| N = 22 | 5 | 5 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 0 | 0 | 5 | 5 | 9 | 9 | 14 | 9 | 18 | 5 | 5 | 5 | 5 | 0 | 0 |

| Area 12 22 | Intersection | Non-Intersection | City | Small Town | Suburban | Country | Commercial | Industrial | Residential | School | Playground | Open Area |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| N = 22 | 9.1 | 45.5 | 0.0 | 27.3 | 27.3 | 45.5 | 36.4 | 9.1 | 45.4 | 4.5 | 0.0 | 4.5 |

| Roadway Type: Suburban, Small Town, City N = 13 | Limited Access | Controlled Access | Major Arterial Highway | Collector-Distributor | Local Street | Frontage or Service Road | Other |
|---|---|---|---|---|---|---|---|
| | 0.0 | 0.0 | 9.1 | 0.0 | 9.1 | 0.0 | 40.9 |

| Roadway Type Country N = 9 | Limited Access | Controlled Access | Primary Highway | Secondary Highway | Improved Highway | Unimproved Highway | Frontage or Service Road | Other |
|---|---|---|---|---|---|---|---|---|
| | 0.0 | 0.0 | 0.0 | 18.2 | 4.5 | 0.0 | 0.0 | 18.2 |

| Selected Site Factors | Impact occurred: 54.5 not on roadway; 22.7 along shoulder edge of trvld way | Roadside features: 18.2 ditch; 18.2 driveway |
|---|---|---|

| Pedestrian Activity N = 22 | Not in roadway 50.0 | Other 13.6 | Coming from behind parked vehicle 9.1 |
|---|---|---|---|

| Vehicle Activity N = | Straight ahead 36.4 | Starting from parked position 13.6 | Driving off roadway 9.1 | Backing 9.1 |
|---|---|---|---|---|

| Ped Causal Factors N = 22 | Specifically indicated none 36.4 | Poor path prediction 22.7 | Inadequate search and detection 9.1 |
|---|---|---|---|

| Driver Causal Factors N = 22 | Inadequate search and detection 40.9 | Ran off trvld way 27.3 | Vehicle speed 22.7 |
|---|---|---|---|

| Environmental Causal Factors N = 22 | Specifically indicated none 45.4 | Other 13.6 | Inadequate or no shoulder 9.1 |
|---|---|---|---|

| Selected Interview Items | |
|---|---|

| Selected Pedestrian Precipitating Factors | Misinterp driver intent 27.2 | Distraction other peds 22.7 | Other search failures 13.6 | Improper decision 13.6 | High exposure to vehicles 9.0 |
|---|---|---|---|---|---|

| Selected Driver Precipitating Factors | Other course failures 27.3 | Traffic related maneuver 22.7 | Misinterp ped intent 22.7 | Poor path prediction 22.7 | Alcohol 18.2 |
|---|---|---|---|---|---|

*Rounded to nearest percent.

Figure III-10. Ped Not in Roadway Summary Data: Type 24

## Type 25: Walking Along Roadway N = 178

| | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Pedestrian Age* | 0-4 | | 5-9 | | 10-14 | | 15-19 | | 20-24 | | 25-29 | | 30-34 | | 35-39 | | 40-44 | | 45-49 | | 50-54 | | 55-59 | | 60-65 | | Over 65 | |
| N = 169 | 1 | | 1 | | 20 | | 30 | | 12 | | 7 | | 5 | | 3 | | 5 | | 2 | | 2 | | 2 | | 2 | | 5 | |
| Time of Day* | 1 AM | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 PM | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| N = 178 | 1 | 1 | 1 | 0 | 1 | 2 | 8 | 3 | 0 | 1 | 3 | 2 | 2 | 4 | 8 | 7 | 9 | 6 | 8 | 7 | 9 | 11 | 5 | 3 |
| Area 177<br>177<br>N = 177 | Intersection | | Non-Intersection | | City | | Small Town | | Suburban | | Country | | Commercial | | Industrial | | Residential | | School | | Playground | | Open Area | |
| | 18.5 | | 80.9 | | 3.9 | | 14.0 | | 25.3 | | 56.2 | | 13.5 | | 1.7 | | 59.0 | | 2.2 | | 0.6 | | 22.5 | |
| Roadway Type: Suburban, Small Town, City N = 79 | Limited Access | | Controlled Access | | Major Arterial Highway | | | | Collector-Distributor | | | | Local Street | | Frontage or Service Road | | | | Other | | | | | |
| | 0.0 | | 0.0 | | 10.1 | | | | 7.9 | | | | 22.5 | | 2.2 | | | | 0.0 | | | | | |
| Roadway Type Country N = 102 | Limited Access | | Controlled Access | | Primary Highway | | Secondary Highway | | Improved Highway | | | | Unimproved Highway | | Frontage or Service Road | | | | Other | | | | | |
| | 2.8 | | 1.1 | | 14.6 | | 27.5 | | 9.5 | | | | 0.0 | | 1.1 | | | | 0.0 | | | | | |
| Selected Site Factors | Total trvld lanes:<br>89.9 - two<br>6.8 - one | | Impact occurred:<br>73.6 Shldr or edge of tvld way<br>6.7 As entered trvld way | | | | | | | | | | Roadside features:<br>29.8 Ditch<br>19.1 Vegetation | | | | | | Roadway center markings:<br>30.9 None<br>28.1 Single dashed center | | | | | |
| Pedestrian Activity N = | Walking in road w/traffic<br>64.6 | | Walking in road against traffic<br>23.6 | | | | | | | | | | | | | | | | | | | | | |
| Vehicle Activity N = | Straight ahead<br>80.3 | | Passing<br>7.3 | | | | | | | | | | | | | | | | | | | | | |
| Ped Causal Factors N = 178 | Risk taking<br>53.4 | | Search and detection pattern misdirected<br>21.3 | | | | Unusual or unexpected place<br>15.7 | | | | | | | | | | | | | | | | | |
| Driver Causal Factors N = 178 | Poor path prediction<br>22.5 | | Specifically indicated none<br>20.8 | | | | Inadequate search and detection<br>15.2 | | | | | | | | | | | | | | | | | |
| Environmental Causal Factors N = 178 | Specifically indicated none<br>27.5 | | Inadequate or no roadway light<br>33.7 | | | | Inadequate or no shoulder<br>19.1 | | | | | | | | | | | | | | | | | |
| Selected Interview Items | | | | | | | | | | | | | | | | | | | | | | | | |
| Selected Pedestrian Precipitating Factors | Search and detect failure NFS<br>76.9 | | Walking w/traffic wrong side of road<br>57.9 | | | | High exposure to vehicles<br>32.0 | | | | Inattention/ day dreaming<br>25.8 | | | | Distraction other peds<br>18.5 | | | | | | | | | |
| Selected Driver Precipitating Factors | Poor light<br>20.8 | | Other course failures<br>15.7 | | | | Traffic related maneuver<br>13.5 | | | | Moving traffic<br>12.3 | | | | Speeding<br>12.5 | | | | | | | | | |

*Rounded to nearest percent.

Figure III-11. Walking Along Roadway Summary Data: Type 25

Type 26: Hitchhiking N = 23

| Pedestrian Age* | 0-4 | 5-9 | 10-14 | 15-19 | 20-24 | 25-29 | 30-34 | 35-39 | 40-44 | 45-49 | 50-54 | 55-59 | 60-65 | Over 65 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| N = 23 | 0 | 0 | 0 | 39 | 30 | 17 | 4 | 0 | 0 | 0 | 4 | 0 | 0 | 4 |

| Time of Day* | 1 AM | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 PM | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| N = 23 | 4 | 4 | 9 | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 0 | 4 | 0 | 4 | 0 | 0 | 0 | 4 | 0 | 17 | 17 | 9 | 9 | 13 |

| Area 23 | Intersection | Non-Intersection | City | Small Town | Suburban | Country | Commercial | Industrial | Residential | School | Playground | Open Area |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| N = 23 | 13.0 | 87.0 | 0.0 | 8.7 | 43.5 | 47.8 | 30.4 | 4.3 | 21.7 | 0.0 | 0.0 | 43.5 |

| Roadway Type: Suburban, Small Town, City N = 12 | Limited Access | Controlled Access | Major Arterial Highway | Collector-Distributor | Local Street | Frontage or Service Road | Other |
|---|---|---|---|---|---|---|---|
| | 21.7 | 0.0 | 30.4 | 0.0 | 0.0 | 0.0 | 0.0 |

| Roadway Type Country N = 11 | Limited Access | Controlled Access | Primary Highway | Secondary Highway | Improved Highway | Unimproved Highway | Frontage or Service Road | Other |
|---|---|---|---|---|---|---|---|---|
| | 4.3 | 4.3 | 30.4 | 8.7 | 0.0 | 0.0 | 0.0 | 0.0 |

| Selected Site Factors | | | |
|---|---|---|---|
| Total trvld lanes: | Impact occurred: | Shoulder surface: | Roadside features: |
| 43.5 -two | 73.9 Shldr/t.w.edge | 30.4 bituminous (blacktop) | 21.7 ditch |
| 26.1 -four | 17.4 1st quarter | 21.7 gravel,shell, shale | 17.4 vegetation |

| Pedestrian Activity N = | | | |
|---|---|---|---|
| Hitchhiking 56.5 | Walking in road w/traffic 17.4 | Standing in roadway 13.0 | |

| Vehicle Activity N = | |
|---|---|
| Straight ahead 78.3 | |

| Ped Causal Factors N = 23 | | |
|---|---|---|
| Risk taking 52.2 | Alcohol 30.4 | Misinterpretation driver's intent 17.4 |

| Driver Causal Factors N = 23 | | |
|---|---|---|
| Specifically indicated none 26.1 | Search and detection pattern misdirected 21.7 | Poor path prediction 17.4 |

| Environmental Causal Factors N = 23 | | |
|---|---|---|
| Specifically indicated none 39.1 | Inadequate or no roadway light 39.1 | Ped and/or driver vision impaired by weather 13.0 |

| Selected Interview Items | |
|---|---|
| | |

| Selected Pedestrian Precipitating Factors | | | | |
|---|---|---|---|---|
| High exposure to vehicles 60.9 | Search and detect failure NFS 39.1 | Unexpected or unusual place 34.8 | Walking wrong side of road 21.7 | Poor path prediction 21.7 |

| Selected Driver Precipitating Factors | | | | |
|---|---|---|---|---|
| Inadequate search 26.1 | Other course failures 21.7 | Traffic related maneuver 17.4 | Moving traffic 17.4 | Poor light 13.0 |

*Rounded to nearest percent.

Figure III-12. Hitchhiking Summary Data: Type 26

## Type 32: Vendor/Ice Cream Truck N = 21

| Pedestrian Age* | 0-4 | 5-9 | 10-14 | 15-19 | 20-24 | 25-29 | 30-34 | 35-39 | 40-44 | 45-49 | 50-54 | 55-59 | 60-65 | Over 65 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| N = 20 | 24 | 48 | 14 | 0 | 0 | 0 | 5 | 0 | 0 | 0 | 0 | 0 | 0 | 5 |

| Time of Day* | 1 AM | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 PM | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| N = 21 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 5 | 10 | 10 | 14 | 0 | 29 | 10 | 19 | 0 | 0 | 0 | 0 | 0 |

| Area 21 | Intersection | Non-Intersection | City | Small Town | Suburban | Country | Commercial | Industrial | Residential | School | Playground | Open Area |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| N = 21 | 0.0 | 0.0 | 57.1 | 9.5 | 28.6 | 4.8 | 0.0 | 0.0 | 95.2 | 4.8 | 0.0 | 0.0 |

| Roadway Type: Suburban, | Limited Access | Controlled Access | Major Arterial Highway | Collector-Distributor | Local Street | Frontage or Service Road | Other |
|---|---|---|---|---|---|---|---|
| Small Town, City N = 20 | 0.0 | 0.0 | 0.0 | 4.8 | 90.5 | 0.0 | 0.0 |

| Roadway Type | Limited Access | Controlled Access | Primary Highway | Secondary Highway | Improved Highway | Unimproved Highway | Frontage or Service Road | Other |
|---|---|---|---|---|---|---|---|---|
| Country N = 1 | 0.0 | 0.0 | 0.0 | 4.8 | 0.0 | 0.0 | 0.0 | 0.0 |

| Selected Site Factors | | | | |
|---|---|---|---|---|
| Total trvld lanes: 100.0 -two | Impact occurred: 52.4 2nd quarter 19.0 1st quarter | Roadside features: 14.3 Driveway 9.5 Ditch | Parking restrict. 90.5 none permitted both sides | Shoulder surf. 80.9 none 9.5 grass |

| Pedestrian Activity N = 21 | | | |
|---|---|---|---|
| Crossing not at intersection 66.7 | Coming from behind parked vehicle 23.8 | Crossing at intersection 9.5 | |

| Vehicle Activity N = | |
|---|---|
| Straight ahead 90.5 | |

| Ped Causal Factors N = 21 | | |
|---|---|---|
| Short time exposure 66.7 | Running into roadway 52.4 | Distraction (from traffic) 33.3 |

| Driver Causal Factors N = 21 | | |
|---|---|---|
| Search and detection pattern misdirected 38.1 | Specifically indicated none 28.6 | Vehicle speed 19.0 |

| Environmental Causal Factors N = 21 | | |
|---|---|---|
| Driver vision obscured by parked vehicles 61.9 | Ped vision obscured by parked vehicle 47.6 | Driver vision obscured by standing traffic 28.6 |

| Selected Interview Items | | | | | |
|---|---|---|---|---|---|
| Selected Pedestrian Precipitating Factors | Inattention/ daydreaming 47.6 | Other search failures 38.0 | Parked cars 38.0 | Standing traffic 23.8 | Search and detect failures 14.3 |
| Selected Driver Precipitating Factors | Parked cars 71.4 | Inadequate search 38.1 | Standing traffic 23.8 | Wrong side of road 9.5 | Environmental limits 4.8 |

*Rounded to nearest percent.

Figure III-13. Vendor/Ice Cream Truck Summary Data: Type 32

Type 33: Disabled Vehicle N = 86

| | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Pedestrian Age* | 0-4 | 5-9 | 10-14 | 15-19 | 20-24 | 25-29 | 30-34 | 35-39 | 40-44 | 45-49 | 50-54 | 55-59 | 60-65 | Over 65 | | | | | | | | | | |
| N = 85 | 0 | 0 | 2 | 19 | 22 | 15 | 8 | 8 | 5 | 7 | 5 | 5 | 2 | 1 | | | | | | | | | | |
| Time of Day* | 1 AM | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 PM | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| N = 86 | 7 | 5 | 2 | 4 | 1 | 0 | 2 | 1 | 1 | 1 | 0 | 2 | 7 | 5 | 2 | 2 | 7 | 7 | 2 | 4 | 8 | 9 | 14 | 6 |
| Area 86 86 | Intersection | | Non-Intersection | | City | | Small Town | | Suburban | | Country | | Commercial | | Industrial | | Residential | | School | | Playground | | Open Area | |
| N = 86 | 24.4 | | 75.6 | | 9.3 | | 3.5 | | 20.9 | | 66.3 | | 10.5 | | 5.8 | | 29.1 | | 1.2 | | 1.2 | | 52.3 | |
| Roadway Type: Suburban, | Limited Access | | Controlled Access | | Major Arterial Highway | | | | Collector-Distributor | | | | Local Street | | Frontage or Service Road | | | | Other | | | | | |
| Small Town, City N = 30 | 11.6 | | 0.0 | | 13.9 | | | | 2.3 | | | | 5.8 | | 0.0 | | | | 0.0 | | | | | |
| Roadway Type | Limited Access | | Controlled Access | | Primary Highway | | Secondary Highway | | Improved Highway | | Unimproved Highway | | Frontage or Service Road | | Other | | | | | | | | | |
| Country N = 57 | 13.9 | | 1.2 | | 20.9 | | 18,6 | | 9.3 | | 1.2 | | 1.2 | | 0.0 | | | | | | | | | |
| Selected Site Factors | Total trvld lanes: 47.7 - two 24.4 - four | | | | Impact occurred: 46.5 Shldr/t.w. edge 26.7 Other | | | | Shldr surface: 25.5 Bituminous 23.3 None | | | | Roadside features: 39.5 Ditch 15.1 Vegetation | | | | Center Marking 27.9 divided hwy w/median | | | | | |
| Pedestrian Activity N = 86 | Working on vehicle 43.0 | | | | Standing in roadway 30.2 | | | | Other 8.1 | | | | Getting on or off other vehicle 7.0 | | | | | | | | | | | |
| Vehicle Activity N = | Straight ahead 57.0 | | | | Driving off roadway 8.1 | | | | Weaving 7.0 | | | | Out of control 7.0 | | | | | | | | | | | |
| Ped Causal Factors N = 86 | Unusual or un-expected place 40.7 | | | | Risk taking 31.4 | | | | Distraction (from traffic) 26.7 | | | | | | | | | | | | | | | |
| Driver Causal Factors N = 86 | Inadequate search and detection 27.9 | | | | Vehicle speed 19.8 | | | | Ran off trvld way 19.8 | | | | | | | | | | | | | | | |
| Environmental Causal Factors N = 86 | Specifically indicated none 27.9 | | | | Inadequate or no roadway light 26.7 | | | | Condition of roadway, ice, snow 15.1 | | | | | | | | | | | | | | | |
| Selected Interview Items | | | | | | | | | | | | | | | | | | | | | | | | |
| Selected Pedestrian Precipitating Factors | High exposure to vehicles 53.5 | | | | Other search failures 25.6 | | | | Other course failures 12.8 | | | | Parked car 11.6 | | | | Standing traffic 11.6 | | | | | | | |
| Selected Driver Precipitating Factors | Alcohol 18.6 | | | | Out of control/ prior ped involv. 16.3 | | | | Inattention 15.1 | | | | Environmental limits 15.1 | | | | Headlight blinding 11.6 | | | | | | | |

*Rounded to nearest percent.

Figure III-14. Disabled Vehicle Summary Data: Type 33

Type 34: Auto-Auto N = 14

| Pedestrian Age* | 0-4 | 5-9 | 10-14 | 15-19 | 20-24 | 25-29 | 30-34 | 35-39 | 40-44 | 45-49 | 50-54 | 55-59 | 60-65 | Over 65 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| N = 14 | 0 | 0 | 7 | 14 | 29 | 7 | 14 | 0 | 7 | 7 | 0 | 7 | 0 | 7 |

| Time of Day* | 1 AM | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 PM | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| N = 14 | 0 | 14 | 0 | 0 | 0 | 0 | 0 | 0 | 7 | 0 | 7 | 0 | 0 | 0 | 14 | 0 | 0 | 7 | 0 | 14 | 14 | 0 | 14 | 0 |

| Area 14 | Intersection | Non-Intersection | City | Small Town | Suburban | Country | Commercial | Industrial | Residential | School | Playground | Open Area |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| N = 14 | 28.6 | 71.4 | 14.3 | 28.6 | 28.6 | 28.6 | 14.3 | 7.1 | 57.1 | 7.1 | 0.0 | 14.3 |

| Roadway Type: Suburban, | Limited Access | Controlled Access | Major Arterial Highway | Collector-Distributor | Local Street | Frontage or Service Road | Other |
|---|---|---|---|---|---|---|---|
| Small Town, City N = 10 | 7.1 | 0.0 | 28.6 | 14.3 | 14.3 | 0.0 | 7.1 |

| Roadway Type | Limited Access | Controlled Access | Primary Highway | Secondary Highway | Improved Highway | Unimproved Highway | Frontage or Service Road | Other |
|---|---|---|---|---|---|---|---|---|
| Country N = 4 | 7.1 | 0.0 | 14.3 | 0.0 | 7.1 | 0.0 | 0.0 | 0.0 |

| Selected Site Factors | | | |
|---|---|---|---|
| Roadway center mrkgs:<br>35.7 Double solid cntr.<br>28.6 None | Shoulder surface:<br>35.7 None<br>28.6 Bituminous | Roadside features<br>21.4 Guardrail/fence<br>14.3 Driveway | Parking restrictions:<br>50.0 permitted both sides<br>28.9 prohibited both sides |

| Pedestrian Activity N = 14 | | | |
|---|---|---|---|
| Working on vehicle 28.6 | Standing on roadway 28.6 | Getting on or off other vehicle 14.3 | |

| Vehicle Activity N = | |
|---|---|
| Straight ahead 78.6 | |

| Ped Causal Factors N = 14 | | |
|---|---|---|
| Specifically indicated none 50.0 | Unusual or unexpected place 28.6 | Risk taking 21.4 |

| Driver Causal Factors N = 14 | | |
|---|---|---|
| Vehicle speed 35.7 | Inadequate search and detection 35.7 | Ran stop sign 7.1 |

| Environmental Causal Factors N = 14 | | |
|---|---|---|
| Specifically indicated none 57.1 | Roadway curvature 7.1 | Driver visual obstruction standing traffic 7.1 |

| Selected Interview Items | |
|---|---|
| | |

| Selected Pedestrian Precipitating Factors | | | | |
|---|---|---|---|---|
| High exposure to vehicles 43.0 | Inattention/ day dreaming 36.0 | Parked car 14.2 | Poor path prediction 14.2 | Alcohol 14.2 |

| Selected Driver Precipitating Factors | | | | |
|---|---|---|---|---|
| Inattention/no specific distraction 42.8 | Alcohol 35.7 | Out of control 28.6 | Traffic related maneuver 21.4 | Wrong side of road 14.3 |

*Rounded to nearest percent.

Figure III-15. Auto-Auto Summary Data: Type 34

## Type 35: Working on Roadway N = 26

| | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Pedestrian Age* | 0-4 | 5-9 | 10-14 | 15-19 | 20-24 | 25-29 | 30-34 | 35-39 | 40-44 | 45-49 | 50-54 | 55-59 | 60-65 | Over 65 | | | | | | | | | | |
| N = 26 | 0 | 0 | 0 | 12 | 15 | 15 | 8 | 4 | 12 | 0 | 8 | 12 | 8 | 8 | | | | | | | | | | |
| Time of Day* | 1 AM | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 PM | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| N = 26 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 8 | 8 | 15 | 8 | 15 | 8 | 15 | 12 | 4 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Area 26<br>26<br>N = 26 | Intersection | Non-Intersection | City | Small Town | Suburban | Country | Commercial | Industrial | Residential | School | Playground | Open Area | | | | | | | | | | | | |
| | 30.8 | 69.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | | | | | | | | | | | | |
| Roadway Type: Suburban, Small Town, City N = 12 | Limited Access | Controlled Access | Major Arterial Highway | Collector-Distributor | Local Street | Frontage or Service Road | Other | | | | | | | | | | | | | | | | | |
| | 3.8 | 0.0 | 15.4 | 11.5 | 15.4 | 0.0 | 0.0 | | | | | | | | | | | | | | | | | |
| Roadway Type Country N = 14 | Limited Access | Controlled Access | Primary Highway | Secondary Highway | Improved Highway | Unimproved Highway | Frontage or Service Road | Other | | | | | | | | | | | | | | | | |
| | 3.8 | 0.0 | 11.5 | 30.8 | 3.8 | 0.0 | 0.0 | 3.8 | | | | | | | | | | | | | | | | |
| Selected Site Factors | Total traveled lanes:<br>80.8 - two<br>11.5 - four | | | Impact occurred:<br>46.1 Other<br>26.9 Edge of trvld way or shoulder | | | | | | | | | | | | | | | | | | | | |
| Pedestrian Activity N = 26 | Working in roadway 76.9 | Standing in roadway 7.7 | | | | | | | | | | | | | | | | | | | | | | |
| Vehicle Activity N = | Straight ahead 50.0 | Passing 15.4 | Starting from parked position 7.7 | | | | | | | | | | | | | | | | | | | | | |
| Ped Causal Factors N = 26 | Specifically indicated none 30.8 | Search and detection pattern misdirected 30.8 | Misinterpretation driver's intent 11.5 | | | | | | | | | | | | | | | | | | | | | |
| Driver Causal Factors N = 26 | Inadequate search and detection 26.9 | Other 19.2 | Search and detection pattern misdirected 15.4 | | | | | | | | | | | | | | | | | | | | | |
| Environmental Causal Factors N = 26 | Specifically indicated none 38.5 | Condition of roadway, other 26.9 | Other 23.1 | | | | | | | | | | | | | | | | | | | | | |
| Selected Interview Items | | | | | | | | | | | | | | | | | | | | | | | | |
| Selected Pedestrian Precipitating Factors | Other search failures 23.0 | High exposure to vehicles 19.2 | Search and detection failures NFS 11.5 | Overload 11.5 | Improper decision avoidance 11.5 | | | | | | | | | | | | | | | | | | | |
| Selected Driver Precipitating Factors | Poor path prediction 30.8 | Other course failures 26.9 | Inattention 23.1 | Traffic related maneuver 19.2 | Overload 11.5 | | | | | | | | | | | | | | | | | | | |

*Rounded to nearest percent.

Figure III-16. Working on Roadway Summary Data: Type 35

Type 36: School Bus N = 46

| Pedestrian Age* | 0-4 | 5-9 | 10-14 | 15-19 | 20-24 | 25-29 | 30-34 | 35-39 | 40-44 | 45-49 | 50-54 | 55-59 | 60-65 | Over 65 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| N = 46 | 4 | 41 | 30 | 22 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 |

| Time of Day* | 1 AM | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 PM | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| N = 46 | 0 | 0 | 0 | 0 | 0 | 2 | 39 | 9 | 4 | 0 | 4 | 2 | 2 | 2 | 24 | 9 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

| Area 46 | Intersection | Non-Intersection | City | Small Town | Suburban | Country | Commercial | Industrial | Residential | School | Playground | Open Area |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| N = 46 | 23.9 | 76.1 | 0.0 | 8.7 | 28.3 | 63.0 | 2.2 | 4.3 | 78.3 | 4.3 | 0.0 | 10.9 |

| Roadway Type: Suburban, | Limited Access | Controlled Access | Major Arterial Highway | Collector-Distributor | Local Street | Frontage or Service Road | Other |
|---|---|---|---|---|---|---|---|
| Small Town, City N = 19 | 0.0 | 0.0 | 10.9 | 10.9 | 15.2 | 0.0 | 0.0 |

| Roadway Type | Limited Access | Controlled Access | Primary Highway | Secondary Highway | Improved Highway | Unimproved Highway | Frontage or Service Road | Other |
|---|---|---|---|---|---|---|---|---|
| Country N = 29 | 0.0 | 2.2 | 13.0 | 34.8 | 10.9 | 0.0 | 0.0 | 2.2 |

| Selected Site Factors | Total trvld. lanes: 91.3 - two | Struck in lane: 56.5 - first 41.3 - second | Shoulder surface: 28.3 None 26.1 Gravel,shell,shale | Roadside features 43.5 Driveway 26.1 Ditch | Road markings: 41.3 Single dashed center |
|---|---|---|---|---|---|
| Pedestrian Activity N = | Getting on or off school bus 43.5 | Crossing not at intersection 28.3 | Standing in roadway 8.7 | Crossing at intersection 8.7 | |
| Vehicle Activity N = | Straight ahead 65.2 | Starting in roadway 13.0 | Passing 13.0 | | |
| Ped Causal Factors N = 46 | Running into roadway 37.0 | Misinterp. driver intent 15.2 | Inadequate search and detection 15.2 | | |
| Driver Causal Factors N = 46 | Specifically indicated none 32.6 | Search and detect. pattern misdirected 17.4 | Risk-taking 17.4 | | |
| Environmental Causal Factors N = 46 | Specifically indicated none 39.1 | Driver visual obscurement, standing traffic 17.4 | Inadequate or no roadway light 10.9 | | |
| Selected Interview Items | | | | | |
| Selected Pedestrian Precipitating Factors | Short time exposure 30.4 | Stopped bus 30.4 | Poor path prediction 26.0 | Search and detection failure NFS 21.7 | Distraction, other peds 19.6 |
| Selected Driver Precipitating Factors | Stopped bus 34.8 | Inadequate search 23.9 | Other course failures 21.7 | Speeding 13.0 | Poor path prediction 13.0 |

*Rounded to nearest percent.

Figure III-17. School Bus Summary Data: Type 36

## Type 37: Mailbox-Related N = 21

| Pedestrian Age* | 0-4 | 5-9 | 10-14 | 15-19 | 20-24 | 25-29 | 30-34 | 35-39 | 40-44 | 45-49 | 50-54 | 55-59 | 60-65 | Over 65 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| N = 21 | 24 | 38 | 10 | 0 | 5 | 0 | 10 | 0 | 0 | 0 | 0 | 0 | 0 | 14 |

| Time of Day* | 1 AM | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 PM | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| N = 21 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 0 | 5 | 10 | 5 | 5 | 10 | 5 | 29 | 10 | 0 | 10 | 5 | 5 | 0 | 0 | 0 | 0 |

| Area 21<br>21<br>N = 21 | Intersection | Non-Intersection | City | Small Town | Suburban | Country | Commercial | Industrial | Residential | School | Playground | Open Area |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0.0 | 100.0 | 4.8 | 4.8 | 9.5 | 80.9 | 0.0 | 0.0 | 76.2 | 0.0 | 0.0 | 23.8 |

| Roadway Type: Suburban, Small Town, City N = 4 | Limited Access | Controlled Access | Major Arterial Highway | Collector-Distributor | Local Street | Frontage or Service Road | Other |
|---|---|---|---|---|---|---|---|
| | 0.0 | 0.0 | 4.8 | 9.5 | 4.8 | 0.0 | 0.0 |

| Roadway Type | Limited Access | Controlled Access | Primary Highway | Secondary Highway | Improved Highway | Unimproved Highway | Frontage or Service Road | Other |
|---|---|---|---|---|---|---|---|---|
| Country N = 17 | 0.0 | 0.0 | 14.3 | 42.9 | 23.8 | 0.0 | 0.0 | 0.0 |

| Selected Site Factors | | | | |
|---|---|---|---|---|
| Total trvld. lanes:<br>100.0 - two | Struck in lane:<br>61.9 - first<br>38.1 - second | Shoulder surface:<br>33.3 Gravel, shell<br>33.3 Dirt or sand | Roadside features:<br>52.4 Driveway<br>28.6 Vegetation | Road markings:<br>33.3 Double solid center |

| Pedestrian Activity N = 21 | Crossing not at intersection 90.5 |
|---|---|
| Vehicle Activity N = | Straight ahead 100.0 |

| Ped Causal Factors N = 21 | Inadequate search and detection 52.4 | Running into roadway 52.4 | Poor path prediction 19.0 |
|---|---|---|---|
| Driver Causal Factors N = 21 | Specifically indicated none 42.8 | Misinterp. ped intent 28.6 | Stimulus overload 14.3 |
| Environmental Causal Factors N = 21 | Specifically indicated none 52.4 | Driver vision obscured, trees, roadside items 19.0 | Ped vision obscured, moving traffic 9.5 |

| Selected Interview Items | | | | | |
|---|---|---|---|---|---|
| Selected Pedestrian Precipitating Factors | Short time exposure 33.3 | Inattention, daydreaming 28.6 | Search and detection failure NFS 19.0 | Distraction, other peds 14.3 | Trees, brush, weeds 14.3 |
| Selected Driver Precipitating Factors | Speeding 23.8 | Improper avoidance decision 19.0 | Moving traffic 14.3 | Trees, brush 14.3 | Poor path prediction 14.3 |

*Rounded to nearest percent.

Figure III-18. Mailbox-Related Summary Data: Type 37

## Type 38: Emergency/Police Vehicle-Related N = 9

| | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Pedestrian Age* | 0-4 | 5-9 | 10-14 | 15-19 | 20-24 | 25-29 | 30-34 | 35-39 | 40-44 | 45-49 | 50-54 | 55-59 | 60-65 | Over 65 | | | | | | | | | |
| N = 9 | 0 | 0 | 0 | 0 | 0 | 22 | 44 | 0 | 11 | 11 | 0 | 11 | 0 | 0 | | | | | | | | | |
| Time of Day* | 1 AM | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 PM | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| N = 9 | 0 | 22 | 11 | 0 | 0 | 11 | 0 | 11 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 22 | 0 | 11 | 0 | 0 | 0 | 0 |
| Area 9<br>9<br>N = 9 | Intersection | Non-Intersection | | City | Small Town | Suburban | Country | | Commercial | Industrial | Residential | | School | Playground | Open Area | | | | | | | | |
| | 11.1 | 88.8 | | 22.2 | 22.2 | 11.1 | 44.4 | | 33.3 | 11.1 | 33.3 | | 0.0 | 0.0 | 22.2 | | | | | | | | |
| Roadway Type: Suburban, Small Town, City N=5 | Limited Access | Controlled Access | | Major Arterial Highway | | Collector-Distributor | | | Local Street | Frontage or Service Road | | | | Other | | | | | | | | | |
| | 11.1 | 0.0 | | 22.2 | | 11.1 | | | 11.1 | 0.0 | | | | 0.0 | | | | | | | | | |
| Roadway Type<br>Country N = 4 | Limited Access | Controlled Access | | Primary Highway | Secondary Highway | | Improved Highway | | Unimproved Highway | Frontage or Service Road | | | | Other | | | | | | | | | |
| | 22.2 | 0.0 | | 0.0 | 11.1 | | 11.1 | | 0.0 | 0.0 | | | | 0.0 | | | | | | | | | |
| Selected Site Factors | Total trvld. lanes:<br>44.4 - Two<br>22.2 - Four | | | Impact occurred:<br>44.4 Shoulder or edge of traveled way | | | 22.2 2nd quarter | | | Shoulder surface:<br>55.6 None<br>22.2 Bituminous | | | | Roadside features:<br>22.2 Sidewalks<br>22.2 Driveways | | | | | | | | | |
| Pedestrian Activity<br>N = 9 | Working in roadway<br>44.4 | | | Standing in roadway<br>22.2 | | | Not in roadway<br>11.1 | | | Getting on or off other vehicle<br>11.1 | | | | Crossing not at intersection<br>11.1 | | | | | | | | | |
| Vehicle Activity<br>N = 9 | Straight ahead<br>22.2 | | | Slowing or stopping<br>22.2 | | | Weaving<br>22.2 | | | Braking<br>11.1 | Passing<br>11.1 | | | Driving off roadway<br>11.1 | | | | | | | | | |
| Ped Causal Factors<br>N = 9 | Specifically indicated none<br>55.5 | | | Misinterp. driver intent<br>22.2 | | | Poor path prediction<br>22.2 | | | | | | | | | | | | | | | | |
| Driver Causal Factors<br>N = 9 | Inadequate search and detection<br>33.2 | | | Search and detection pattern misdirected<br>22.2 | | | Ran off traveled way<br>22.2 | | | | | | | | | | | | | | | | |
| Environmental Causal Factors<br>N = 9 | Specifically indicated none<br>66.7 | | | Other<br>22.2 | Ped and/or driver vision impaired by weather<br>11.1 | | | | | | | | | | | | | | | | | | |
| Selected Interview Items | | | | | | | | | | | | | | | | | | | | | | | |
| Selected Pedestrian Precipitating Factors | High exposure to vehicles<br>33.3 | | | Other search failures<br>33.3 | | | Unexpected/unusual place<br>22.2 | | | Distraction, other peds<br>22.2 | | | | Human factors<br>11.1 | | | | | | | | | |
| Selected Driver Precipitating Factors | Traffic-related maneuver<br>33.3 | | | Inattention<br>33.3 | | | Alcohol<br>33.3 | | | Speeding<br>22.2 | | | | Wrong side of road<br>11.1 | | | | | | | | | |

*Rounded to nearest percent.

Figure III-19. Emergency/Police Vehicle-Related Summary Data: Type 38

## Type 39: Going Out of Congrol N = 57

| Pedestrian Age* | 0-4 | 5-9 | 10-14 | 15-19 | 20-24 | 25-29 | 30-34 | 35-39 | 40-44 | 45-49 | 50-54 | 55-59 | 60-65 | Over 65 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| N = 57 | 7 | 7 | 14 | 16 | 12 | 4 | 5 | 4 | 5 | 5 | 4 | 7 | 7 | 4 |

| Time of Day* | 1 AM | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 PM | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| N = 57 | 2 | 2 | 0 | 0 | 0 | 0 | 9 | 0 | 4 | 4 | 5 | 2 | 5 | 7 | 4 | 5 | 5 | 12 | 2 | 11 | 11 | 0 | 0 | 0 |

| Area 53<br>57<br>N = 57 | Intersection | Non-Intersection | City | Small Town | Suburban | Country | Commercial | Industrial | Residential | School | Playground | Open Area |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 24.6 | 68.4 | 14.0 | 22.8 | 31.6 | 31.6 | 17.5 | 3.5 | 56.1 | 7.0 | 3.5 | 12.3 |

| Roadway Type: Suburban, Small Town, City N = 38 | Limited Access | Controlled Access | Major Arterial Highway | Collector-Distributor | Local Street | Frontage or Service Road | Other |
|---|---|---|---|---|---|---|---|
| | 3.5 | 0.0 | 8.8 | 7.0 | 42.1 | 0.0 | 5.3 |

| Roadway Type | Limited Access | Controlled Access | Primary Highway | Secondary Highway | Improved Highway | Unimproved Highway | Frontage or Service Road | Other |
|---|---|---|---|---|---|---|---|---|
| Country N = 19 | 5.3 | 0.0 | 5.3 | 10.5 | 5.3 | 1.7 | 0.0 | 5.3 |

| Selected Site Factors | | | | |
|---|---|---|---|---|
| Total trvld lanes:<br>75.4 - Two<br>7.0 - Four | Impact occurred:<br>42.1 Shldr/t.w. edge<br>33.3 Not on roadway | Shoulder surface:<br>42.1 None<br>15.8 Gravel, shell, shale | Roadside features:<br>19.3 Ditch<br>14.0 Driveway | |

| Pedestrian Activity N = | | | | |
|---|---|---|---|---|
| Not in roadway<br>35.1 | Standing in roadway<br>12.3 | Walking in road with traffic<br>12.3 | Other<br>10.5 | Walking in roadway against traffic<br>8.8 |

| Vehicle Activity N = | | |
|---|---|---|
| Out of control<br>49.1 | Going straight ahead<br>19.3 | Driving off roadway<br>8.8 |

| Ped Causal Factors N = 57 | | |
|---|---|---|
| Specifically indicated none<br>52.6 | Search and detection pattern misdirected<br>7.0 | Unexpected or unusual place<br>7.0 |

| Driver Causal Factors N = 57 | | |
|---|---|---|
| Ran off traveled way<br>49.1 | Alcohol, drug<br>21.0 | Poor path prediction<br>8.8 |

| Environmental Causal Factors N = 57 | | |
|---|---|---|
| Specifically indicated none<br>35.1 | Condition of roadway, ice<br>17.5 | Condition of vehicle<br>14.0 |

| Selected Interview Items | | | | |
|---|---|---|---|---|
| | | | | |

| Selected Pedestrian Precipitating Factors | | | | |
|---|---|---|---|---|
| Poor path prediction<br>12.3 | Other course failures<br>12.3 | Improper evasive decision<br>8.8 | Play activity<br>8.8 | Other evaluation failures<br>7.0 |

| Selected Driver Precipitating Factors | | | | |
|---|---|---|---|---|
| Out of control/ prior ped involvement<br>80.7 | Speeding<br>28.1 | Environmental limits, slippery surface<br>21.0 | Inadequate brakes<br>12.3 | Traffic-related maneuver<br>10.5 |

*Rounded to nearest percent.

Figure III-20. Going Out of Control Summary Data: Type 39

## Type 40: Walk To or From Disabled Vehicle N = 11

| | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Pedestrian Age* | 0-4 | | 5-9 | | 10-14 | | 15-19 | | 20-24 | | 25-29 | | 30-34 | | 35-39 | | 40-44 | | 45-49 | | 50-54 | | 55-59 | | 60-65 | | Over 65 | |
| N = 11 | 0 | | 0 | | 0 | | 0 | | 45 | | 9 | | 9 | | 0 | | 9 | | 0 | | 9 | | 18 | | 0 | | 0 | |
| Time of Day* | 1 AM | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 PM | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| N = 11 | 9 | 9 | 0 | 0 | 0 | 0 | 9 | 0 | 0 | 0 | 0 | 0 | 0 | 18 | 0 | 0 | 0 | 0 | 0 | 18 | 0 | 0 | 18 | 18 |
| Area 11 | Intersection | | Non-Intersection | | | | City | | Small Town | | Suburban | | Country | | Commercial | | Industrial | | Residential | | School | | Playground | | Open Area | |
| N = 11 | 18.2 | | 81.8 | | | | 9.1 | | 18.2 | | 18.2 | | 54.5 | | 9.1 | | 0.0 | | 9.1 | | 0.0 | | 0.0 | | 81.8 | |
| Roadway Type: Suburban, | Limited Access | | Controlled Access | | | | Major Arterial Highway | | | | Collector-Distributor | | | | Local Street | | Frontage or Service Road | | | | | | Other | |
| Small Town, City N = 5 | 18.2 | | 0.0 | | | | 9.1 | | | | 18.2 | | | | 0.0 | | 0.0 | | | | | | 0.0 | |
| Roadway Type | Limited Access | | Controlled Access | | | | Primary Highway | | | | Secondary Highway | | | | Improved Highway | | Unimproved Highway | | | | Frontage or Service Road | | Other | |
| Country N = 6 | 18.2 | | 0.0 | | | | 27.3 | | | | 9.1 | | | | 0.0 | | 0.0 | | | | 0.0 | | 0.0 | |
| Selected Site Factors | Total trvld. lanes:<br>54.5 - Two<br>27.3 - Four | | | | | | Impact occurred:<br>27.3 Shldr/t.w.edg<br>27.3 3rd quarter | | | | Shoulder surface:<br>36.4 Bituminous<br>18.2 Concrete | | | | Roadside features:<br>27.3 Guardrail<br>18.2 Ditch | | | | Road center markings:<br>45.4 Divided hwy with median or barrier | | | | | |
| Pedestrian Activity N = 11 | Crossing not at intersection<br>45.4 | | | | | | Crossing at intersection<br>18.2 | | | | Walking in road with traffic<br>18.2 | | | | Standing in roadway<br>9.1 | | | | | | | | | |
| Vehicle Activity N = | Straight ahead<br>90.9 | | | | | | Changing lanes or merging<br>9.1 | | | | | | | | | | | | | | | | | |
| Ped Causal Factors N = 11 | Risk-taking<br>54.5 | | | | | | Search and detection pattern misdirected<br>27.3 | | | | | | Inadequate search<br>18.2 | | | | | | | | | | | |
| Driver Causal Factors N = 11 | Specifically indicated none<br>27.3 | | | | | | Search and detection pattern misdirected<br>27.3 | | | | | | Ran off traveled way<br>18.2 | | | | | | | | | | | |
| Environmental Causal Factors N = 11 | No roadway light/ inadequate light<br>54.5 | | | | | | Ped and/or driver vision obscured by weather<br>27.3 | | | | | | Condition of roadway, ice or snow<br>18.2 | | | | | | | | | | | |
| Selected Interview Items | | | | | | | | | | | | | | | | | | | | | | | | |
| Selected Pedestrian Precipitating Factors | High exposure to vehicles<br>45.4 | | | | | | Unexpected or unusual place<br>45.4 | | | | Search and detection failure<br>45.4 | | | | | | Alcohol<br>36.3 | | | | Inattention, daydreaming<br>27.2 | | | |
| Selected Driver Precipitating Factors | Weather conditions<br>36.4 | | | | | | Poor roadside light<br>36.4 | | | | Other distractions<br>27.3 | | | | Limited avoidance response, weather<br>27.3 | | | | | | Inadequate search<br>18.2 | | | |

*Rounded to nearest percent.

Figure III-21. Walk To or From Disabled Vehicle Summary Data: Type 40

## Type 97: Other N = 145

| Pedestrian Age* | 0-4 | 5-9 | 10-14 | 15-19 | 20-24 | 25-29 | 30-34 | 35-39 | 40-44 | 45-49 | 50-54 | 55-59 | 60-65 | Over 65 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| N = 142 | 12 | 13 | 12 | 17 | 10 | 6 | 2 | 5 | 4 | 1 | 1 | 1 | 2 | 12 |

| Time of Day* | 1 AM | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 PM | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| N = 145 | 4 | 3 | 0 | 0 | 0 | 1 | 1 | 3 | 1 | 2 | 6 | 3 | 5 | 6 | 3 | 12 | 11 | 8 | 10 | 3 | 3 | 6 | 3 | 3 |

| Area 141 144 | Intersection | Non-Intersection | City | Small Town | Suburban | Country | Commercial | Industrial | Residential | School | Playground | Open Area |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| N = 144 | 20.7 | 76.5 | 14.5 | 13.8 | 34.5 | 36.5 | 25.5 | 2.8 | 44.1 | 9.7 | 1.4 | 15.9 |

| Roadway Type: Suburban, Small Town, City N=90 | Limited Access | Controlled Access | Major Arterial Highway | Collector-Distributor | Local Street | Frontage or Service Road | Other |
|---|---|---|---|---|---|---|---|
| | 2.8 | 0.7 | 17.2 | 6.9 | 31.0 | 0.0 | 2.8 |

| Roadway Type | Limited Access | Controlled Access | Primary Highway | Secondary Highway | Improved Highway | Unimproved Highway | Frontage or Service Road | Other |
|---|---|---|---|---|---|---|---|---|
| Country N = 55 | 6.2 | 2.1 | 8.3 | 12.4 | 6.9 | 1.4 | 0.0 | 0.7 |

| Selected Site Factors | | | |
|---|---|---|---|
| Total trvld. lanes:<br>71.0 - Two<br>14.5 - Four | Ped struck in lane:<br>52.4 - First<br>22.7 - Second | Shoulder surface:<br>44.8 None<br>17.9 Bituminous | Roadside features:<br>24.8 Driveway<br>9.6 Vegetation |

| Pedestrian Activity N = | | | | |
|---|---|---|---|---|
| Crossing not at intersection 26.9 | Standing in roadway 19.3 | Crossing at intersection 13.1 | Other 13.1 | Playing in roadway 11.7 |

| Vehicle Activity N = | |
|---|---|
| Straight ahead | 89.7 |

| Ped Causal Factors N = 145 | | |
|---|---|---|
| Risk-taking 31.0 | Alcohol 23.4 | Inadequate search and detection 17.9 |

| Driver Causal Factors N = 145 | | |
|---|---|---|
| Specifically indicated none 32.4 | Inadequate search and detection 16.5 | Search and detection pattern misdirected 11.7 |

| Environmental Causal Factors N = 145 | | |
|---|---|---|
| Specifically indicated none 38.6 | Inadequate or no roadway light 22.8 | Other 7.6 |

| Selected Interview Items | | | | | |
|---|---|---|---|---|---|
| Selected Pedestrian Precipitating Factors | High exposure to vehicles 35.9 | Unexpected or unusual place 26.2 | Inattention, daydreaming 22.0 | Short time exposure 20.7 | Distraction, play activity 17.9 |
| Selected Driver Precipitating Factors | Misinterp. ped intent 24.1 | Poor path prediction 14.5 | Poor roadside light 13.1 | Speeding 12.4 | Alcohol 9.0 |

*Rounded to nearest percent.

Figure III-22. Other Summary Data: Type 97

Type 98: Weird N = 114

| Pedestrian Age* | 0-4 | 5-9 | 10-14 | 15-19 | 20-24 | 25-29 | 30-34 | 35-39 | 40-44 | 45-49 | 50-54 | 55-59 | 60-65 | Over 65 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| N = | 5 | 4 | 8 | 25 | 21 | 10 | 6 | 4 | 2 | 4 | 2 | 3 | 1 | 8 |

| Time of Day* | 1 AM | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 PM | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| N = | 3 | 5 | 5 | 4 | 3 | 0 | 1 | 1 | 4 | 2 | 4 | 2 | 4 | 4 | 8 | 7 | 6 | 8 | 4 | 7 | 5 | 5 | 5 | 10 |

| Area 105 113 | Intersection | Non-Intersection | City | Small Town | Suburban | Country | Commercial | Industrial | Residential | School | Playground | Open Area |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| N = 113 | 16.7 | 75.4 | 9.6 | 16.7 | 28.1 | 44.7 | 21.9 | 3.5 | 38.6 | 3.5 | 1.7 | 29.8 |

| Roadway Type: Suburban, Small Town, City N = 62 | Limited Access | Controlled Access | Major Arterial Highway | Collector-Distributor | Local Street | Frontage or Service Road | Other |
|---|---|---|---|---|---|---|---|
| | 4.4 | 1.7 | 11.4 | 7.0 | 26.3 | 0.8 | 2.6 |

| Roadway Type | Limited Access | Controlled Access | Primary Highway | Secondary Highway | Improved Highway | Unimproved Highway | Frontage or Service Road | Other |
|---|---|---|---|---|---|---|---|---|
| Country N = | 3.5 | 2.6 | 9.6 | 8.8 | 12.3 | 1.7 | 0.0 | 5.3 |

| Selected Site Factors | Total trvld. lanes: 61.4 - Two 14.9 - Four | Struck in lane: 23.7 First 17.5 Second | Shoulder surface: 37.7 None 18.4 Grass | Roadside features: 14.9 Driveway 11.4 Ditch |
|---|---|---|---|---|

| Pedestrian Activity N = | Other 22.8 | Crossing not at intersection 14.0 | Standing in roadway 14.0 | Lying in roadway 13.6 | Getting on or off other vehicle 8.8 |
|---|---|---|---|---|---|

| Vehicle Activity N = | Straight ahead 59.6 | Starting in roadway 7.0 | Starting from parked position 7.0 |
|---|---|---|---|

| Ped Causal Factors N = 114 | Risk-taking 42.1 | Unexpected or unusual place 21.0 | Alcohol 20.2 |
|---|---|---|---|

| Driver Causal Factors N = 114 | Specifically indicated none 30.7 | Search and detection pattern misdirected 12.3 | Risk-taking 11.4 |
|---|---|---|---|

| Environmental Causal Factors N = 114 | Specifically indicated none 57.9 | Inadequate or no roadway light 20.2 | Driver blinded by headlights 7.9 |
|---|---|---|---|

| Selected Interview Items | |
|---|---|

| Selected Pedestrian Precipitating Factors | Other course failures 35.9 | High exposure to vehicles 27.1 | Misinterp. driver intent 26.6 | Distraction, play activity 17.9 | Distraction, other peds 13.8 |
|---|---|---|---|---|---|

| Selected Driver Precipitating Factors | Misinterp. ped intent 21.0 | Other course failures 21.0 | Inadequate search and detection 12.3 | Speeding 9.6 | Poor path prediction 9.6 |
|---|---|---|---|---|---|

*Rounded to nearest percent.

Figure III-23. Weird Summary Data: Type 98

## Type 99: Limited Information N = 24

| Pedestrian Age* | 0-4 | 5-9 | 10-14 | 15-19 | 20-24 | 25-29 | 30-34 | 35-39 | 40-44 | 45-49 | 50-54 | 55-59 | 60-65 | Over 65 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| N = 21 | 4 | 8 | 8 | 8 | 8 | 8 | 13 | 0 | 8 | 8 | 0 | 0 | 0 | 13 |

| Time of Day* | 1 AM | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 PM | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| N = 24 | 8 | 8 | 0 | 0 | 0 | 4 | 0 | 0 | 0 | 4 | 0 | 0 | 4 | 0 | 17 | 8 | 8 | 4 | 0 | 4 | 8 | 13 | 0 | 0 |

| Area 23 | Intersection | Non-Intersection | City | Small Town | Suburban | Country | Commercial | Industrial | Residential | School | Playground | Open Area |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| N = 23 | 16.7 | 79.2 | 25.0 | 4.2 | 16.7 | 50.0 | 25.0 | 4.2 | 33.3 | 0.0 | 0.0 | 33.3 |

| Roadway Type: Suburban, | Limited Access | Controlled Access | Major Arterial Highway | Collector-Distributor | Local Street | Frontage or Service Road | Other |
|---|---|---|---|---|---|---|---|
| Small Town, City N = 11 | 8.3 | 0.0 | 20.8 | 4.2 | 12.5 | 0.0 | 0.0 |

| Roadway Type | Limited Access | Controlled Access | Primary Highway | Secondary Highway | Improved Highway | Unimproved Highway | Frontage or Service Road | Other |
|---|---|---|---|---|---|---|---|---|
| Country N = 12 | 0.0 | 4.2 | 4.2 | 33.3 | 8.3 | 0.0 | 0.0 | 0.0 |

| | | | | |
|---|---|---|---|---|
| Selected Site Factors | Total trvld. lanes:<br>54.2 - Two<br>25.0 - Four | Struck in lane:<br>50.0 Second<br>16.7 First | Shoulder surface:<br>29.2 None<br>16.7 Bituminous | Roadside features:<br>25.0 Driveway<br>12.5 Vegetation |
| Pedestrian Activity N = | Crossing not at intersection<br>54.2 | Crossing at intersection<br>12.5 | Standing in roadway<br>12.5 | Other<br>8.3 |
| Vehicle Activity N = | Straight ahead<br>91.7 | | | |
| Ped Causal Factors N = 24 | Risk-taking<br>45.8 | Alcohol<br>16.7 | Short time exposure<br>8.3 | |
| Driver Causal Factors N = 24 | Specifically indicated none<br>33.3 | Inadequate search and detection<br>16.7 | Vehicle speed<br>12.5 | |
| Environmental Causal Factors N = 24 | Specifically indicated none<br>45.8 | Inadequate or no roadway light<br>29.2 | Roadway curvature<br>8.3 | |
| Selected Interview Items | | | | |
| Selected Pedestrian Precipitating Factors | Search and detection failure NFS<br>41.7 | High exposure to vehicles<br>33.3 | Unexpected or unusual place<br>20.8 | Inattention, daydreaming<br>8.3 | Running<br>8.3 |
| Selected Driver Precipitating Factors | Poor roadside light<br>20.8 | Poor path prediction<br>8.3 | Inattention<br>8.3 | Adequate search but detection failure<br>8.3 | Alcohol<br>4.2 |

*Rounded to nearest percent.

Figure III-24. Limited Information Summary Data: Type 99

## Accident Type Comparison Data

This section presents a series of cross-tabulations of selected variables for each accident type. The information presentation format permits comparisons and contrasts to be made between the various accident types. Similarities and differences between the accident types which were described in the previous section can be examined in greater detail. The following tabulations are discussed:

- Accident type by state
- Injury severity by accident type
- Vehicle speed and baserate data by accident type
- Roadway geometry by accident type
- Vertical placement by accident type
- Horizontal curvature by accident type
- Pedestrian accommodations by selected accident types

Table III-35 shows the frequency of the various accident types experienced by each state. The row percent figure shows the percentage of each type that occurred in that state. It is most meaningful when compared to the total percentage figure at the bottom of the chart. For example, California had 44 percent of the dart-out first-half accidents yet represented 33 percent of the sample. The column percent shows the percentage of the particular state's sample that were of that specific accident type. That figure is most frequently compared to the column percent figure found in the total column. Thus, 15 percent of California's sample were dart-out first-half accidents while 11 percent of the total sample were that type. The total percent row shows the percentage of the total sample found that coordinate. Thus, 5 percent of the total sample were dart-out first half accidents in California. Interestingly, California appears to be overrepresented in intersection-related accidents, Types 12, 13, and 23 as well as Vendor/Ice Cream Truck accidents. Conversely,

California is underrepresented in those accident types that occur in more open areas 24, 25, and 33. The high incidence of multiple threat has implications with regard to California's pedestrian right-of-way regulations. Michigan appears to have more school bus-related and mailbox-related accidents. Missouri has more disabled vehicle and vehicle out-of-control accidents. North Carolina appears to have no particularly high occurrence of any one type. Pennsylvania has more peds not in roadway, as a result of auto-auto, and working on roadway. Texas had more limited information cases.

By examining the column percents, it is apparent that nearly three times more disabled vehicle-related accidents occurred in Missouri than in all the states combined. Result of auto-auto and working on roadway was nearly three times more frequent in Pennsylvania than expected. School bus-related accidents were twice as frequently found in Michigan than elsewhere.

Injury severity by accident type is presented in Table III-36. The same column percent, row percent format is used. The most useful comparisons are made between the row percents and the total percent figures at the bottom of the second page of the chart. For example, 12 percent of all accidents were fatal, yet 23 percent of the ped not in roadway (25) types were more likely to produce fatal injuries.

Vehicle speed and pedestrian and vehicle exposure data are tabulated by accident type in Table III-37. Hitchhiking, mailbox-related and walking to or from a disabled vehicle occurred at the higher speed locations. Intersection-related accidents (Intersection Dash, Vehicle T/M, and Turning Vehicle) occurred at sites with lower posted speeds. The observed mean speed appears to "track" the posted or legal speed limit and, in most cases, is slightly less. Traffic volumes and pedestrian volumes were higher at Intersection Dash, Turning Vehicle, and Multiple Threat sites.

As might be expected, pedestrian volumes were relatively low at hitchhiking, mailbox-related, working on roadway, and walking to or from disabled vehicle sites.

Table III-38 contains the roadway geometry data for each accident type. Not surprisingly, multiple threat accidents occur on the widest roads and mailbox-related occur on the most narrow roadways. This is particularly interesting when considered in the context of the high posted speeds found at those locations. Shoulders were relatively wide at the walking along the roadway sites.

The vertical alignment of the roadway at the serious accident sites is shown in Table III-39. Some accident types (Vehicle T/M, Backing Up, Ped Not in Roadway), occur more frequently on level roadways (i.e., >75 percent). Other types (walking along roadway, disabled vehicle-related, working on the roadway, and walking to or from disabled vehicle) were found less frequently on level roadway (i.e., <65 percent). Of these, walking along the roadway shows the greatest variation in vertical placement site characteristics. Interestingly enough, 10 percent of the accidents occur on a downgrade.

The horizontal curvature of the roadway at the accident site is presented in Table III-40. Walking along the roadway involved a variety of roadway curvatures; in particular, relatively gradual right and left turns. Vehicle out of control and weird type accidents had a greater proportion occurring on sharper turns than did the other types.

Table III-41 shows the pedestrian accommodations found at the sites of nine selected accident types. Accommodations include such factors as the suitability of the shoulder for walking and the presence or absence of pavement edge markings. Type 25, Walking Along Roadway, had lowest incidence of pavement edge markings or curbs, and the second highest incidence of shoulders that were unsuitable for pedestrian travel.

# Table III-35

## Accident Type by State

| Accident Type | Column Percent | Calif. 1 | Mich. 2 | Mo. 3 | N.C. 4 | Penn. 5 | Tex. 6 | Total |
|---|---|---|---|---|---|---|---|---|
| Dart Out 1st Half | 1 N = | 73 | 12 | 13 | 28 | 17 | 23 | 166 |
| | Row% | 44 | 7 | 8 | 17 | 10 | 14 | 100 |
| | Col% | 15 | 4 | 11 | 11 | 10 | 11 | 11 |
| | Tot% | 5 | 1 | 1 | 2 | 1 | 2 | |
| Dart Out 2nd Half | 2 N = | 40 | 27 | 12 | 35 | 16 | 27 | 157 |
| | Row% | 25 | 17 | 8 | 22 | 10 | 17 | 100 |
| | Col% | 8 | 10 | 10 | 13 | 9 | 13 | 10 |
| | Tot% | 3 | 2 | 1 | 2 | 1 | 2 | |
| Midblock Dash | 3 N = | 47 | 23 | 6 | 39 | 15 | 22 | 152 |
| | Row% | 31 | 15 | 4 | 26 | 10 | 14 | 100 |
| | Col% | 9 | 8 | 5 | 15 | 9 | 11 | 10 |
| | Tot% | 3 | 2 | 0 | 3 | 1 | 1 | |
| Intersection Dash | 11 N = | 73 | 36 | 5 | 19 | 10 | 9 | 152 |
| | Row% | 48 | 24 | 3 | 12 | 7 | 6 | 100 |
| | Col% | 15 | 13 | 4 | 7 | 6 | 4 | 10 |
| | Tot% | 5 | 2 | 0 | 1 | 1 | 1 | |
| Vehicle Turn/Merge w/ Attention Conflict | 12 N = | 15 | 0 | 0 | 3 | 0 | 2 | 20 |
| | Row% | 75 | 0 | 0 | 15 | 0 | 10 | 100 |
| | Col% | 3 | 0 | 0 | 1 | 0 | 1 | 1 |
| | Tot% | 1 | 0 | 0 | 0 | 0 | 0 | |
| Turning Vehicle | 13 N = | 27 | 2 | 0 | 0 | 0 | 0 | 29 |
| | Row% | 93 | 7 | 0 | 0 | 0 | 0 | 100 |
| | Col% | 5 | 1 | 0 | 0 | 0 | 0 | 2 |
| | Tot% | 2 | 0 | 0 | 0 | 0 | 0 | |
| Trapped | 14 N = | 1 | 1 | 0 | 0 | 0 | 1 | 3 |
| | Row% | 33 | 33 | 0 | 0 | 0 | 33 | 100 |
| | Col% | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Tot% | 0 | 0 | 0 | 0 | 0 | 0 | |
| Multiple Threat | 22 N = | 20 | 4 | 0 | 1 | 0 | 1 | 26 |
| | Row% | 77 | 15 | 0 | 4 | 0 | 4 | 100 |
| | Col% | 4 | 1 | 0 | 0 | 0 | 0 | 2 |
| | Tot% | 1 | 0 | 0 | 0 | 0 | 0 | |
| Backing Up | 23 N = | 9 | 7 | 1 | 3 | 2 | 4 | 26 |
| | Row% | 35 | 27 | 4 | 12 | 8 | 15 | 100 |
| | Col% | 2 | 3 | 1 | 1 | 1 | 2 | 2 |
| | Tot% | 1 | 0 | 0 | 0 | 0 | 0 | |
| Ped Not in Roadway | 24 N = | 2 | 5 | 0 | 2 | 9 | 4 | 22 |
| | Row% | 9 | 23 | 0 | 9 | 41 | 18 | 100 |
| | Col% | 0 | 2 | 0 | 1 | 5 | 2 | 1 |
| | Tot% | 0 | 0 | 0 | 0 | 1 | 0 | |
| Walking Along Roadway | 25 N = | 22 | 39 | 14 | 43 | 24 | 36 | 178 |
| | Row% | 12 | 22 | 8 | 24 | 13 | 20 | 100 |
| | Col% | 4 | 14 | 12 | 16 | 14 | 18 | 12 |
| | Tot% | 1 | 3 | 1 | 3 | 2 | 2 | |
| Hitchhiking | 26 N = | 8 | 6 | 4 | 1 | 3 | 1 | 23 |
| | Row% | 35 | 26 | 17 | 4 | 13 | 4 | 100 |
| | Col% | 2 | 2 | 3 | 0 | 2 | 0 | 2 |
| | Tot% | 1 | 0 | 0 | 0 | 0 | 0 | |
| Bus Stop-Related | 31 N = | 1 | 1 | 0 | 0 | 0 | 0 | 2 |
| | Row% | 50 | 50 | 0 | 0 | 0 | 0 | 100 |
| | Col% | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Tot% | 0 | 0 | 0 | 0 | 0 | 0 | |
| Vendor-Ice Cream Truck | 32 N = | 15 | 2 | 0 | 2 | 0 | 2 | 21 |
| | Row% | 71 | 10 | 0 | 10 | 0 | 10 | 100 |
| | Col% | 3 | 1 | 0 | 1 | 0 | 1 | 1 |
| | Tot% | 1 | 0 | 0 | 0 | 0 | 0 | |
| Disabled Vehicle-Related | 33 N = | 15 | 22 | 19 | 12 | 8 | 10 | 86 |
| | Row% | 17 | 26 | 22 | 14 | 9 | 12 | 100 |
| | Col% | 3 | 8 | 17 | 5 | 5 | 5 | 6 |
| | Tot% | 1 | 1 | 1 | 1 | 1 | 1 | |

# Table III-35

## Accident Type by State
## (Continued)

| Accident Type | Column Percent | Calif. 1 | Mich. 2 | Mo. 3 | N.C. 4 | Penn. 5 | Tex. 6 | Total |
|---|---|---|---|---|---|---|---|---|
| Result Auto-Auto Crash | 34 N = | 3 | 3 | 0 | 2 | 5 | 1 | 14 |
| | Row% | 21 | 21 | 0 | 14 | 35 | 7 | 100 |
| | Col% | 1 | 1 | 0 | 1 | 3 | 0 | 1 |
| | Tot% | 0 | 0 | 0 | 0 | 0 | 0 | |
| Working On Roadway | 35 N = | 5 | 2 | 2 | 6 | 8 | 3 | 26 |
| | Row% | 19 | 8 | 8 | 23 | 31 | 12 | 100 |
| | Col% | 1 | 1 | 2 | 2 | 5 | 1 | 2 |
| | Tot% | 0 | 0 | 0 | 0 | 1 | 0 | |
| School Bus-Related | 36 N = | 7 | 16 | 1 | 11 | 1 | 10 | 46 |
| | Row% | 15 | 35 | 2 | 24 | 2 | 22 | 100 |
| | Col% | 1 | 6 | 1 | 4 | 1 | 5 | 3 |
| | Tot% | 0 | 1 | 0 | 1 | 0 | 1 | |
| Mail Box-Related | 37 N = | 3 | 7 | 2 | 4 | 5 | 0 | 21 |
| | Row% | 14 | 33 | 10 | 19 | 24 | 0 | 100 |
| | Col% | 1 | 3 | 2 | 2 | 3 | 0 | 1 |
| | Tot% | 0 | 0 | 0 | 0 | 0 | 0 | |
| Emergency/Police Vehicle-Related | 38 N = | 4 | 1 | 1 | 0 | 2 | 1 | 9 |
| | Row% | 44 | 11 | 11 | 0 | 22 | 11 | 100 |
| | Col% | 1 | 0 | 1 | 0 | 1 | 0 | 1 |
| | Tot% | 0 | 0 | 0 | 0 | 0 | 0 | |
| Result of Vehicle Going Out of Control | 39 N = | 16 | 12 | 9 | 9 | 8 | 4 | 58 |
| | Row% | 28 | 21 | 16 | 16 | 14 | 7 | 100 |
| | Col% | 3 | 4 | 8 | 3 | 5 | 2 | 4 |
| | Tot% | 1 | 1 | 1 | 1 | 1 | 0 | |
| Walking To or From Disabled Vehicle | 40 N = | 5 | 3 | 1 | 0 | 1 | 1 | 11 |
| | Row% | 45 | 27 | 9 | 0 | 9 | 9 | 100 |
| | Col% | 1 | 1 | 1 | 0 | 1 | 0 | 1 |
| | Tot% | 0 | 0 | 0 | 0 | 0 | 0 | |
| Other | 97 N = | 54 | 20 | 10 | 32 | 11 | 18 | 145 |
| | Row% | 37 | 14 | 7 | 22 | 8 | 12 | 100 |
| | Col% | 11 | 7 | 9 | 12 | 6 | 9 | 9 |
| | Tot% | 4 | 1 | 1 | 2 | 1 | 1 | |
| Weird | 98 N = | 28 | 22 | 14 | 9 | 24 | 17 | 114 |
| | Row% | 25 | 19 | 12 | 8 | 21 | 15 | 100 |
| | Tot% | 6 | 8 | 12 | 3 | 14 | 8 | 7 |
| | Tot% | 2 | 1 | 1 | 1 | 2 | 1 | |
| Limited Information | 99 N = | 9 | 1 | 1 | 5 | 1 | 7 | 24 |
| | Row% | 37 | 4 | 4 | 21 | 4 | 29 | 100 |
| | Col% | 2 | 0 | 1 | 2 | 1 | 3 | 2 |
| | Tot% | 1 | 0 | 0 | 0 | 0 | 0 | |
| | Col Tot | 502 | 274 | 115 | 266 | 170 | 204 | |
| | Tot% | 33 | 18 | 8 | 17 | 11 | 13 | |
| Total Number of Observations = 1531 | | | | | | | | |

# Table III-36

## Injury Severity by Accident Type

| Accident Type | Column Percent | None 1 | Minor 2 | Moderate 3 | Serious 4 | Fatal 5 | Total |
|---|---|---|---|---|---|---|---|
| Dart Out 1st Half | 1 N = | 2 | 25 | 66 | 46 | 22 | 162 |
| | Row% | 1 | 15 | 41 | 28 | 14 | 100 |
| | Col% | 6 | 12 | 12 | 9 | 12 | 11 |
| | Tot% | 0 | 2 | 4 | 3 | 1 | |
| Dart Out 2nd Half | 2 N = | 1 | 14 | 48 | 64 | 27 | 154 |
| | Row% | 1 | 9 | 31 | 42 | 18 | 100 |
| | Col% | 3 | 7 | 9 | 12 | 15 | 10 |
| | Tot% | 0 | 1 | 3 | 4 | 2 | |
| Midblock Dash | 3 N = | 4 | 14 | 67 | 60 | 6 | 151 |
| | Row% | 3 | 9 | 44 | 40 | 4 | 100 |
| | Col% | 12 | 7 | 13 | 11 | 3 | 10 |
| | Tot% | 0 | 1 | 4 | 4 | 0 | |
| Intersection Dash | 11 N = | 6 | 14 | 58 | 53 | 14 | 146 |
| | Row% | 4 | 10 | 40 | 36 | 10 | 100 |
| | Col% | 18 | 7 | 11 | 10 | 8 | 10 |
| | Tot% | 0 | 1 | 4 | 4 | 1 | |
| Vehicle Turn/Merge w/ Attention Conflict | 12 N = | 1 | 6 | 5 | 7 | 0 | 19 |
| | Row% | 5 | 32 | 26 | 37 | 0 | 100 |
| | Col% | 3 | 3 | 1 | 1 | 0 | 1 |
| | Tot% | 0 | 0 | 0 | 0 | 0 | |
| Turning Vehicle | 13 N = | 2 | 10 | 11 | 4 | 0 | 27 |
| | Row% | 7 | 37 | 41 | 15 | 0 | 100 |
| | Col% | 6 | 5 | 2 | 1 | 0 | 2 |
| | Tot% | 0 | 1 | 1 | 0 | 0 | |
| Trapped | 14 N = | 0 | 0 | 2 | 1 | 0 | 3 |
| | Row% | 0 | 0 | 67 | 33 | 0 | 100 |
| | Col% | 0 | 0 | 0 | 0 | 0 | 0 |
| | Tot% | 0 | 0 | 0 | 0 | 0 | |
| Multiple Threat | 22 N = | 0 | 4 | 9 | 11 | 2 | 26 |
| | Row% | 0 | 15 | 35 | 42 | 8 | 100 |
| | Col% | 0 | 2 | 2 | 2 | 1 | 2 |
| | Tot% | 0 | 0 | 1 | 1 | 0 | |
| Backing Up | 23 N = | 0 | 9 | 8 | 6 | 1 | 25 |
| | Row% | 0 | 36 | 32 | 24 | 4 | 100 |
| | Col% | 0 | 4 | 2 | 1 | 1 | 2 |
| | Tot% | 0 | 1 | 1 | 0 | 0 | |
| Ped Not in Roadway | 24 N = | 0 | 6 | 9 | 2 | 5 | 22 |
| | Row% | 0 | 27 | 41 | 9 | 23 | 100 |
| | Col% | 0 | 3 | 2 | 0 | 3 | 1 |
| | Tot% | 0 | 0 | 1 | 0 | 0 | |
| Walking Along Roadway | 25 N = | 4 | 24 | 60 | 61 | 25 | 174 |
| | Row% | 2 | 14 | 34 | 35 | 14 | 100 |
| | Col% | 12 | 11 | 11 | 12 | 14 | 12 |
| | Tot% | 0 | 2 | 4 | 4 | 2 | |
| Hitchhiking | 26 N = | 0 | 4 | 5 | 11 | 2 | 22 |
| | Row% | 0 | 18 | 23 | 50 | 9 | 100 |
| | Col% | 0 | 2 | 1 | 2 | 1 | 1 |
| | Tot% | 0 | 0 | 0 | 1 | 0 | |
| Bus Stop-Related | 31 N = | 0 | 2 | 0 | 0 | 0 | 2 |
| | Row% | 0 | 100 | 0 | 0 | 0 | 100 |
| | Col% | 0 | 1 | 0 | 0 | 0 | 0 |
| | Tot% | 0 | 0 | 0 | 0 | 0 | |
| Vendor-Ice Cream Truck | 32 N = | 0 | 4 | 11 | 4 | 1 | 20 |
| | Row% | 0 | 20 | 55 | 20 | 5 | 100 |
| | Col% | 0 | 2 | 2 | 1 | 1 | 1 |
| | Tot% | 0 | 0 | 1 | 0 | 0 | |
| Disabled Vehicle-Related | 33 N = | 0 | 8 | 30 | 30 | 10 | 79 |
| | Row% | 0 | 10 | 38 | 38 | 13 | 100 |
| | Col% | 0 | 4 | 6 | 6 | 6 | 5 |
| | Tot% | 0 | 1 | 2 | 2 | 1 | |
| Result Auto-Auto Crash | 34 N = | 1 | 1 | 2 | 7 | 2 | 13 |
| | Row% | 8 | 8 | 15 | 54 | 15 | 100 |
| | Col% | 3 | 0 | 0 | 1 | 1 | 1 |
| | Tot% | 0 | 0 | 0 | 0 | 0 | |

# Table III-36

## Injury Severity by Accident Type (Continued)

| Accident Type | Column Percent | None 1 | Minor 2 | Moderate 3 | Serious 4 | Fatal 5 | Total |
|---|---|---|---|---|---|---|---|
| Working on Roadway | 35 N = | 0 | 5 | 10 | 10 | 1 | 26 |
| | Row% | 0 | 19 | 38 | 38 | 4 | 100 |
| | Col% | 0 | 2 | 2 | 2 | 1 | 2 |
| | Tot% | 0 | 0 | 1 | 1 | 0 | |
| School-Bus Related | 36 N = | 0 | 9 | 18 | 16 | 3 | 46 |
| | Row% | 0 | 20 | 39 | 35 | 7 | 100 |
| | Col% | 0 | 4 | 3 | 3 | 2 | 3 |
| | Tot% | 0 | 1 | 1 | 1 | 0 | |
| Mail Box-Related | 37 N = | 0 | 2 | 3 | 13 | 3 | 21 |
| | Row% | 0 | 10 | 14 | 62 | 14 | 100 |
| | Col% | 0 | 1 | 1 | 2 | 2 | 1 |
| | Tot% | 0 | 0 | 0 | 1 | 0 | |
| Emergency/Police Vehicle-Related | 38 N = | 0 | 4 | 4 | 0 | 1 | 9 |
| | Row% | 0 | 44 | 44 | 0 | 11 | 100 |
| | Col% | 0 | 2 | 1 | 0 | 1 | 1 |
| | Tot% | 0 | 0 | 0 | 0 | 0 | |
| Result of Vehicle Going Out of Control | 39 N = | 2 | 11 | 18 | 21 | 5 | 57 |
| | Row% | 4 | 19 | 32 | 37 | 9 | 100 |
| | Col% | 6 | 5 | 3 | 4 | 3 | 4 |
| | Tot% | 0 | 1 | 1 | 1 | 0 | |
| Walking To or From Disabled Vehicle | 40 N = | 0 | 0 | 4 | 4 | 3 | 11 |
| | Row% | 0 | 0 | 36 | 36 | 27 | 100 |
| | Col% | 0 | 0 | 1 | 1 | 2 | 1 |
| | Tot% | 0 | 0 | 0 | 0 | 0 | |
| Other | 97 N = | 5 | 16 | 48 | 56 | 15 | 142 |
| | Row% | 4 | 11 | 34 | 39 | 11 | 100 |
| | Col% | 15 | 7 | 9 | 11 | 8 | 10 |
| | Tot% | 0 | 1 | 3 | 4 | 1 | |
| Weird | 98 N = | 5 | 21 | 31 | 36 | 19 | 112 |
| | Row% | 4 | 19 | 28 | 32 | 17 | 100 |
| | Col% | 15 | 10 | 6 | 7 | 11 | 8 |
| | Tot% | 0 | 1 | 2 | 2 | 1 | |
| Limited Information | 99 N = | 1 | 1 | 3 | 6 | 10 | 21 |
| | Row% | 5 | 5 | 14 | 29 | 48 | 100 |
| | Col% | 3 | 0 | 1 | 1 | 6 | 1 |
| | Tot% | 0 | 0 | 0 | 0 | 1 | |
| | Col Tot | 34 | 214 | 530 | 529 | 177 | |
| | Tot% | 2 | 14 | 36 | 36 | 12 | |
| Total Number of Observations = 1490 | | | | | | | |

## Table III-37

## Vehicle Speed and Baserate Data by Accident Type

| Accident Type | N | Vehicle Speed | | | | Pedestrian Volume | | Traffic Volume | |
|---|---|---|---|---|---|---|---|---|---|
| | | Posted Speed | | Observed Speed | | Hourly Volume | | Hourly Volume | |
| | | X | S.D. | X | S.D. | X | S.D. | X | S.D. |
| Dart Out First Half | 166 | 35.9 | 11.7 | 33.5 | 11.8 | 38.2 | 69.0 | 309.5 | 555.9 |
| Dart Out Second Half | 157 | 40.0 | 11.8 | 36.7 | 12.6 | 29.0 | 71.9 | 370.7 | 556.1 |
| Midblock Dash | 151 | 38.8 | 11.0 | 35.6 | 9.3 | 27.1 | 45.6 | 307.3 | 435.5 |
| Intersection Dash | 152 | 35.1 | 9.3 | 32.2 | 9.5 | 69.8 | 117.2 | 620.8 | 728.3 |
| Vehicle Turn/Merge - Attention Conflict | 20 | 32.2 | 7.9 | 24.6 | 9.0 | 53.8 | 47.7 | 474.2 | 610.6 |
| Turning Vehicle | 29 | 28.9 | 6.5 | 23.3 | 7.7 | 150.8 | 153.7 | 892.1 | 984.1 |
| Trapped | 3 | 48.3 | 9.4 | 45.7 | 11.9 | 28.5 | 4.5 | 1659.0 | 945.0 |
| Multiple Threat | 26 | 36.3 | 6.1 | 32.5 | 6.7 | 97.5 | 147.5 | 1282.5 | 842.0 |
| Baking Up | 26 | 32.1 | 12.5 | 32.9 | 9.9 | 32.7 | 32.7 | 301.7 | 301.7 |
| Ped Not In Roadway | 22 | 42.3 | 15.3 | 34.8 | 10.9 | 14.5 | 22.4 | 212.0 | 305.1 |
| Walking Along Roadway | 178 | 41.8 | 12.0 | 37.6 | 12.1 | 13.9 | 45.6 | 227.0 | 402.9 |
| Hitchhiking | 23 | 50.0 | 6.1 | 48.0 | 10.8 | 3.3 | 6.7 | 508.1 | 521.4 |
| Bus Stop-Related | 2 | 30.0 | 5.0 | 29.5 | 4.5 | 36.0 | 6.0 | 499.5 | 193.5 |
| Vendor-Ice Cream Truck | 21 | 26.9 | 6.8 | 24.2 | 3.4 | 30.2 | 27.2 | 87.2 | 121.3 |
| Disabled Vehicle-Related | 86 | 49.1 | 10.2 | 44.6 | 14.2 | 7.5 | 21.5 | 436.5 | 661.4 |
| Result Auto-Auto Crash | 14 | 42.3 | 13.1 | 37.9 | 9.6 | 23.0 | 23.6 | 280.0 | 349.7 |
| Working On Roadway | 26 | 44.0 | 10.1 | 40.4 | 9.9 | 6.4 | 10.6 | 447.1 | 503.2 |
| School Bus-Related | 46 | 44.6 | 11.3 | 42.2 | 13.5 | 12.0 | 13.6 | 214.2 | 263.9 |
| Mailbox-Related | 21 | 50.0 | 9.9 | 41.3 | 11.2 | 3.2 | 6.3 | 146.8 | 234.4 |
| Emergency/Police Vehicle-Related | 9 | 43.3 | 13.7 | 41.2 | 15.0 | 27.6 | 25.0 | 310.5 | 25.0 |
| Result of Vehicle Going Out of Control | 58 | 37.5 | 14.0 | 34.0 | 12.5 | 36.3 | 95.3 | 162.7 | 318.1 |
| Walking To or From Disabled Vehicle | 11 | 50.0 | 13.0 | 47.1 | 12.3 | 6.6 | 13.2 | 428.4 | 194.9 |
| Other | 145 | 39.3 | 12.7 | 37.3 | 13.6 | 27.1 | 58.3 | 290.6 | 508.8 |
| Weird | 114 | 42.1 | 12.5 | 38.0 | 14.5 | 17.0 | 57.4 | 352.2 | 648.6 |
| Limited Information | 24 | 43.9 | 11.5 | 41.8 | 12.7 | 9.2 | 17.2 | 698.2 | 1014.6 |
| All Accidents | 1531 | 39.7 | 12.3 | 36.4 | 12.6 | 31.5 | 24.6 | 372.3 | 196.2 |

# Table III-38

## Roadway Geometry by Accident Type

| Accident Type | N | V.R.E. Direction of Travel | | | | MEDIAN | Other Direction of Travel | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Outside Shoulder Width | Traveled Way Width | Number of Traffic Lanes | Median Shoulder Width | | Median Shoulder Width | Traveled Way Width | Number of Traffic Lanes | Outside Shoulder Width |
| | | $\bar{X}$ | $\bar{X}$ | $\bar{X}$ | $\bar{X}$ | $\bar{X}$ | $\bar{X}$ | $\bar{X}$ | $\bar{X}$ | $\bar{X}$ |
| Dart Out First Half | 166 | 3.1 | 16.1 | 1.2 | 0.4 | 3.4 | 0.5 | 16.2 | 1.2 | 3.1 |
| Dart Out Second Half | 157 | 4.2 | 15.5 | 1.2 | 0.2 | 2.0 | 0.2 | 15.1 | 1.2 | 4.2 |
| Midblock Dash | 152 | 3.9 | 13.9 | 1.1 | 0.6 | 1.2 | 0.1 | 14.0 | 1.1 | 4.3 |
| Intersection Dash | 152 | 3.2 | 19.6 | 1.5 | 0.0 | 1.6 | 0.0 | 19.2 | 1.4 | 2.7 |
| Vehicle Turn/Merge w/ Attention Conflict | 20 | 0.6 | 22.5 | 1.6 | 0.1 | 1.6 | 0.5 | 23.5 | 1.7 | 1.4 |
| Turning Vehicle | 29 | 0.2 | 24.7 | 1.7 | 0.0 | 0.5 | 0.3 | 28.7 | 2.0 | 0.2 |
| Trapped | 3 | 6.0 | 34.0 | 2.7 | 0.0 | 4.0 | 0.0 | 22.3 | 1.3 | 2.7 |
| Multiple Threat | 26 | 1.4 | 29.8 | 2.2 | 0.0 | 3.6 | 0.0 | 29.2 | 2.2 | 2.1 |
| Backing Up | 26 | 3.1 | 13.8 | 1.1 | 0.0 | 1.3 | 0.0 | 13.0 | 1.1 | 3.1 |
| Ped Not in Roadway | 22 | 3.6 | 13.5 | 1.2 | 0.7 | 1.5 | 0.7 | 14.1 | 1.2 | 2.6 |
| Walking Along Roadway | 178 | 5.3 | 12.5 | 1.1 | 0.2 | 0.2 | 0.2 | 11.9 | 1.1 | 4.6 |
| Hitchhiking | 23 | 7.7 | 19.8 | 1.6 | 0.9 | 9.3 | 0.9 | 19.0 | 1.5 | 7.3 |
| Bus Stop-Related | 2 | 3.0 | 24.5 | 2.0 | 0.0 | 0.0 | 0.0 | 24.5 | 2.0 | 3.0 |
| Vendor-Ice Cream Truck | 21 | 1.2 | 15.5 | 1.0 | 0.0 | 0.0 | 0.0 | 15.5 | 1.0 | 1.2 |
| Disabled Vehicle-Related | 86 | 5.5 | 19.9 | 1.8 | 1.5 | 7.0 | 1.5 | 18.8 | 1.7 | 5.6 |
| Result Auto-Auto Crash | 14 | 5.3 | 17.5 | 1.4 | 0.5 | 0.5 | 0.5 | 17.4 | 13.4 | 4.5 |
| Working On Roadway | 26 | 5.2 | 15.7 | 1.3 | 0.3 | 0.8 | 0.0 | 15.0 | 1.3 | 4.7 |
| School Bus-Related | 46 | 4.9 | 11.9 | 1.1 | 0.0 | 0.2 | 0.0 | 11.8 | 1.1 | 4.9 |
| Mailbox-Related | 21 | 4.3 | 11.0 | 1.0 | 0.0 | 0.0 | 0.0 | 11.1 | 1.0 | 4.6 |
| Emergency/Police Vehicle-Related | 9 | 4.2 | 26.6 | 2.0 | 1.1 | 10.6 | 1.2 | 25.3 | 1.9 | 4.0 |
| Result of Vehicle Going Out of Control | 58 | 4.0 | 13.4 | 1.2 | 0.4 | 0.8 | 0.4 | 12.7 | 1.1 | 3.8 |
| Walking To or From Disabled Vehicle | 11 | 7.8 | 22.6 | 1.8 | 2.8 | 14.3 | 2.8 | 22.6 | 1.8 | 7.2 |
| Other | 145 | 4.2 | 17.4 | 1.3 | 0.6 | 3.4 | 0.5 | 16.4 | 1.3 | 3.6 |
| Weird | 114 | 4.8 | 16.0 | 1.3 | 0.7 | 3.9 | 0.9 | 15.8 | 1.3 | 4.5 |
| Limited Information | 24 | 5.8 | 17.8 | 1.4 | .54 | 7.3 | 0.7 | 17.7 | 1.4 | 4.7 |
| All Accidents | 1531 | 4.1 | 16.5 | 1.3 | 0.4 | 2.6 | 0.39 | 16.1 | 1.3 | 3.9 |

# Table III-39

## Vertical Placement by Accident Type

| Accident Type | Column Percent | Level 1 | Initial Upgrade 2 | Upgrade 3 | Hillcrest 4 | Downgrade 5 | Final Downgrade 6 | Bottom of Hill 7 | Total |
|---|---|---|---|---|---|---|---|---|---|
| Dart Out 1st Half | 1 N = | 114 | 9 | 16 | 4 | 15 | 5 | 2 | 165 |
| | Row% | 69 | 5 | 10 | 2 | 9 | 3 | 1 | 100 |
| | Col% | 11 | 11 | 18 | 11 | 10 | 8 | 8 | 11 |
| | Tot% | 8 | 1 | 1 | 0 | 1 | 0 | 0 | |
| Dart Out 2nd Half | 2 N = | 112 | 6 | 7 | 3 | 20 | 5 | 4 | 157 |
| | Row% | 71 | 4 | 4 | 2 | 13 | 3 | 3 | 100 |
| | Col% | 11 | 8 | 8 | 8 | 13 | 8 | 15 | 11 |
| | Tot% | 8 | 0 | 0 | 0 | 1 | 0 | 0 | |
| Midblock Dash | 3 N = | 111 | 7 | 4 | 3 | 16 | 7 | 3 | 151 |
| | Row% | 74 | 5 | 3 | 2 | 11 | 5 | 2 | 100 |
| | Col% | 11 | 9 | 4 | 8 | 10 | 11 | 12 | 10 |
| | Tot% | 7 | 0 | 0 | 0 | 1 | 0 | 0 | |
| Intersection Dash | 11 N = | 112 | 8 | 7 | 5 | 11 | 6 | 3 | 152 |
| | Row% | 74 | 5 | 5 | 3 | 7 | 4 | 2 | 100 |
| | Col% | 11 | 10 | 8 | 14 | 7 | 10 | 12 | 10 |
| | Tot% | 8 | 1 | 0 | 0 | 1 | 0 | 0 | |
| Vehicle Turn/Merge w/ Attention Conflict | 12 N = | 14 | 1 | 3 | 0 | 0 | 0 | 0 | 18 |
| | Row% | 78 | 6 | 17 | 0 | 0 | 0 | 0 | 100 |
| | Col% | 1 | 1 | 3 | 0 | 0 | 0 | 0 | 1 |
| | Tot% | 1 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Turning Vehicle | 13 N = | 21 | 1 | 2 | 0 | 2 | 2 | 1 | 29 |
| | Row% | 72 | 3 | 7 | 0 | 7 | 7 | 3 | 100 |
| | Col% | 2 | 1 | 2 | 0 | 1 | 3 | 4 | 2 |
| | Tot% | 1 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Trapped | 14 N = | 2 | 0 | 1 | 0 | 0 | 0 | 0 | 3 |
| | Row% | 67 | 0 | 33 | 0 | 0 | 0 | 0 | 100 |
| | Col% | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| | Tot% | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Multiple Threat | 22 N = | 19 | 0 | 4 | 0 | 1 | 1 | 1 | 26 |
| | Row% | 73 | 0 | 15 | 0 | 4 | 4 | 4 | 100 |
| | Col% | 2 | 0 | 4 | 0 | 1 | 2 | 4 | 2 |
| | Tot% | 1 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Backing Up | 23 N = | 16 | 0 | 0 | 0 | 1 | 2 | 1 | 20 |
| | Row% | 80 | 0 | 0 | 0 | 5 | 10 | 5 | 100 |
| | Col% | 2 | 0 | 0 | 0 | 1 | 3 | 4 | 1 |
| | Tot% | 1 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Ped Not in Roadway | 24 N = | 10 | 0 | 0 | 1 | 1 | 0 | 0 | 12 |
| | Row% | 83 | 0 | 0 | 8 | 8 | 0 | 0 | 100 |
| | Col% | 1 | 0 | 0 | 3 | 1 | 0 | 0 | 1 |
| | Tot% | 1 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Walking Along Roadway | 25 N = | 113 | 9 | 13 | 6 | 26 | 5 | 5 | 177 |
| | Row% | 64 | 5 | 7 | 3 | 15 | 3 | 3 | 100 |
| | Col% | 11 | 11 | 15 | 17 | 17 | 8 | 19 | 12 |
| | Tot% | 8 | 1 | 1 | 0 | 2 | 2 | 0 | 0 |
| Hitchhiking | 26 N = | 17 | 2 | 0 | 0 | 3 | 0 | 1 | 23 |
| | Row% | 74 | 9 | 0 | 0 | 13 | 0 | 4 | 100 |
| | Col% | 2 | 3 | 0 | 0 | 2 | 0 | 4 | 2 |
| | Tot% | 1 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Bus Stop-Related | 31 N = | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 2 |
| | Row% | 50 | 0 | 50 | 0 | 0 | 0 | 0 | 100 |
| | Col% | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| | Tot% | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Vendor - Ice Cream Truck | 32 N = | 16 | 2 | 0 | 0 | 1 | 2 | 0 | 21 |
| | Row% | 76 | 10 | 0 | 0 | 5 | 10 | 0 | 100 |
| | Col% | 2 | 3 | 0 | 0 | 1 | 3 | 0 | 1 |
| | Tot% | 1 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Disabled Vehicle-Related | 33 N = | 54 | 11 | 7 | 1 | 7 | 4 | 1 | 85 |
| | Row% | 64 | 13 | 8 | 1 | 8 | 5 | 1 | 100 |
| | Col% | 5 | 14 | 8 | 3 | 5 | 7 | 4 | 6 |
| | Tot% | 4 | 1 | 0 | 0 | 0 | 0 | 0 | |
| Result Auto-Auto Crash | 34 N = | 10 | 1 | 1 | 0 | 1 | 1 | 0 | 14 |
| | Row% | 71 | 7 | 7 | 0 | 7 | 7 | 0 | 100 |
| | Col% | 1 | 1 | 1 | 0 | 1 | 2 | 0 | 1 |
| | Tot% | 1 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Working on Roadway | 35 N = | 16 | 2 | 5 | 1 | 1 | 1 | 0 | 26 |
| | Row% | 62 | 8 | 19 | 4 | 4 | 4 | 0 | 100 |
| | Col% | 2 | 3 | 6 | 3 | 1 | 2 | 0 | 2 |
| | Tot% | 1 | 0 | 0 | 0 | 0 | 0 | 0 | |

# Table III-39

## Vertical Placement by Accident Type (Continued)

| Accident Type | Column Percent | Level 1 | Initial Upgrade 2 | Upgrade 3 | Hillcrest 4 | Downgrade 5 | Final Downgrade 6 | Bottom Of Hill 7 | Total |
|---|---|---|---|---|---|---|---|---|---|
| School Bus-Related | 36 N = | 31 | 2 | 2 | 2 | 5 | 4 | 0 | 46 |
| | Row% | 67 | 4 | 4 | 4 | 11 | 9 | 0 | 100 |
| | Col% | 3 | 3 | 2 | 6 | 3 | 7 | 0 | 3 |
| | Tot% | 2 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Mail Box-Related | 37 N = | 15 | 0 | 0 | 1 | 5 | 0 | 0 | 21 |
| | Row% | 71 | 0 | 0 | 5 | 24 | 0 | 0 | 100 |
| | Col% | 1 | 0 | 0 | 3 | 3 | 0 | 0 | 1 |
| | Tot% | 1 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Emergency/Police Vehicle-Related | 38 N = | 6 | 1 | 0 | 0 | 2 | 0 | 0 | 9 |
| | Row% | 67 | 11 | 0 | 0 | 22 | 0 | 0 | 100 |
| | Col% | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 1 |
| | Tot% | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Result of Vehicle Going Out of Control | 39 N = | 37 | 3 | 0 | 0 | 7 | 4 | 2 | 53 |
| | Row% | 70 | 6 | 0 | 0 | 13 | 8 | 4 | 100 |
| | Col% | 4 | 4 | 0 | 0 | 5 | 7 | 8 | 4 |
| | Tot% | 2 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Walking To or From Disabled Vehicle | 40 N = | 7 | 1 | 1 | 1 | 1 | 0 | 0 | 11 |
| | Row% | 64 | 9 | 9 | 9 | 9 | 0 | 0 | 100 |
| | Col% | 1 | 1 | 1 | 3 | 1 | 0 | 0 | 1 |
| | Tot% | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Other | 97 N = | 100 | 9 | 8 | 6 | 13 | 4 | 2 | 142 |
| | Row% | 70 | 6 | 6 | 4 | 9 | 3 | 1 | 100 |
| | Col% | 10 | 11 | 9 | 17 | 8 | 7 | 8 | 10 |
| | Tot% | 7 | 1 | 1 | 0 | 1 | 0 | 0 | |
| Weird | 98 N = | 74 | 3 | 6 | 2 | 12 | 7 | 0 | 104 |
| | Row% | 71 | 3 | 6 | 2 | 12 | 7 | 0 | 100 |
| | Col% | 7 | 4 | 7 | 6 | 8 | 11 | 0 | 7 |
| | Tot% | 5 | 0 | 0 | 0 | 1 | 0 | 0 | |
| Limited Information | 99 N = | 17 | 1 | 1 | 0 | 2 | 1 | 0 | 22 |
| | Row% | 77 | 5 | 5 | 0 | 9 | 5 | 0 | 100 |
| | Col% | 2 | 1 | 1 | 0 | 1 | 2 | 0 | 1 |
| | Tot% | 1 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | Col Tot | 1045 | 79 | 89 | 36 | 153 | 61 | 26 | |
| | Tot% | 70 | 5 | 6 | 2 | 10 | 4 | 2 | |
| Total Number of Observations = 1489 | | | | | | | | | |

# Table III-40

## Horizontal Curvature by Accident Type

| Accident Type | Column Percent | Occur in Intersection 0 | More than 90° Left 1 | 60° - 90° Left 2 | 30° - 60° Left 3 | 5° - 30° Left 4 | Straight ± 5° 5 | 5° - 30° Right 6 | 30° - 60° Right 7 | 60° - 90° Right 8 | More than 90° Right 9 | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Dart Out 1st Half | 1 N = | 13 | 0 | 0 | 2 | 3 | 137 | 4 | 5 | 0 | 0 | 164 |
| | Row% | 8 | 0 | 0 | 1 | 2 | 84 | 2 | 3 | 0 | 0 | 100 |
| | Col% | 3 | 0 | 0 | 13 | 9 | 14 | 17 | 38 | 0 | 0 | 11 |
| | Tot% | 1 | 0 | 0 | 0 | 0 | 9 | 0 | 0 | 0 | 0 | |
| Dart Out 2nd Half | 2 N = | 11 | 0 | 0 | 1 | 7 | 133 | 4 | 1 | 0 | 0 | 157 |
| | Row% | 7 | 0 | 0 | 1 | 4 | 85 | 3 | 1 | 0 | 0 | 100 |
| | Col% | 3 | 0 | 0 | 7 | 21 | 13 | 17 | 8 | 0 | 0 | 11 |
| | Tot% | 1 | 0 | 0 | 0 | 0 | 9 | 0 | 0 | 0 | 0 | |
| Midblock Dash | 3 N = | 5 | 0 | 1 | 1 | 5 | 134 | 3 | 2 | 0 | 0 | 151 |
| | Row% | 3 | 0 | 1 | 1 | 3 | 89 | 2 | 1 | 0 | 0 | 100 |
| | Col% | 1 | 0 | 8 | 7 | 15 | 13 | 12 | 15 | 0 | 0 | 10 |
| | Tot% | 0 | 0 | 0 | 0 | 0 | 9 | 0 | 0 | 0 | 0 | |
| Intersection Dash | 11 N = | 140 | 0 | 0 | 0 | 0 | 12 | 0 | 0 | 0 | 0 | 152 |
| | Row% | 92 | 0 | 0 | 0 | 0 | 8 | 0 | 0 | 0 | 0 | 100 |
| | Col% | 36 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 10 |
| | Tot% | 9 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | |
| Vehicle Turn/Merge w/ Attention Conflict | 12 N = | 17 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 18 |
| | Row% | 94 | 0 | 0 | 0 | 0 | 6 | 0 | 0 | 0 | 0 | 100 |
| | Col% | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| | Tot% | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Turning Vehicle | 13 N = | 28 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 29 |
| | Row% | 97 | 0 | 0 | 0 | 0 | 3 | 0 | 0 | 0 | 0 | 100 |
| | Col% | 7 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 |
| | Tot% | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Trapped | 14 N = | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 |
| | Row% | 100 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 100 |
| | Col% | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Tot% | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Multiple Threat | 22 N = | 19 | 0 | 0 | 0 | 0 | 7 | 0 | 0 | 0 | 0 | 26 |
| | Row% | 73 | 0 | 0 | 0 | 0 | 27 | 0 | 0 | 0 | 0 | 100 |
| | Col% | 5 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 2 |
| | Tot% | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Backing Up | 23 N = | 2 | 0 | 0 | 0 | 0 | 17 | 0 | 0 | 0 | 0 | 19 |
| | Row% | 11 | 0 | 0 | 0 | 0 | 89 | 0 | 0 | 0 | 0 | 100 |
| | Col% | 1 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 1 |
| | Tot% | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | |
| Ped Not in Roadway | 24 N = | 1 | 1 | 0 | 0 | 0 | 10 | 0 | 0 | 0 | 0 | 12 |
| | Row% | 8 | 8 | 0 | 0 | 0 | 83 | 0 | 0 | 0 | 0 | 100 |
| | Col% | 0 | 100 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 |
| | Tot% | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Walking Along Roadway | 25 N = | 32 | 0 | 4 | 1 | 4 | 130 | 5 | 0 | 0 | 1 | 177 |
| | Row% | 18 | 0 | 2 | 1 | 2 | 73 | 3 | 0 | 0 | 1 | 100 |
| | Col% | 8 | 0 | 31 | 7 | 12 | 13 | 21 | 0 | 0 | 100 | 12 |
| | Tot% | 2 | 0 | 0 | 0 | 0 | 9 | 0 | 0 | 0 | 0 | |

# Table III-40

## Horizontal Curvature by Accident Type (Continued)

| Accident Type | Column Percent | Occur in Intersection 0 | More than 90° Left 1 | 60° - 90° Left 2 | 30° - 60° Left 3 | 5° - 30° Left 4 | Straight ± 5° 5 | 5° - 30° Right 6 | 30° - 60° Right 7 | 60° - 90° Right 8 | More than 90° Right 9 | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hitchhiking | 26 N = | 3 | 0 | 0 | 0 | 3 | 15 | 1 | 1 | 0 | 0 | 23 |
| | Row% | 13 | 0 | 0 | 0 | 13 | 65 | 4 | 4 | 0 | 0 | 100 |
| | Col% | 1 | 0 | 0 | 0 | 9 | 2 | 4 | 8 | 0 | 0 | 2 |
| | Tot% | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | |
| Bus Stop-Related | 31 N = | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 2 |
| | Row% | 50 | 0 | 0 | 0 | 0 | 50 | 0 | 0 | 0 | 0 | 100 |
| | Col% | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Tot% | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Vendor-Ice Cream Truck | 32 N = | 1 | 0 | 0 | 0 | 0 | 20 | 0 | 0 | 0 | 0 | 21 |
| | Row% | 5 | 0 | 0 | 0 | 0 | 95 | 0 | 0 | 0 | 0 | 100 |
| | Col% | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 2 |
| | Tot% | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | |
| Disabled Vehicle-Related | 33 N = | 20 | 0 | 3 | 1 | 4 | 55 | 1 | 1 | 0 | 0 | 85 |
| | Row% | 24 | 0 | 4 | 1 | 5 | 65 | 1 | 1 | 0 | 0 | 100 |
| | Col% | 5 | 0 | 23 | 7 | 12 | 6 | 4 | 8 | 0 | 0 | 6 |
| | Tot% | 1 | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 0 | 0 | |
| Result Auto-Auto Crash | 34 N = | 3 | 0 | 0 | 1 | 0 | 9 | 0 | 1 | 0 | 0 | 14 |
| | Row% | 21 | 0 | 0 | 7 | 0 | 64 | 0 | 7 | 0 | 0 | 100 |
| | Col% | 1 | 0 | 0 | 7 | 0 | 1 | 0 | 8 | 0 | 0 | 1 |
| | Tot% | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | |
| Working on Roadway | 35 N = | 8 | 0 | 0 | 1 | 0 | 17 | 0 | 0 | 0 | 0 | 26 |
| | Row% | 31 | 0 | 0 | 4 | 0 | 65 | 0 | 0 | 0 | 0 | 100 |
| | Col% | 2 | 0 | 0 | 7 | 0 | 2 | 0 | 0 | 0 | 0 | 2 |
| | Tot% | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | |
| School Bus-Related | 36 N = | 11 | 0 | 0 | 0 | 0 | 33 | 0 | 2 | 0 | 0 | 46 |
| | Row% | 24 | 0 | 0 | 0 | 0 | 72 | 0 | 4 | 0 | 0 | 100 |
| | Col% | 3 | 0 | 0 | 0 | 0 | 3 | 0 | 15 | 0 | 0 | 3 |
| | Tot% | 1 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | |
| Mail Box-Related | 37 N = | 0 | 0 | 0 | 0 | 0 | 20 | 0 | 0 | 1 | 0 | 21 |
| | Row% | 0 | 0 | 0 | 0 | 0 | 95 | 0 | 0 | 5 | 0 | 100 |
| | Col% | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 50 | 0 | 1 |
| | Tot% | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | |
| Emergency/Police Vehicle-Related | 38 N = | 1 | 0 | 0 | 0 | 0 | 8 | 0 | 0 | 0 | 0 | 9 |
| | Row% | 11 | 0 | 0 | 0 | 0 | 89 | 0 | 0 | 0 | 0 | 100 |
| | Col% | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 |
| | Tot% | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | |
| Result of Vehicle Going Out of Control | 39 N = | 14 | 0 | 2 | 2 | 2 | 33 | 1 | 0 | 0 | 0 | 54 |
| | Row% | 26 | 0 | 4 | 4 | 4 | 61 | 2 | 0 | 0 | 0 | 100 |
| | Col% | 4 | 0 | 15 | 13 | 6 | 3 | 4 | 0 | 0 | 0 | 4 |
| | Tot% | 1 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | |

## Table III-40

## Horizontal Curvature by Accident Type
## (Continued)

| Accident Type | Column Percent | Occur in Intersection 0 | More than 90° Left 1 | 60° - 90° Left 2 | 30° - 60° Left 3 | 5° - 30° Left 4 | Straight ± 5° 5 | 5° - 30° Right 6 | 30° - 60° Right 7 | 60° - 90° Right 8 | More than 90° Right 9 | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Walking to or from Disabled Vehicle | 39 N = | 1 | 0 | 1 | 0 | 1 | 6 | 2 | 0 | 0 | 0 | 11 |
| | Row% | 9 | 0 | 9 | 0 | 9 | 55 | 18 | 0 | 0 | 0 | 100 |
| | Col% | 0 | 0 | 8 | 0 | 3 | 1 | 8 | 0 | 0 | 0 | 1 |
| | Tot% | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Other | 97 N = | 30 | 0 | 0 | 2 | 3 | 106 | 1 | 0 | 0 | 0 | 142 |
| | Row% | 21 | 0 | 0 | 1 | 2 | 75 | 1 | 0 | 0 | 0 | 100 |
| | Col% | 8 | 0 | 0 | 13 | 9 | 11 | 4 | 0 | 0 | 0 | 10 |
| | Tot% | 2 | 0 | 0 | 0 | 0 | 7 | 0 | 0 | 0 | 0 | |
| Weird | 98 N = | 19 | 0 | 2 | 3 | 2 | 75 | 2 | 0 | 1 | 0 | 104 |
| | Row% | 18 | 0 | 2 | 3 | 2 | 72 | 2 | 0 | 1 | 0 | 100 |
| | Col% | 5 | 0 | 15 | 20 | 6 | 8 | 8 | 0 | 50 | 0 | 7 |
| | Tot% | 1 | 0 | 0 | 0 | 0 | 5 | 0 | 0 | 0 | 0 | |
| Limited Information | 99 N = | 4 | 0 | 0 | 0 | 0 | 18 | 0 | 0 | 0 | 0 | 22 |
| | Row% | 18 | 0 | 0 | 0 | 0 | 82 | 0 | 0 | 0 | 0 | 100 |
| | Col% | 1 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 1 |
| | Tot% | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | |
| | Col Tot | 387 | 1 | 13 | 15 | 34 | 998 | 24 | 13 | 2 | 1 | |
| | Tot% | 26 | 0 | 1 | 1 | 2 | 67 | 2 | 1 | 0 | 0 | |
| Total Number of Observations = 1488 | | | | | | | | | | | | |

## Table III-41

## Pedestrian Accommodations by Selected Accident Types

| Accident Type | Pedestrian Accommodations at Site | | | | | | |
|---|---|---|---|---|---|---|---|
| | Suitable Shoulder | | | Unsuitable Shoulder | | | |
| | Pavement Edge or Curb Markings | No Pavement Edge Markings | Total | Pavement Edge or Curb Markings | No Pavement Edge Markings | Total | Grand Total |
| 1. Dart Out First Half N = 166 | 65.5 | 13.4 | 78.9 | 10.5 | 11.4 | 21.9 | 100 |
| 2. Dart Out Second Half N = 157 | 57.2 | 25.4 | 82.6 | 7.0 | 10.2 | 17.2 | 100 |
| 3. Midblock Dash N = 152 | 58.9 | 20.5 | 79.4 | 6.0 | 14.6 | 20.6 | 100 |
| 11. Intersection Dash N = 152 | 75.5 | 17.7 | 93.2 | 2.6 | 3.9 | 6.5 | 100 |
| 25. Walking Along Roadway N = 178 | 32.2 | 29.9 | 62.1 | 8.4 | 29.9 | 38.3 | 100 |
| 33. Disabled Vehicle-Related N = 86 | 43.1 | 12.7 | 55.8 | 22.1 | 22.1 | 44.2 | 100 |
| 39. Result of Vehicle Out of Control N = 57 | 35.8 | 26.4 | 62.2 | 9.5 | 28.3 | 37.8 | 100 |
| 97. Other N = 145 | 58.0 | 16.3 | 74.3 | 11.3 | 14.2 | 25.5 | 100 |
| 98. Weird N = 114 | 45.7 | 21.0 | 66.7 | 10.3 | 22.8 | 33.1 | 100 |

# IV. POTENTIAL COUNTERMEASURES

## Introduction

This section bridges the gaps between data and potential remedial actions. As in most action-oriented research projects, the most difficult step is the one from description (of the problem situation) to prescription (for remedial actions). In this study, a comprehensive data base has been acquired so that the power to describe the phenomena of pedestrian accidents has been greatly enhanced. These data must now be interpreted to lead to testable solutions as directly and unerringly as possible.

The criticality of the gap-bridging step is a justification for employing more than one approach to the interpretive process. Three approaches are used based on the area of professional expertise of the analysts. In the following subsections, the sequence follows a pattern from ad hoc, but progresses to a more comprehensive but necessarily more abstract analysis. Specifically, the first set of interpretations constitutes a summary of the responses of the field investigators (FI's) to the immediate accident situations. Next, a traffic engineer's views are presented. These views tend to reflect more intensive consideration of engineering feasibility and cost. Next, there is a subsection reflecting the views of highway safety systems analysts. This presentation leads to an integrated synthesis which attempts to provide an overall priority rating of potential countermeasures that incorporates all viewpoints and that attempts to emphasize cost-benefit considerations.

The final factors that are seen to be important bring into consideration the concept of warrants and the hypothesis that driver and pedestrian education programs should be planned for "mutual and interior augmentation." That is, it is hypothesized that superior results will occur when the educational messages to drivers, pedestrians (and parents) are mutually reinforcing and when the

programs link messages from the site level (i.e., guide signs and caution signs) through protective procedures (e.g., crossing guard practices) and enforcement procedures to the more general level of posters, spot broadcasts, and school-based safety instruction.

With priorities indicated at at least a tentative level, some examples are suggested for the mode of test site implementation and evaluation.

## Site-Specific Perceptions of FI's

This subsection discusses the various countermeasures (C/M's) that have been identified during the course of data collection, reduction, and analysis. Basically, these three phases identified countermeasures which are best presented in three different formats. Included are tables of the potential countermeasures identified by the field investigator (FI) and the FI's estimate of each C/M's effectiveness at eliminating the particular accident (Table IV-1). In this presentation, countermeasures are identified for each accident type. Three levels of C/M effectiveness were combined and the proposed countermeasures are tabulated for each accident type in the summary table.

The most frequently coded countermeasures involved pedestrian education (25.7 percent) and driver education (12.1 percent). All the remaining countermeasures were coded as being appropriate in less than five percent of the cases. Certain countermeasures can be logically grouped because they are intended to impact on a similar causal factor (i.e., nighttime visibility). Reflectorized clothing (3.2 percent), improve headlights (0.8 percent), provide street lighting (3.5 percent) are all potential countermeasures that would impact on the nighttime visibility of the pedestrian.

# Table IV-1

## Potential Countermeasures Suggested by FI's

| | Level of Effectiveness | | | | | | Total | |
|---|---|---|---|---|---|---|---|---|
| | Most | Percent | Middle | Percent | Least | Percent | All Levels of Effectiveness | Percent |
| **Pedestrian Oriented** | | | | | | | | |
| Education | 472 | 37.31 | 163 | 16.74 | 104 | 16.59 | 739 | 25.7 |
| Reflectorized clothing | 17 | 1.34 | 44 | 4.52 | 30 | 4.78 | 91 | 3.2 |
| Other | 76 | 6.01 | 27 | 2.77 | 9 | 1.44 | 112 | 3.9 |
| **Driver Oriented** | | | | | | | | |
| Education | 115 | 9.09 | 175 | 17.97 | 57 | 9.09 | 347 | 12.1 |
| Increase awareness of danger of fatigue | 10 | .79 | 2 | .21 | 2 | .32 | 14 | .5 |
| Other | 26 | 2.06 | 26 | 2.67 | 8 | 1.28 | 60 | 2.0 |
| **Vehicular Oriented** | | | | | | | | |
| Improve safety condition of vehicles | 8 | .63 | 3 | .31 | 1 | .16 | 12 | .4 |
| Improve headlights | 10 | .79 | 10 | 1.03 | 5 | .80 | 25 | .8 |
| Improve handling and braking capabilities | 4 | .32 | 4 | .41 | 4 | .64 | 12 | .4 |
| Improve vehicle flashers | 8 | .63 | 11 | 1.13 | 3 | .48 | 22 | .7 |
| Other | 24 | 1.90 | 13 | 1.33 | 9 | 1.44 | 46 | 1.6 |
| **Enforcement Related** | | | | | | | | |
| Enforce existing vehicle regulations | 32 | 2.53 | 48 | 4.93 | 32 | 5.10 | 112 | 3.9 |
| Enforce existing pedestrian regulations | 18 | 1.42 | 33 | 3.39 | 8 | 1.28 | 59 | 2.0 |
| Control drinking drivers | 40 | 3.16 | 16 | 1.64 | 7 | 1.12 | 63 | 2.1 |
| Control drinking pedestrians | 45 | 3.56 | 29 | 2.98 | 14 | 2.23 | 88 | 3.0 |
| Change speed limit | 24 | 1.90 | 46 | 4.72 | 22 | 3.51 | 39 | 3.2 |
| Other | 15 | 1.19 | 15 | 1.54 | 9 | 1.44 | 39 | 1.3 |
| **Traffic Engineering** | | | | | | | | |
| Provide signs | 45 | 3.56 | 51 | 5.24 | 36 | 5.74 | 132 | 4.6 |
| Provide signals | 35 | 2.77 | 18 | 1.85 | 5 | .80 | 58 | 2.0 |
| Improve existing signs and signals | 8 | .64 | 8 | .83 | 7 | 1.12 | 23 | .8 |
| Provide crosswalks | 23 | 1.82 | 55 | 5.65 | 27 | 4.31 | 105 | 4.0 |
| Provide sidewalks | 50 | 3.95 | 32 | 3.29 | 29 | 4.63 | 111 | 3.8 |
| Provide pedestrian barriers | 21 | 1.66 | 18 | 1.85 | 7 | 1.12 | 46 | 1.6 |
| Provide street lighting | 45 | 3.56 | 35 | 3.59 | 21 | 3.35 | 101 | 3.5 |
| Other | 40 | 3.16 | 36 | 3.70 | 35 | 5.58 | 111 | 3.8 |
| **Traffic Engineering/New Procedures** | | | | | | | | |
| Provide marking on outer pavement edge | 2 | .16 | 6 | .62 | 5 | .80 | 13 | .5 |
| Relocate mail/paper boxes | 6 | .47 | 5 | .51 | 8 | 1.28 | 19 | .6 |
| Parking restrictions/redeployment | 7 | .55 | 7 | .72 | 5 | .80 | 19 | .6 |
| Relocate or improve bus stop | 5 | .40 | 4 | .41 | 2 | .32 | 11 | .4 |
| Other | 28 | 2.21 | 17 | 1.75 | 19 | 3.03 | 64 | 2.2 |
| **None of Above Applicable** | 6 | .47 | 17 | 1.75 | 97 | 15.47 | 120 | 4.1 |
| **TOTAL** | 1265 | 100% | 974 | 100% | 627 | 100% | 2866 | 100% |

The types of countermeasures indicated and the nature of the target accidents previously discussed strongly imply that countermeasure programs need to be tailored to the specific situation.

Table IV-2 shows which of the various countermeasures were indicated as applicable to each accident type. Of the countermeasures suggested for dart-out first half, 30 percent were pedestrian-oriented education (i.e., the row percent). Thirteen percent of the time that pedestrian education was coded, it was coded on the dart-out first half types (i.e., the column percent). This represents three percent of the total countermeasures indicated (i.e., the total percent). The potential applicability of any given countermeasure to any given accident type can be extracted from this table. For example, a variety of countermeasures were indicated as applicable to the walking along the roadway situation (see third and fourth pages of the table). Although pedestrian education (25 percent of the C/Ms indicated) and driver education (13 percent of the C/Ms indicated) were frequently indicated, a number of traffic engineering procedures were coded, providing sidewalks (13 percent of the C/Ms indicated) and providing street lighting (5 percent of the C/Ms indicated). Although together this represents only 18 percent of the countermeasures coded for this type, these countermeasures were applicable to 38.2 percent of the walking along the roadway accidents.

## Traffic Engineering Review: Countermeasure Identification

Each of the RUPED data forms was personally reviewed by the principal traffic engineer assigned to the project. The review served two purposes: first, to eliminate inconsistencies and correct coding errors in the traffic engineering sections of the form; and second, to subjectively evaluate the circumstances of the accident to determine if that type of accident could be prevented by an engineering improvement to the physical environment in which the accident occurred.

# Table IV-2
## Potential Countermeasures by Accident Type

| ACCIDENT TYPE \ COUNTERMEASURES | | Education | Reflectorized clothing | Other | Education | Increase awareness of danger of driving while fatigued | Other | Improve safety condition of vehicles | Improve headlights | Improve braking capability | Improve handling capability | Improve vehicle warning light system (flashers) | Other | Enforce existing vehicle regulations | Enforce existing pedestrian regulations | Control drinking drivers | Control drinking pedestrians | Change speed limit | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Pedestrian Oriented | | | Driver Oriented | | | Vehicular Oriented | | | | | | Enforcement Related | | | | | |
| | | 1 | 2 | 9 | 11 | 12 | 19 | 21 | 22 | 23 | 24 | 25 | 29 | 31 | 32 | 33 | 34 | 35 | 39 |
| Dart-out, First Half | N= | 98 | 9 | 17 | 14 | 1 | 1 | 0 | 3 | 3 | 0 | 0 | 1 | 14 | 8 | 3 | 13 | 20 | 3 |
| | ROW% | 30 | 3 | 5 | 4 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 4 | 2 | 1 | 4 | 6 | 1 |
| | COL% | 13 | 10 | 14 | 4 | 7 | 2 | 0 | 11 | 25 | 0 | 0 | 2 | 12 | 13 | 4 | 12 | 21 | 7 |
| | TOT% | 3 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| Dart-out, Second Half | N= | 109 | 7 | 17 | 24 | 0 | 3 | 0 | 3 | 1 | 0 | 1 | 0 | 10 | 8 | 4 | 15 | 17 | 4 |
| | ROW% | 35 | 2 | 6 | 8 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 3 | 3 | 1 | 5 | 6 | 1 |
| | COL% | 14 | 8 | 14 | 7 | 0 | 5 | 0 | 11 | 8 | 0 | 4 | 0 | 8 | 13 | 6 | 14 | 18 | 10 |
| | TOT% | 4 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 |
| Midblock Dash | N= | 90 | 0 | 29 | 27 | 0 | 3 | 0 | 0 | 1 | 0 | 0 | 1 | 7 | 4 | 1 | 4 | 15 | 4 |
| | ROW% | 35 | 0 | 11 | 11 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 2 | 0 | 2 | 6 | 2 |
| | COL% | 12 | 0 | 24 | 7 | 0 | 5 | 0 | 0 | 8 | 0 | 0 | 2 | 6 | 6 | 1 | 4 | 16 | 10 |
| | TOT% | 3 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| Intersection Dash | N= | 82 | 8 | 13 | 29 | 0 | 3 | 1 | 0 | 0 | 0 | 1 | 0 | 9 | 4 | 1 | 9 | 10 | 5 |
| | ROW% | 27 | 3 | 4 | 9 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 1 | 0 | 3 | 3 | 2 |
| | COL% | 10 | 9 | 11 | 8 | 0 | 5 | 8 | 0 | 0 | 0 | 4 | 0 | 8 | 6 | 1 | 9 | 11 | 12 |
| | TOT% | 3 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Vehicle Turn Merge with Attention Conflict | N= | 9 | 1 | 0 | 9 | 0 | 2 | 2 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 0 | 0 | 0 | 0 |
| | ROW% | 23 | 3 | 0 | 23 | 0 | 5 | 5 | 0 | 0 | 0 | 0 | 0 | 8 | 0 | 0 | 0 | 0 | 0 |
| | COL% | 1 | 1 | 0 | 2 | 0 | 3 | 15 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 0 | 0 | 0 | 0 |
| | TOT% | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Turning Vehicle | N= | 10 | 2 | 0 | 9 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 2 | 3 | 0 | 1 | 0 | 0 | 2 |
| | ROW% | 21 | 4 | 0 | 19 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 4 | 6 | 0 | 2 | 0 | 0 | 4 |
| | COL% | 1 | 2 | 0 | 2 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 4 | 3 | 0 | 1 | 0 | 0 | 5 |
| | TOT% | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

# Table IV-2

## Potential Countermeasures by Accident Type (Continued)

| ACCIDENT TYPE \ COUNTERMEASURES | | Provide signs | Provide signals | Improve existing signs | Improve existing signals | Provide crosswalks | Provide sidewalks | Provide pedestrian barriers | Provide street lighting | Other | Provide marking on outer edge of pavement to prevent veering off roadway | Relocate mail/paper boxes | Parking restrictions/ redeployment | Relocate or improve bus stop | Other | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Traffic Engineering/Existing Procedures | | | | | | | | | Traffic Engineering New or Innovative Procedures | | | | | |
| | | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 51 | 52 | 53 | 54 | 59 | TOTAL |
| Dart-out, First Half | N= | 26 | 7 | 1 | 1 | 20 | 11 | 9 | 10 | 23 | 0 | 1 | 5 | 0 | 9 | 331 |
| | ROW% | 8 | 2 | 0 | 0 | 6 | 3 | 3 | 3 | 7 | 0 | 0 | 2 | 0 | 3 | 100 |
| | COL% | 18 | 11 | 9 | 8 | 18 | 10 | 19 | 9 | 19 | 0 | 5 | 26 | 0 | 13 | 11 |
| | TOT% | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | |
| Dart-out, Second Half | N= | 20 | 5 | 0 | 1 | 16 | 5 | 9 | 15 | 8 | 0 | 0 | 3 | 0 | 4 | 309 |
| | ROW% | 6 | 2 | 0 | 0 | 5 | 2 | 3 | 5 | 3 | 0 | 0 | 1 | 0 | 1 | 100 |
| | COL% | 14 | 8 | 0 | 8 | 15 | 4 | 19 | 14 | 7 | 0 | 0 | 16 | 0 | 6 | 11 |
| | TOT% | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Midblock Dash | N= | 15 | 2 | 0 | 0 | 12 | 15 | 7 | 4 | 6 | 0 | 2 | 0 | 2 | 4 | 255 |
| | ROW% | 6 | 1 | 0 | 0 | 5 | 6 | 3 | 2 | 2 | 0 | 1 | 0 | 1 | 2 | 100 |
| | COL% | 10 | 3 | 0 | 0 | 11 | 13 | 15 | 4 | 5 | 0 | 10 | 0 | 14 | 6 | 9 |
| | TOT% | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Intersection Dash | N= | 22 | 22 | 4 | 2 | 31 | 7 | 7 | 12 | 13 | 1 | 0 | 1 | 1 | 8 | 306 |
| | ROW% | 7 | 7 | 1 | 1 | 10 | 2 | 2 | 4 | 4 | 0 | 0 | 0 | 0 | 3 | 100 |
| | COL% | 15 | 34 | 36 | 17 | 28 | 6 | 15 | 11 | 11 | 8 | 0 | 5 | 7 | 11 | 10 |
| | TOT% | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Vehicle Turn Merge with Attention Conflict | N= | 3 | 4 | 0 | 2 | 2 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 39 |
| | ROW% | 8 | 10 | 0 | 5 | 5 | 0 | 0 | 0 | 5 | 0 | 0 | 0 | 0 | 0 | 100 |
| | COL% | 2 | 6 | 0 | 17 | 2 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 1 |
| | TOT% | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Turning Vehicle | N= | 4 | 2 | 0 | 1 | 3 | 0 | 1 | 1 | 1 | 0 | 0 | 1 | 0 | 3 | 48 |
| | ROW% | 8 | 4 | 0 | 2 | 6 | 0 | 2 | 2 | 2 | 0 | 0 | 2 | 0 | 6 | 100 |
| | COL% | 3 | 3 | 0 | 8 | 3 | 0 | 2 | 1 | 1 | 0 | 0 | 5 | 0 | 4 | 2 |
| | TOT% | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |

# Table IV-2

## Potential Countermeasures by Accident Type (Continued)

| ACCIDENT TYPE / COUNTERMEASURES | | Education | Reflectorized clothing | Other | Education | Increase awareness of danger of driving while fatigued | Other | Improve safety condition of vehicles | Improve headlights | Improve braking capability | Improve handling capability | Improve vehicle warning light system (flashers) | Other | Enforce existing vehicle regulations | Enforce existing pedestrian regulations | Control drinking drivers | Control drinking pedestrians | Change speed limit | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Pedestrian Oriented | | | Driver Oriented | | | Vehicular Oriented | | | | | | Enforcement Related | | | | | |
| | | 1 | 2 | 9 | 11 | 12 | 19 | 21 | 22 | 23 | 24 | 25 | 29 | 31 | 32 | 33 | 34 | 35 | 39 |
| Trapped | N= | 3 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | ROW% | 43 | 0 | 0 | 14 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | COL% | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | TOT% | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Multiple Threat | N= | 9 | 1 | 2 | 7 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 2 | 0 | 1 | 2 | 0 |
| | ROW% | 18 | 2 | 4 | 14 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 4 | 0 | 2 | 4 | 0 |
| | COL% | 1 | 1 | 2 | 2 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 3 | 0 | 1 | 2 | 0 |
| | TOT% | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Backing Up | N= | 9 | 1 | 2 | 9 | 0 | 4 | 1 | 0 | 0 | 0 | 0 | 6 | 1 | 0 | 2 | 1 | 2 | 1 |
| | ROW% | 19 | 2 | 4 | 19 | 0 | 9 | 2 | 0 | 0 | 0 | 0 | 13 | 2 | 0 | 4 | 2 | 4 | 2 |
| | COL% | 1 | 1 | 2 | 2 | 0 | 7 | 8 | 0 | 0 | 0 | 0 | 12 | 1 | 0 | 3 | 1 | 2 | 2 |
| | TOT% | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped Not in Roadway | N= | 4 | 1 | 1 | 13 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 6 | 1 | 2 | 0 | 1 | 0 |
| | ROW% | 11 | 3 | 3 | 34 | 0 | 3 | 0 | 0 | 0 | 0 | 3 | 0 | 16 | 3 | 5 | 0 | 3 | 0 |
| | COL% | 1 | 1 | 1 | 4 | 0 | 2 | 0 | 0 | 0 | 0 | 4 | 0 | 5 | 2 | 3 | 0 | 1 | 0 |
| | TOT% | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Walking Along Roadway | N= | 98 | 30 | 5 | 49 | 2 | 9 | 0 | 10 | 0 | 0 | 0 | 7 | 13 | 8 | 12 | 15 | 4 | 1 |
| | ROW% | 25 | 8 | 1 | 13 | 1 | 2 | 0 | 3 | 0 | 0 | 0 | 2 | 3 | 2 | 3 | 4 | 1 | 0 |
| | COL% | 13 | 32 | 4 | 14 | 13 | 15 | 0 | 37 | 0 | 0 | 0 | 14 | 11 | 13 | 17 | 14 | 4 | 2 |
| | TOT% | 3 | 1 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| Hitchhiking | N= | 14 | 5 | 2 | 5 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 1 | 2 | 7 | 1 | 3 | 0 | 0 |
| | ROW% | 31 | 11 | 4 | 11 | 0 | 0 | 0 | 4 | 0 | 0 | 0 | 2 | 4 | 16 | 2 | 7 | 0 | 0 |
| | COL% | 2 | 5 | 2 | 1 | 0 | 0 | 0 | 7 | 0 | 0 | 0 | 2 | 2 | 11 | 1 | 3 | 0 | 0 |
| | TOT% | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

# Table IV-2

## Potential Countermeasures by Accident Type (Continued)

| COUNTERMEASURES / ACCIDENT TYPE | | Provide signs | Provide signals | Improve existing signs | Improve existing signals | Provide crosswalks | Provide sidewalks | Provide pedestrian barriers | Provide street lighting | Other | Provide marking on outer edge of pavement to prevent veering off roadway | Relocate mail/paper boxes | Parking restrictions/ redeployment | Relocate or improve bus stop | Other | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Traffic Engineering/Existing Procedures | | | | | | | | | Traffic Engineering New or Innovative Procedures | | | | | |
| | | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 51 | 52 | 53 | 54 | 59 | TOTAL |
| Trapped | N= | 0 | 0 | 0 | 0 | 2 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 7 |
| | ROW% | 0 | 0 | 0 | 0 | 29 | 0 | 14 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 100 |
| | COL% | 0 | 0 | 0 | 0 | 2 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | TOT% | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Multiple Threat | N= | 6 | 8 | 0 | 0 | 3 | 0 | 3 | 1 | 1 | 0 | 1 | 0 | 0 | 1 | 50 |
| | ROW% | 12 | 16 | 0 | 0 | 6 | 0 | 6 | 2 | 2 | 0 | 2 | 0 | 0 | 2 | 100 |
| | COL% | 4 | 13 | 0 | 0 | 3 | 0 | 6 | 1 | 1 | 0 | 5 | 0 | 0 | 1 | 2 |
| | TOT% | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Backing Up | N= | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 2 | 1 | 0 | 1 | 0 | 1 | 47 |
| | ROW% | 2 | 0 | 0 | 0 | 2 | 2 | 0 | 0 | 4 | 2 | 0 | 2 | 0 | 2 | 100 |
| | COL% | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 2 | 8 | 0 | 5 | 0 | 1 | 2 |
| | TOT% | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Ped Not in Roadway | N= | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 2 | 0 | 0 | 1 | 0 | 0 | 1 | 38 |
| | ROW% | 3 | 3 | 0 | 0 | 0 | 3 | 0 | 5 | 0 | 0 | 3 | 0 | 0 | 3 | 100 |
| | COL% | 1 | 2 | 0 | 0 | 0 | 1 | 0 | 2 | 0 | 0 | 5 | 0 | 0 | 1 | 1 |
| | TOT% | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Walking Along Roadway | N= | 10 | 1 | 0 | 0 | 3 | 49 | 5 | 19 | 22 | 4 | 0 | 2 | 0 | 8 | 386 |
| | ROW% | 3 | 0 | 0 | 0 | 1 | 13 | 1 | 5 | 6 | 1 | 0 | 1 | 0 | 2 | 100 |
| | COL% | 7 | 2 | 0 | 0 | 3 | 44 | 11 | 17 | 18 | 31 | 0 | 11 | 0 | 11 | 13 |
| | TOT% | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | |
| Hitchhiking | N= | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 45 |
| | ROW% | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 100 |
| | COL% | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 2 |
| | TOT% | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |

# Table IV-2

## Potential Countermeasures by Accident Type (Continued)

| COUNTERMEASURES / ACCIDENT TYPE | | Education | Reflectorized clothing | Other | Education | Increase awareness of danger of driving while fatigued | Other | Improve safety condition of vehicles | Improve headlights | Improve braking capability | Improve handling capability | Improve vehicle warning light system (flashers) | Other | Enforce existing vehicle regulations | Enforce existing pedestrian regulations | Control drinking drivers | Control drinking pedestrians | Change speed limit | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Pedestrian Oriented | | | Driver Oriented | | | Vehicular Oriented | | | | | | Enforcement Related | | | | | |
| | | 1 | 2 | 9 | 11 | 12 | 19 | 21 | 22 | 23 | 24 | 25 | 29 | 31 | 32 | 33 | 34 | 35 | 39 |
| Bus Stop Related | N= | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | ROW% | 25 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 25 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | COL% | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | TOT% | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Vendor Ice Cream Truck | N= | 7 | 0 | 1 | 8 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 6 | 2 | 0 | 0 | 0 | 0 | 3 |
| | ROW% | 21 | 0 | 3 | 24 | 0 | 0 | 0 | 0 | 0 | 0 | 6 | 18 | 6 | 0 | 0 | 0 | 0 | 9 |
| | COL% | 1 | 0 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 8 | 12 | 2 | 0 | 0 | 0 | 0 | 7 |
| | TOT% | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Disabled Vehicle Related | N= | 42 | 6 | 4 | 36 | 6 | 3 | 1 | 1 | 0 | 0 | 14 | 7 | 3 | 1 | 12 | 2 | 3 | 5 |
| | ROW% | 24 | 3 | 2 | 21 | 3 | 2 | 1 | 1 | 0 | 0 | 8 | 4 | 2 | 1 | 7 | 1 | 2 | 3 |
| | COL% | 5 | 6 | 3 | 10 | 40 | 5 | 8 | 4 | 0 | 0 | 56 | 14 | 3 | 2 | 17 | 2 | 3 | 12 |
| | TOT% | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Result of Auto-Auto Crash | N= | 4 | 0 | 0 | 5 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 3 | 0 | 5 | 0 | 2 | 0 |
| | ROW% | 14 | 0 | 0 | 18 | 0 | 4 | 0 | 0 | 0 | 0 | 4 | 4 | 11 | 0 | 18 | 0 | 7 | 0 |
| | COL% | 1 | 0 | 0 | 1 | 0 | 2 | 0 | 0 | 0 | 0 | 4 | 2 | 3 | 0 | 7 | 0 | 2 | 0 |
| | TOT% | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Working on Roadway | N= | 11 | 2 | 1 | 11 | 0 | 4 | 0 | 0 | 0 | 1 | 0 | 3 | 3 | 0 | 1 | 0 | 0 | 0 |
| | ROW% | 23 | 4 | 2 | 23 | 0 | 8 | 0 | 0 | 0 | 2 | 0 | 6 | 6 | 0 | 2 | 0 | 0 | 0 |
| | COL% | 1 | 2 | 1 | 3 | 0 | 7 | 0 | 0 | 0 | 50 | 0 | 6 | 3 | 0 | 1 | 0 | 0 | 0 |
| | TOT% | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| School Bus Related | N= | 30 | 3 | 4 | 17 | 0 | 4 | 0 | 1 | 0 | 0 | 3 | 2 | 8 | 2 | 0 | 0 | 0 | 0 |
| | ROW% | 27 | 3 | 4 | 15 | 0 | 4 | 0 | 1 | 0 | 0 | 3 | 2 | 7 | 2 | 0 | 0 | 0 | 0 |
| | COL% | 4 | 3 | 3 | 5 | 0 | 7 | 0 | 4 | 0 | 0 | 12 | 4 | 7 | 3 | 0 | 0 | 0 | 0 |
| | TOT% | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

# Table IV-2

## Potential Countermeasures by Accident Type (Continued)

| COUNTERMEASURES / ACCIDENT TYPE | | Provide signs | Provide signals | Improve existing signs | Improve existing signals | Provide crosswalks | Provide sidewalks | Provide pedestrian barriers | Provide street lighting | Other | Provide marking on outer edge of pavement to prevent veering off roadway | Relocate mail/paper boxes | Parking restrictions/ redeployment | Relocate or improve bus stop | Other | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Traffic Engineering/Existing Procedures | | | | | | | | | Traffic Engineering New or Innovative Procedures | | | | | |
| | | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 51 | 52 | 53 | 54 | 59 | TOTAL |
| Bus Stop Related | N= | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 |
| | ROW% | 0 | 25 | 0 | 0 | 0 | 0 | 25 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 100 |
| | COL% | 0 | 2 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | TOT% | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Vendor Ice Cream Truck | N= | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 34 |
| | ROW% | 3 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 9 | 100 |
| | COL% | 1 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 1 |
| | TOT% | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Disabled Vehicle Related | N= | 3 | 0 | 2 | 0 | 0 | 0 | 0 | 7 | 5 | 2 | 0 | 1 | 0 | 5 | 172 |
| | ROW% | 2 | 0 | 1 | 0 | 0 | 0 | 0 | 4 | 3 | 1 | 0 | 1 | 0 | 3 | 100 |
| | COL% | 2 | 0 | 18 | 0 | 0 | 0 | 0 | 6 | 4 | 15 | 0 | 5 | 0 | 7 | 6 |
| | TOT% | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Result of Auto-Auto Crash | N= | 2 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 28 |
| | ROW% | 7 | 0 | 0 | 0 | 0 | 4 | 0 | 4 | 4 | 0 | 0 | 0 | 0 | 4 | 100 |
| | COL% | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 1 |
| | TOT% | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Working on Roadway | N= | 4 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 3 | 0 | 0 | 0 | 0 | 2 | 48 |
| | ROW% | 8 | 0 | 0 | 4 | 0 | 0 | 0 | 0 | 6 | 0 | 0 | 0 | 0 | 4 | 100 |
| | COL% | 3 | 0 | 0 | 17 | 0 | 0 | 0 | 0 | 3 | 0 | 0 | 0 | 0 | 3 | 2 |
| | TOT% | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| School Bus Related | N= | 5 | 1 | 0 | 1 | 4 | 3 | 1 | 2 | 4 | 0 | 0 | 1 | 10 | 4 | 110 |
| | ROW% | 5 | 1 | 0 | 1 | 4 | 3 | 1 | 2 | 4 | 0 | 0 | 1 | 9 | 4 | 100 |
| | COL% | 3 | 2 | 0 | 8 | 4 | 3 | 2 | 2 | 3 | 0 | 0 | 5 | 71 | 6 | 4 |
| | TOT% | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |

# Table IV-2

## Potential Countermeasures by Accident Type (Continued)

| ACCIDENT TYPE \ COUNTERMEASURES | | Education | Reflectorized clothing | Other | Education | Increase awareness of danger of driving while fatigued | Other | Improve safety condition of vehicles | Improve headlights | Improve braking capability | Improve handling capability | Improve vehicle warning light system (flashers) | Other | Enforce existing vehicle regulations | Enforce existing pedestrian regulations | Control drinking drivers | Control drinking pedestrians | Change speed limit | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Pedestrian Oriented | | | Driver Oriented | | | Vehicular Oriented | | | | | | Enforcement Related | | | | | |
| | | 1 | 2 | 9 | 11 | 12 | 19 | 21 | 22 | 23 | 24 | 25 | 29 | 31 | 32 | 33 | 34 | 35 | 39 |
| Mailbox Related | N= | 10 | 0 | 4 | 4 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 4 | 2 |
| | ROW% | 22 | 0 | 9 | 9 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 9 | 4 |
| | COL% | 1 | 0 | 3 | 1 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 4 | 5 |
| | TOT% | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Emergency/Police Vehicle Related | N= | 2 | 1 | 0 | 3 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 2 | 0 | 0 | 2 |
| | ROW% | 15 | 8 | 0 | 23 | 8 | 0 | 8 | 0 | 0 | 0 | 0 | 0 | 8 | 0 | 15 | 0 | 0 | 15 |
| | COL% | 0 | 1 | 0 | 1 | 7 | 0 | 8 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 3 | 0 | 0 | 5 |
| | TOT% | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Result of Vehicle Going out of Control | N= | 18 | 0 | 0 | 21 | 3 | 8 | 5 | 0 | 3 | 0 | 0 | 4 | 7 | 1 | 11 | 0 | 3 | 2 |
| | ROW% | 17 | 0 | 0 | 19 | 3 | 7 | 5 | 0 | 3 | 0 | 0 | 4 | 6 | 1 | 10 | 0 | 3 | 2 |
| | COL% | 2 | 0 | 0 | 6 | 20 | 13 | 38 | 0 | 25 | 0 | 0 | 8 | 6 | 2 | 16 | 0 | 3 | 5 |
| | TOT% | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Walking to or From Disabled Vehicle | N= | 4 | 1 | 0 | 2 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 2 | 1 | 1 | 0 |
| | ROW% | 21 | 5 | 0 | 11 | 5 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 5 | 0 | 11 | 5 | 5 | 0 |
| | COL% | 1 | 1 | 0 | 1 | 7 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 1 | 0 | 3 | 1 | 1 | 0 |
| | TOT% | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Other | N= | 68 | 12 | 12 | 23 | 1 | 4 | 0 | 3 | 2 | 1 | 1 | 3 | 12 | 12 | 6 | 25 | 6 | 2 |
| | ROW% | 24 | 4 | 4 | 8 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 1 | 4 | 4 | 2 | 9 | 2 | 1 |
| | COL% | 9 | 13 | 10 | 6 | 7 | 7 | 0 | 11 | 17 | 50 | 4 | 6 | 10 | 19 | 9 | 24 | 6 | 5 |
| | TOT% | 2 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| Weird | N= | 42 | 1 | 7 | 33 | 0 | 6 | 2 | 2 | 2 | 0 | 0 | 3 | 6 | 4 | 2 | 13 | 4 | 5 |
| | ROW% | 26 | 1 | 4 | 21 | 0 | 4 | 1 | 1 | 1 | 0 | 0 | 2 | 4 | 3 | 1 | 8 | 3 | 3 |
| | COL% | 5 | 1 | 6 | 9 | 0 | 10 | 15 | 7 | 17 | 0 | 0 | 6 | 5 | 6 | 3 | 12 | 4 | 12 |
| | TOT% | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

# Table IV-2

## Potential Countermeasures by Accident Type (Continued)

| COUNTERMEASURES / ACCIDENT TYPE | | Provide signs | Provide signals | Improve existing signs | Improve existing signals | Provide crosswalks | Provide sidewalks | Provide pedestrian barriers | Provide street lighting | Other | Provide marking on outer edge of pavement to prevent veering off roadway | Relocate mail/paper boxes | Parking restrictions/ redeployment | Relocate or improve bus stop | Other | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Traffic Engineering/Existing Procedures | | | | | | | | | Traffic Engineering New or Innovative Procedures | | | | | |
| | | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 51 | 52 | 53 | 54 | 59 | TOTAL |
| Mailbox Related | N= | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 2 | 1 | 14 | 0 | 0 | 0 | 46 |
| | ROW% | 2 | 0 | 2 | 0 | 0 | 2 | 0 | 0 | 4 | 2 | 30 | 0 | 0 | 0 | 100 |
| | COL% | 1 | 0 | 9 | 0 | 0 | 1 | 0 | 0 | 2 | 8 | 67 | 0 | 0 | 0 | 2 |
| | TOT% | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Emergency/Police Vehicle Related | N= | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 13 |
| | ROW% | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 100 |
| | COL% | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | TOT% | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Result of Vehicle Going out of Control | N= | 5 | 1 | 1 | 0 | 0 | 2 | 0 | 2 | 5 | 2 | 1 | 0 | 0 | 3 | 108 |
| | ROW% | 5 | 1 | 1 | 0 | 0 | 2 | 0 | 2 | 5 | 2 | 1 | 0 | 0 | 3 | 100 |
| | COL% | 3 | 2 | 9 | 0 | 0 | 2 | 0 | 2 | 4 | 15 | 5 | 0 | 0 | 4 | 4 |
| | TOT% | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Walking to or From Disabled Vehicle | N= | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 3 | 1 | 0 | 0 | 0 | 0 | 0 | 19 |
| | ROW% | 0 | 0 | 5 | 0 | 0 | 0 | 0 | 16 | 5 | 0 | 0 | 0 | 0 | 0 | 100 |
| | COL% | 0 | 0 | 9 | 0 | 0 | 0 | 0 | 3 | 1 | 0 | 0 | 0 | 0 | 0 | 1 |
| | TOT% | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Other | N= | 9 | 6 | 1 | 2 | 9 | 11 | 1 | 17 | 13 | 2 | 1 | 2 | 1 | 13 | 281 |
| | ROW% | 3 | 2 | 0 | 1 | 3 | 4 | 0 | 6 | 5 | 1 | 0 | 1 | 0 | 5 | 100 |
| | COL% | 6 | 9 | 9 | 17 | 8 | 10 | 2 | 15 | 11 | 15 | 5 | 11 | 7 | 18 | 10 |
| | TOT% | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Weird | N= | 3 | 2 | 0 | 0 | 2 | 3 | 1 | 8 | 7 | 0 | 0 | 1 | 0 | 1 | 160 |
| | ROW% | 2 | 1 | 0 | 0 | 1 | 2 | 1 | 5 | 4 | 0 | 0 | 1 | 0 | 1 | 100 |
| | COL% | 2 | 3 | 0 | 0 | 2 | 3 | 2 | 7 | 6 | 0 | 0 | 5 | 0 | 1 | 5 |
| | TOT% | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |

## Table IV-2

## Potential Countermeasures by Accident Type
## (Continued)

| COUNTERMEASURES / ACCIDENT TYPE | | Education | Reflectorized clothing | Other | Education | Increase awareness of danger of driving while fatigued | Other | Improve safety condition of vehicles | Improve headlights | Improve braking capability | Improve handling capability | Improve vehicle warning light system (flashers) | Other | Enforce existing vehicle regulations | Enforce existing pedestrian regulations | Control drinking drivers | Control drinking pedestrians | Change speed limit | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Pedestrian Oriented | | | Driver Oriented | | | Vehicular Oriented | | | | | | Enforcement Related | | | | | |
| | | 1 | 2 | 9 | 11 | 12 | 19 | 21 | 22 | 23 | 24 | 25 | 29 | 31 | 32 | 33 | 34 | 35 | 39 |
| Limited Information | N= | 7 | 2 | 2 | 1 | 0 | 1 | 0 | 2 | 0 | 0 | 0 | 0 | 3 | 0 | 1 | 2 | 0 | 0 |
| | ROW% | 21 | 6 | 6 | 3 | 0 | 3 | 0 | 6 | 0 | 0 | 0 | 0 | 9 | 0 | 3 | 6 | 0 | 0 |
| | COL% | 1 | 2 | 2 | 0 | 0 | 2 | 0 | 7 | 0 | 0 | 0 | 0 | 3 | 0 | 1 | 2 | 0 | 0 |
| | TOT% | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | COL TOT | 781 | 93 | 123 | 360 | 15 | 61 | 13 | 27 | 12 | 2 | 25 | 49 | 118 | 62 | 69 | 104 | 94 | 41 |
| | TOT% | 27 | 3 | 4 | 12 | 1 | 2 | 0 | 1 | 0 | 0 | 1 | 2 | 4 | 2 | 2 | 4 | 3 | 1 |

## Table IV-2

## Potential Countermeasures by Accident Type (Continued)

| COUNTERMEASURES / ACCIDENT TYPE | | Provide signs | Provide signals | Improve existing signs | Improve existing signals | Provide crosswalks | Provide sidewalks | Provide pedestrian barriers | Provide street lighting | Other | Provide marking on outer edge of pavement to prevent veering off roadway | Relocate mail/paper boxes | Parking restrictions/ redeployment | Relocate or improve bus stop | Other | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Traffic Engineering/Existing Procedures | | | | | | | | | Traffic Engineering New or Innovative Procedures | | | | | |
| | | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 51 | 52 | 53 | 54 | 59 | TOTAL |
| Limited Information | N= | 1 | 1 | 0 | 0 | 2 | 2 | 0 | 5 | 0 | 0 | 0 | 1 | 0 | 0 | 33 |
| | ROW% | 3 | 3 | 0 | 0 | 6 | 6 | 0 | 15 | 0 | 0 | 0 | 3 | 0 | 0 | 100 |
| | COL% | 1 | 2 | 0 | 0 | 2 | 2 | 0 | 5 | 0 | 0 | 0 | 5 | 0 | 0 | 1 |
| | TOT% | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | COL TOT | 143 | 64 | 11 | 12 | 110 | 112 | 47 | 111 | 119 | 13 | 21 | 19 | 14 | 71 | |
| | TOT% | 5 | 2 | 0 | 0 | 4 | 4 | 2 | 4 | 4 | 0 | 1 | 1 | 0 | 2 | |

TOTAL NUMBER OF OBSERVATIONS = 2917

Each 20-page data form was reviewed in the following manner:

- Time of the accident, general information about the pedestrian and driver, and information concerning the environment in which the accident occurred were noted (pages 1 and 2).
- The narrative portion of the attached police accident report was read.
- The sketch, narrative, and site photographs were reviewed (pages 16 and 17).
- Referring to the narratives and photos, as needed, the section on site factors was carefully reviewed (pages 10 through 15).
- Finally, any traffic engineering comments resulting from the review were noted on the back of page 15.

A total of 1,527 forms were reviewed. One hundred fifty-five traffic engineering comments were recorded. These comments pertained to 125 of the 1,527 accidents. The results are summarized in Table IV-3.

Table IV-4 is a breakdown of the traffic engineering comments by the following general categories:

- Signs
- Markings
- Signals
- Construction and/or maintenance
- Regulations (requires combination of above).

Table IV-3

Summary of Traffic Engineering Comments

| Comment* | Frequency | Percent |
|---|---|---|
| Install pavement edge markings | 43 | 27.8 |
| Install crosswalks | 26 | 16.8 |
| Provide a pedestrian path or sidewalk | 22 | 14.2 |
| Install ped crossing warning signs | 18 | 11.6 |
| Install ped and/or traffic signals | 10 | 6.5 |
| Install centerline and/or lane markings | 6 | 3.9 |
| Install fence to keep peds off roadway | 5 | 3.2 |
| Install stoplines | 4 | 2.6 |
| Install advance school warning signs | 3 | 2.0 |
| Trim vegetation | 3 | 2.0 |
| Maintain shoulder | 3 | 2.0 |
| Install prohibit peds from roadway signs | 2 | 1.3 |
| Improve lighting | 2 | 1.3 |
| Provide proper construction signing | 1 | 0.6 |
| Prohibit right turn on red | 1 | 0.6 |
| Install pedestrian median barrier | 1 | 0.6 |
| Prohibit parking near crosswalk | 1 | 0.6 |
| Remove snow from shoulder | 1 | 0.6 |
| Provide roadside delineation | 1 | 0.6 |
| Prohibit peds from bridge | 1 | 0.6 |
| TOTAL | 155 | 100.0 |

*Each comment reflects what might have helped to prevent a specific accident under the circumstances surrounding that accident.

Table IV-4

Traffic Engineering Comments by Category

| Category | Frequency | Percent |
|---|---|---|
| Signs | 24 | 15.5 |
| Markings | 80 | 51.6 |
| Signals | 10 | 6.5 |
| Construction and/or maintenance | 38 | 24.5 |
| Regulations (requires a combination of above) | 3 | 1.9 |
| TOTAL | 155 | 100.0 |

Only eight percent (125 out of the total sample) of the accidents reviewed might have been prevented through traffic-engineering-related improvements. The greatest need for engineering improvement is in the area of markings. Pavement edge markings appear to be the single most needed improvement.

## Highway Safety Systems Analysis

One feature of the systems analytic approach is to give as divergent a perspective to the problem scene as possible. Consequently, both the accident typology and the C/M typology were reconceptualized to see whether a different set of outcomes would emerge.

The restructuring of the accident typology is based on the angle of incidence between the path of the vehicle and the path of the pedestrian. The relative frequency of accidents in each incidence category is shown in Figures IV-1 and IV-2 for those cases where data were available and the pedestrian was actually moving.

A slightly different pattern emerges if only the uncomplicated cases, but those which include standing pedestrians, are included. Two categories account for almost 80 percent of all cases. The larger category involves cases in which the path of the pedestrian is roughly at right angles to a vehicle moving straight ahead (47.4 percent of all cases). The other category involves pedestrians moving roughly parallel to the path of the vehicle, not moving at all, or approaching the roadway without intending to cross (25.1 percent of total of all cases).

Thus, we have two predominant situations; one where the objective would be to prevent the direct, sudden incursion of the pedestrian into the roadway; the second where the objective would be to prevent "drift," either on the part of the vehicle into the path of the pedestrian or vice versa. The question now becomes how to prevent these two phenomena.

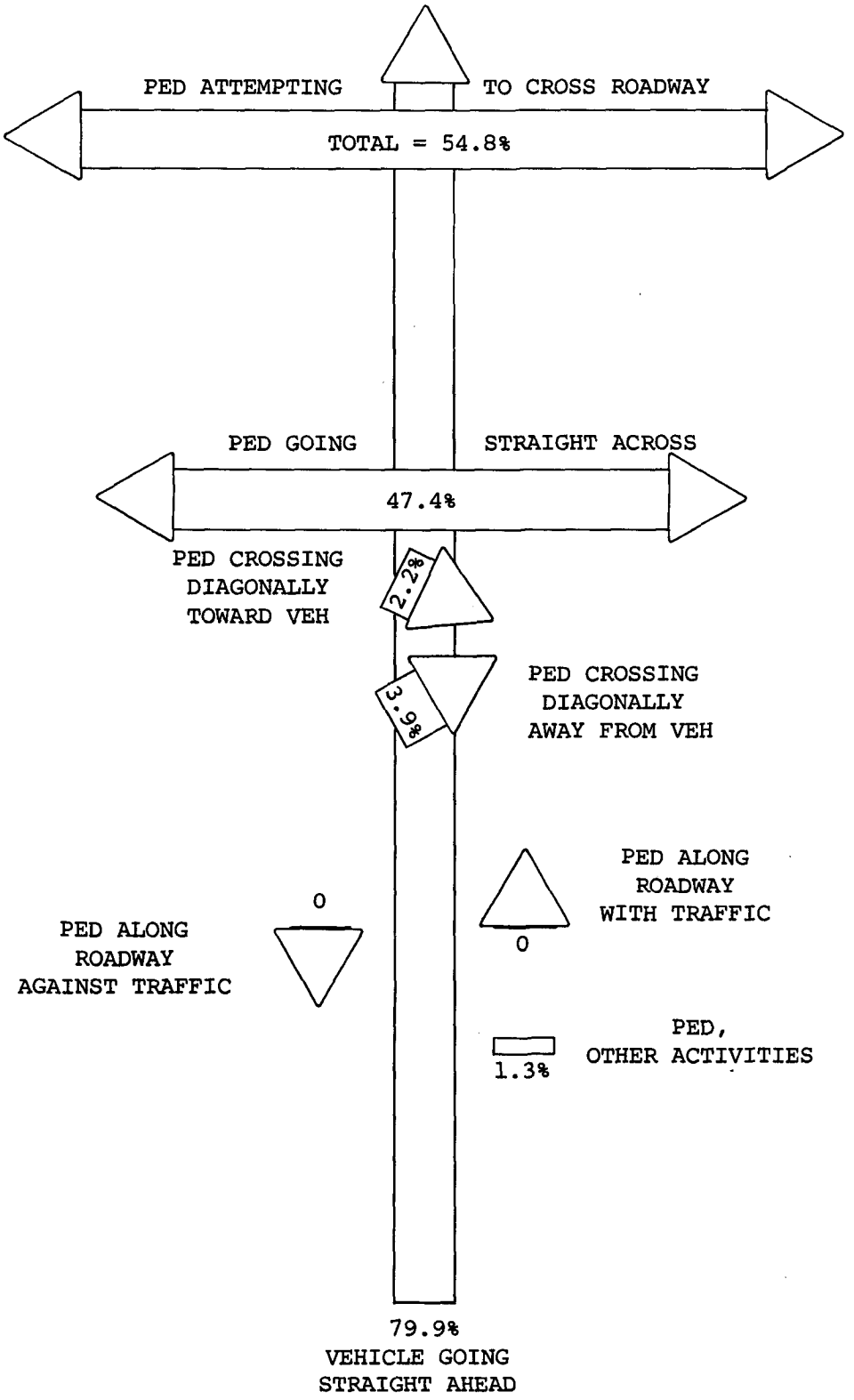


Figure IV-1. Pedestrian/Vehicle; Angle of Incidence for Pedestrian Attempting to Cross Roadway

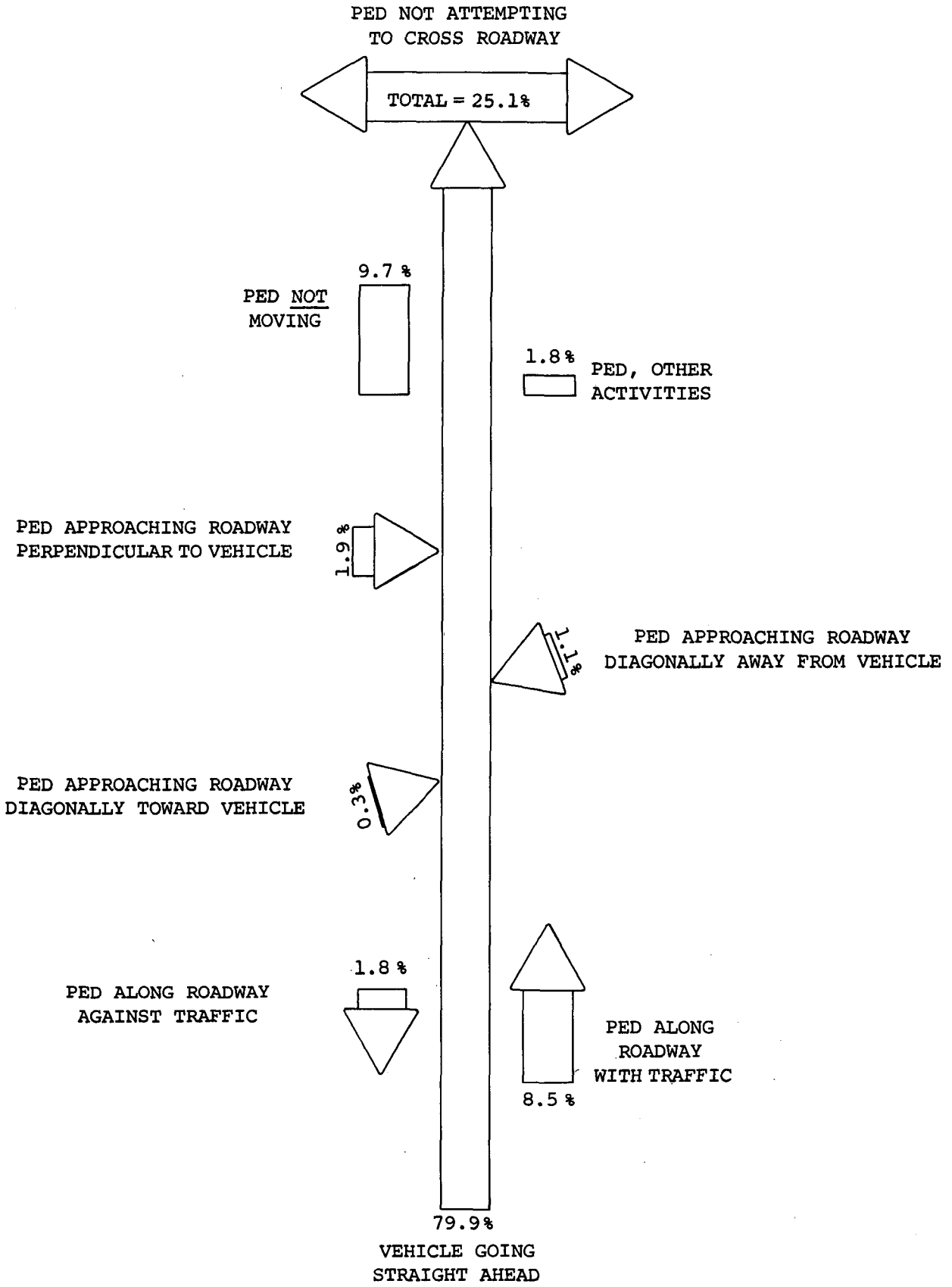


Figure IV-2. Pedestrian/Vehicle; Angle of Incidence for Pedestrian not Attempting to Cross Roadway

This question can be considered first at a generic level. Generic functional requirements can be specified as follows:

- The separation function (while this seems an obvious function, it cannot be dismissed as such; for example, a more subtle aspect is the alternative between separation based on physical barriers versus separation based on conceptual barriers such as edge markings).
- The detection function (this function works both ways; the pedestrian should be detectable by the driver, the driver should be detectable by the pedestrian).
- The alerting function (this function can be manifest in a long-range or strategic mode in educating either driver or pedestrian to chronic high-risk situations; or in a short-range mode where, by signs or other means, both drivers and pedestrians are given an indication of a specific, acute high-risk situation).

We now have two generic problems and three generic requirements. Each requirement leads to at least two alternative action areas. As suggested above, separation can be physical (e.g., guard rails between roadway and pedestrian path) or symbolic (e.g., pavement edge markings). Detection can relate to vehicle conspicuity (e.g., headlights on in daylight conditions) or pedestrian conspicuity (e.g., reflective clothing, reflectorized clothing, or high ambient lighting). Alerting can be long-range (e.g., education, propaganda) or short-range (e.g., signing).

Each potential action area can be considered against a set of what might be called "moderator" variables. These moderator variables involve feasibility, cost, and the nature of the action effect. For example, pavement edge markings have the advantage of being implemented at relatively low cost. There is no known adverse effect nor are there impairments to other traffic or highway engineering values. There is no apparent delay in effect and

the effect will be sustained as long as the markings are legible. Conventional edge markings could have some reasonable impact on those situations where the pedestrian's path is parallel to the vehicle path but only a marginal effect, if any, on those situations where the pedestrian is moving across the flow of vehicular traffic.

To provide a contrasting analysis, let us assume pedestrian education is targeted for children and is administered by the schools. Feasibility is high and, again, there are no obvious adverse side effects with respect to traffic management or highway engineering. Costs, however, can be relatively high. Another negative consideration is that education takes time. There would be a substantial lag from the time of program initiation to a point of detectable impact. The scope of the effect would presumably be broad and general, and duration could extend beyond the time of program operation. However, the magnitude of the effect (based on past efforts) is likely to be modest. Perhaps the most important consideration, though, is that education could be one of the few routes to an assault on the otherwise difficult problem of the pedestrian incursion across the flow of traffic.

With the analytical framework now introduced, we can turn to a consideration of specific countermeasures. A summary presentation is made in Table IV-5, which shows specific countermeasures arranged under their functional headings. Eleven evaluative criteria are used. No attempt is made to be highly quantitative. Qualitative marks are given for each potential countermeasure for each criterion. The overall test rating is, in effect, a hypothesis statement about relative cost-effectiveness and feasibility.

Items that rate highest in net-effect terms are car headlights on during daytime (in high-risk areas), reflectorized clothing, and combination programs integrating signing and mass media education. Edge markings, ambient lighting, and new signing also rate relatively high.

# Table IV-5

## Evaluation Factors

| C/Ms | Evaluation Factors: Cost, Capital | Cost, Operational | Traffic Management | Roadway Engineering | Time to Initiate | Scope of Effect | Duration of Effect | Magnitude of Effect | Cross-Flow Target | Parallel-Flow Target | Other Target | Innovativeness | Overall Test Rating |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. Separation Function | | | | | | | | | | | | | |
| a. Guard rail or fence | HI | M | OK | PP | L | LOC | P | + | + | + | + | 0 | + |
| b. Laid walkway | HI | M | OK | OK | L | LOC | P | + | 0 | + | 0 | 0 | + |
| c. Shoulder hardening | HI | M | PP | PP | L | LOC | P | + | 0 | + | 0 | + | + |
| d. Conventional edge marking | LO | LO | OK | OK | S | LOC | P | + | 0 | + | 0 | 0 | ++ |
| e. Coded edge marking | LO | LO | OK | OK | S | LOC | P | + | ? | +? | 0 | ++ | ++ |
| 2. Detection Function | | | | | | | | | | | | | |
| a. Ambient lighting | HI | M | OK | PP | L | LOC | P | + | + | + | + | 0 | ++ |
| b. Head lights on | LO | LO | OK | OK | S | GEN | P | ? | + | + | + | + | +++ |
| c. Amber lights on | LO | LO | OK | OK | L | GEN | P | ?? | + | + | + | ++ | + |
| d. Reflectorized clothing | LO | LO | OK | OK | S | GEN | P | + | + | + | + | + | +++ |
| 3. Alerting Functions | | | | | | | | | | | | | |
| a. Driver education | M | M | OK | OK | L | GEN | T | ? | + | ? | + | 0 | 0 |
| b. Pedestrian education, school | M | HI | OK | OK | L | GEN | T | ? | + | + | 0 | 0 | 0 |
| c. Combined education, mass media | LO | HI | OK | OK | S | GEN | T | ? | + | + | + | 0 | + |
| d. Signing and signals | HI | M | PP | OK | INT | LOC | P | ? | ? | + | + | ? | ++ |
| e. Combine c & d | HI | HI | PP | OK | INT | LOC | P | ? | ? | + | + | + | +++ |
| f. Combine 3e & 1e | HI | HI | PP | OK | INT | LOC | P | ? | ? | + | 0 | ++ | +++ |
| 4. Other | | | | | | | | | | | | | |
| a. Enforcement based | LO | HI | PP | OK | S | GEN | T | + | + | 0 | + | 0 | + |
| b. Extended crossing guard operations | LO | HI | PP | OK | L* | LOC | P | + | + | 0 | 0 | + | + |

PP = Possible problem
L = Long
S = Short
LOC = Local
GEN = General
P = Permanent
T = Temporary

*Could involve substantial time for recruitment and training

## Warrants

Two of the relatively high ranking C/M's (ambient lighting and edge markings) can be advocated on the basis of existing warrants. In other words, there are justifications for these types of intervention that are independent of the pedestrian safety question. Edge markings provide guidance to drivers. This has been shown to facilitate traffic flow (particularly in adverse weather and darkness) and to work to reduce single-vehicle accidents. Thus, the pedestrian safety aspect simply adds more strength to a trend that is already underway.

The same could be said for improvement of ambient illumination. Ambient lighting is also warranted as an anti-delinquency measure, completely outside the traffic safety realm. Since areas of high delinquency tend to be areas of high pedestrian risk, the arguments for ambient lighting are doubly reinforced.

Finally, there are possible site instances where guardrail separations would be warranted from the standpoint of vehicle control where, again, the argument for erection of such facilities would be strengthened by inclusion of pedestrian safety considerations.

## Some Specific Innovative Designs

Some of the proposed C/M's listed in Table IV-5 need a more complete explanation because they include some unconventional features.

It is proposed that edge markings in high pedestrian risk areas be given added prominence by using color and pattern. Conventional edge marking is a solid white line. Coded edge markings could be made by incorporating diagonal red slash marks every three feet. This signal could indicate to both drivers and pedestrians that they are in a high-risk area. Further, regulations could be established which would specifically prohibit pedestrian

incursions into the roadway in those areas so marked. In any case, signing and educational efforts would be required to support such an innovation.

Another unconventional concept is borrowed from Europe. There, some countries now require that amber lights be used in urban and suburban areas where pedestrians are at risk. The main idea is to enhance vehicle conspicuity.

Finally, a word should be said about "package" programs. Past C/M usage of improved signing has had only marginal impact when used alone. While these forms of C/M are attractive for other reasons, a combined program of signing, markings, education (and enforcement) would be better justified.

A specific example would involve a direct attack on the "dart-out" problem. In this case, signs prohibiting movement by pedestrians onto the roadway would be positioned at close intervals in a high-risk area (e.g., by a playground) with the message facing inward, toward the pedestrian. Message content remains to be developed but, in any case, the meaning of the message would probably need to be established by educational (and enforcement) provisions.