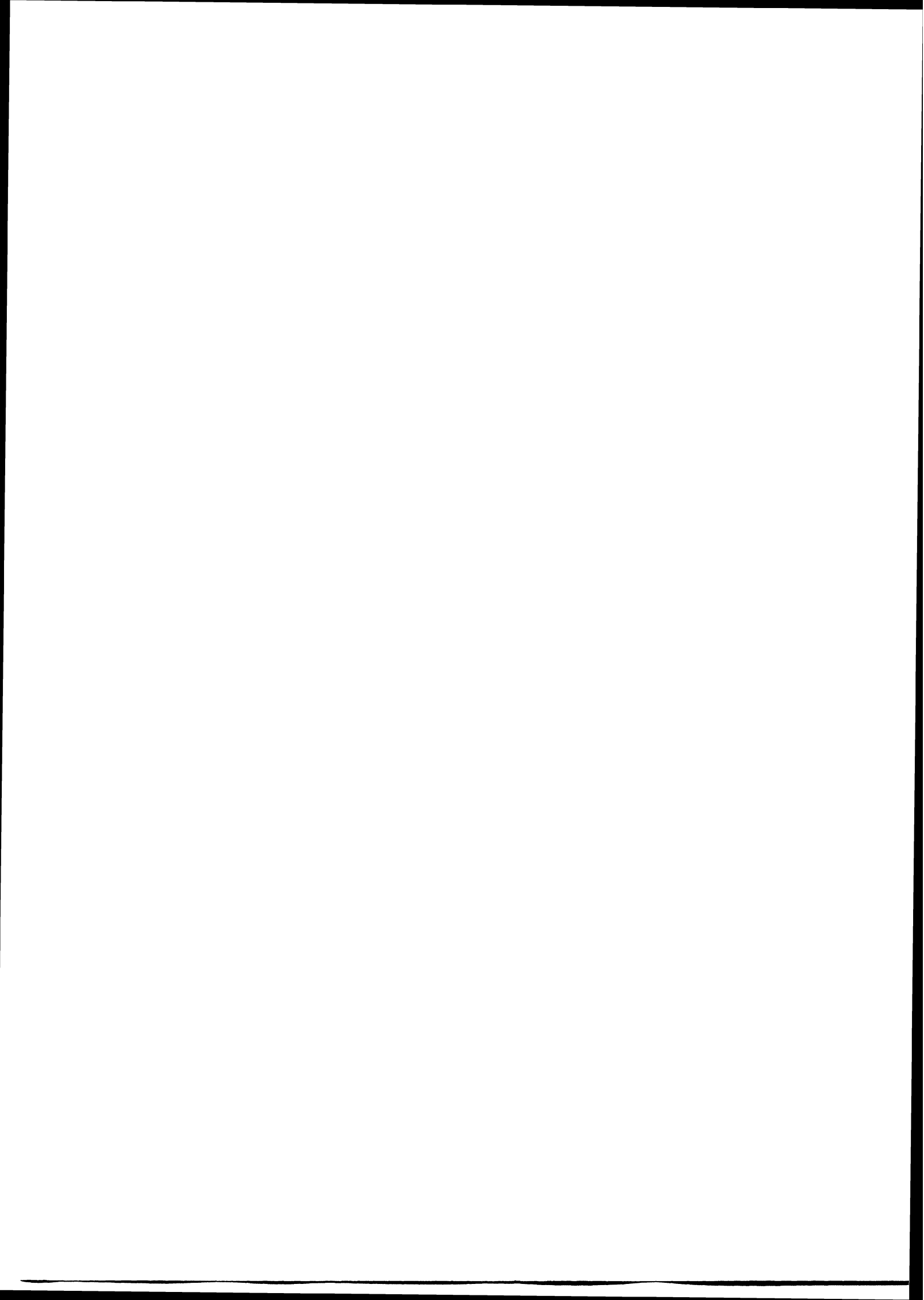


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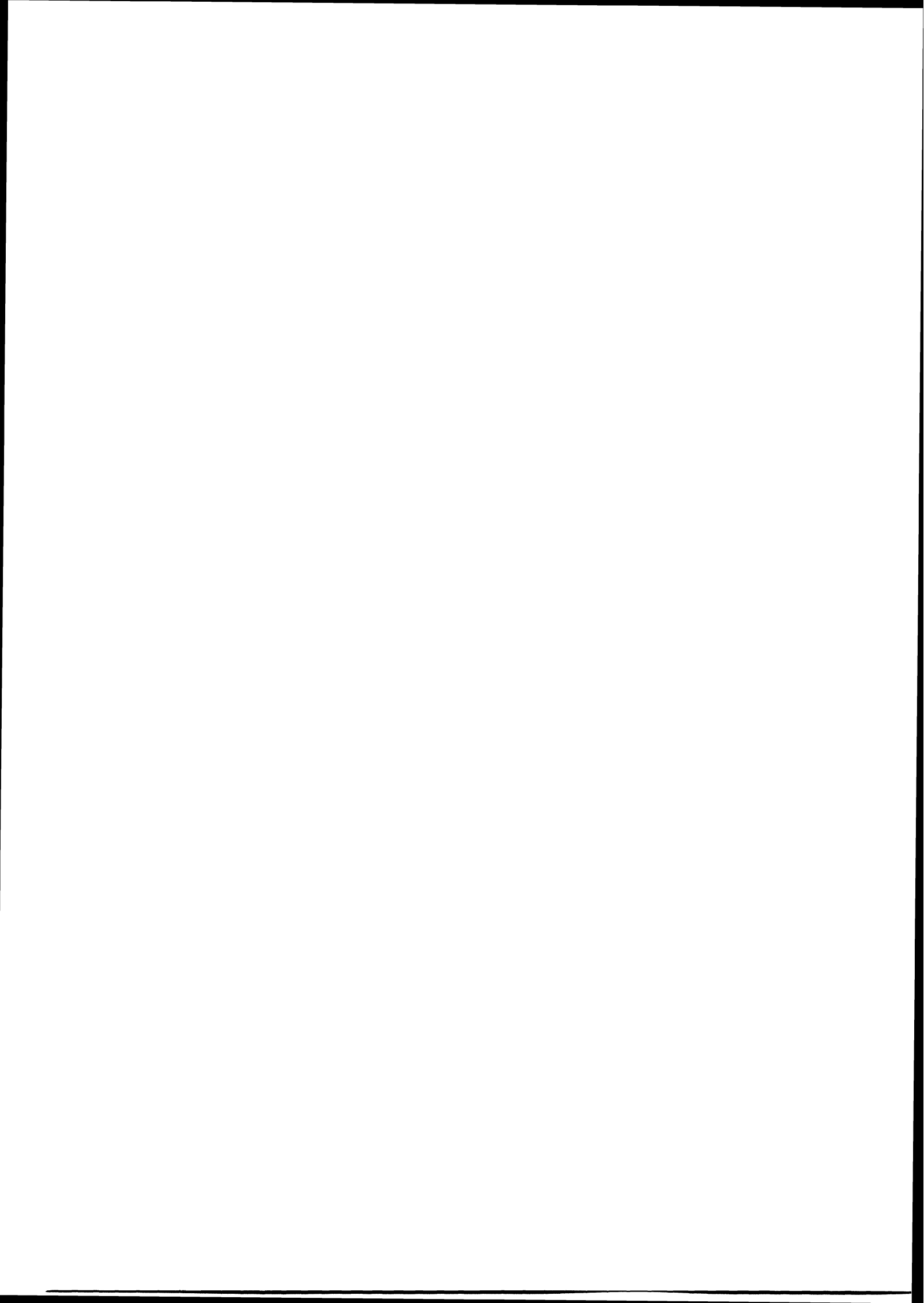
**A STUDY OF
PEDESTRIAN FATALITIES
IN WAYNE COUNTY, MICHIGAN**

Donald F. Huelke
Professor of Anatomy
and
Rollin A. Davis
Research Associate

HSRI Report No. Bio-9

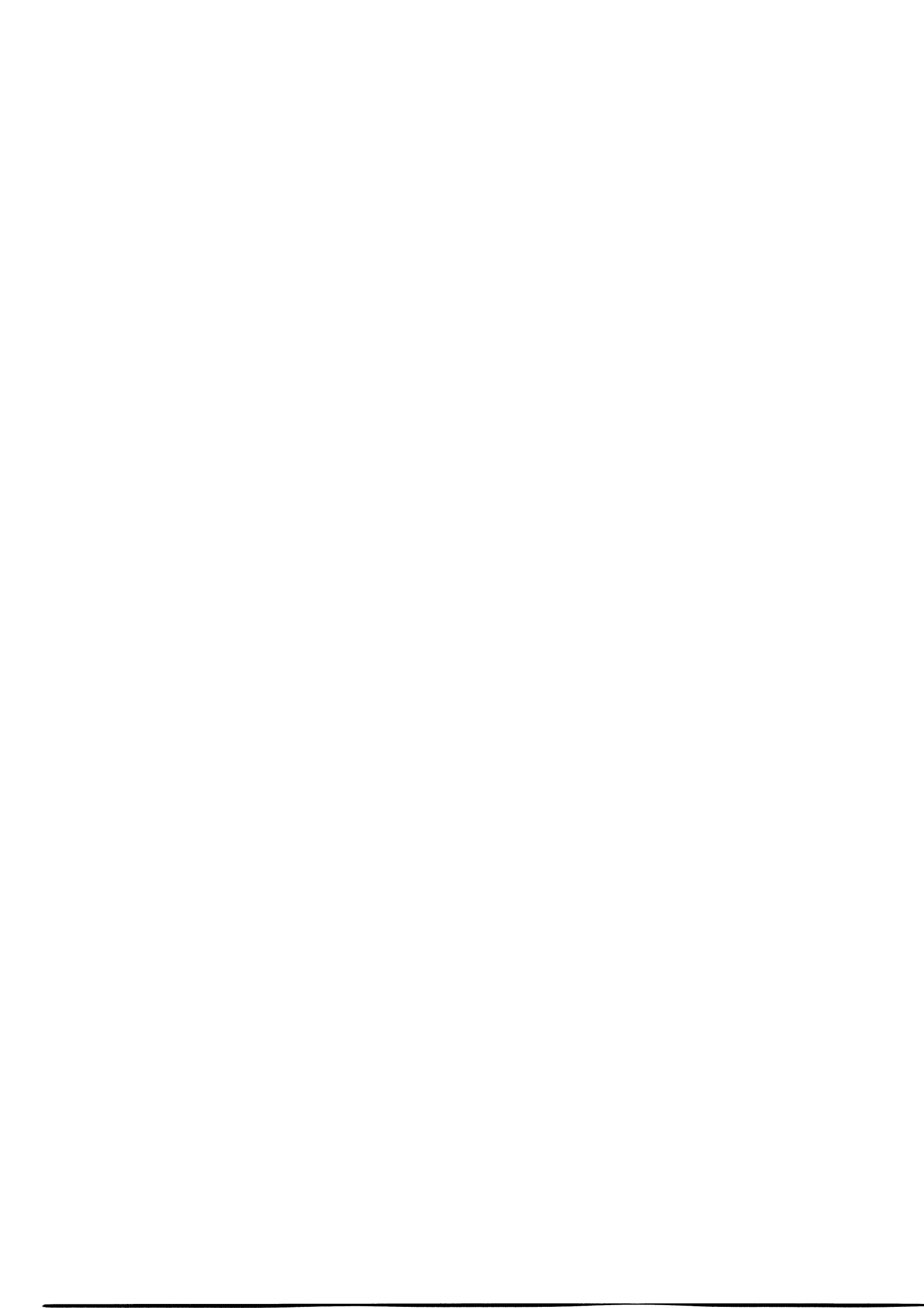
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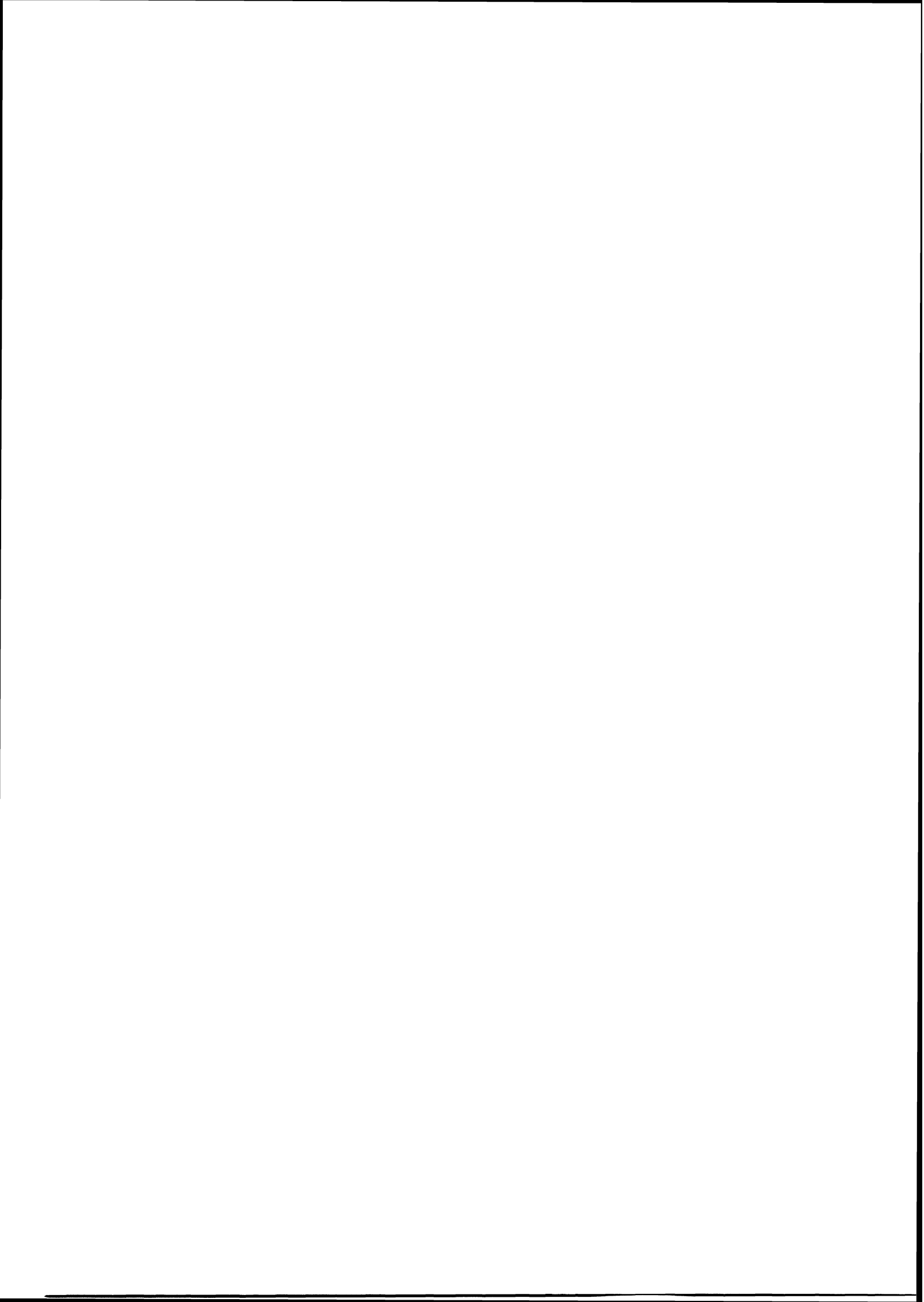
Dedication

To Edward Zawadski, Chief Medical Examiner of Wayne County (1954-1967), whose untimely death on February 5, 1967, deeply saddened all of us interested in forensic pathology.



Acknowledgment

We wish to express our deep appreciation to the staff of the Medical Examiner's Office of Wayne County for their cooperation and assistance in this research. To the police agencies of Wayne County we extend our thanks for their cooperation in providing accident reports. Special mention should be made of Inspector Arthur Sonnenberg and Lieutenant James Martin of the Accident Prevention Bureau, Detroit Police Department, who obtained most of the police reports for us.



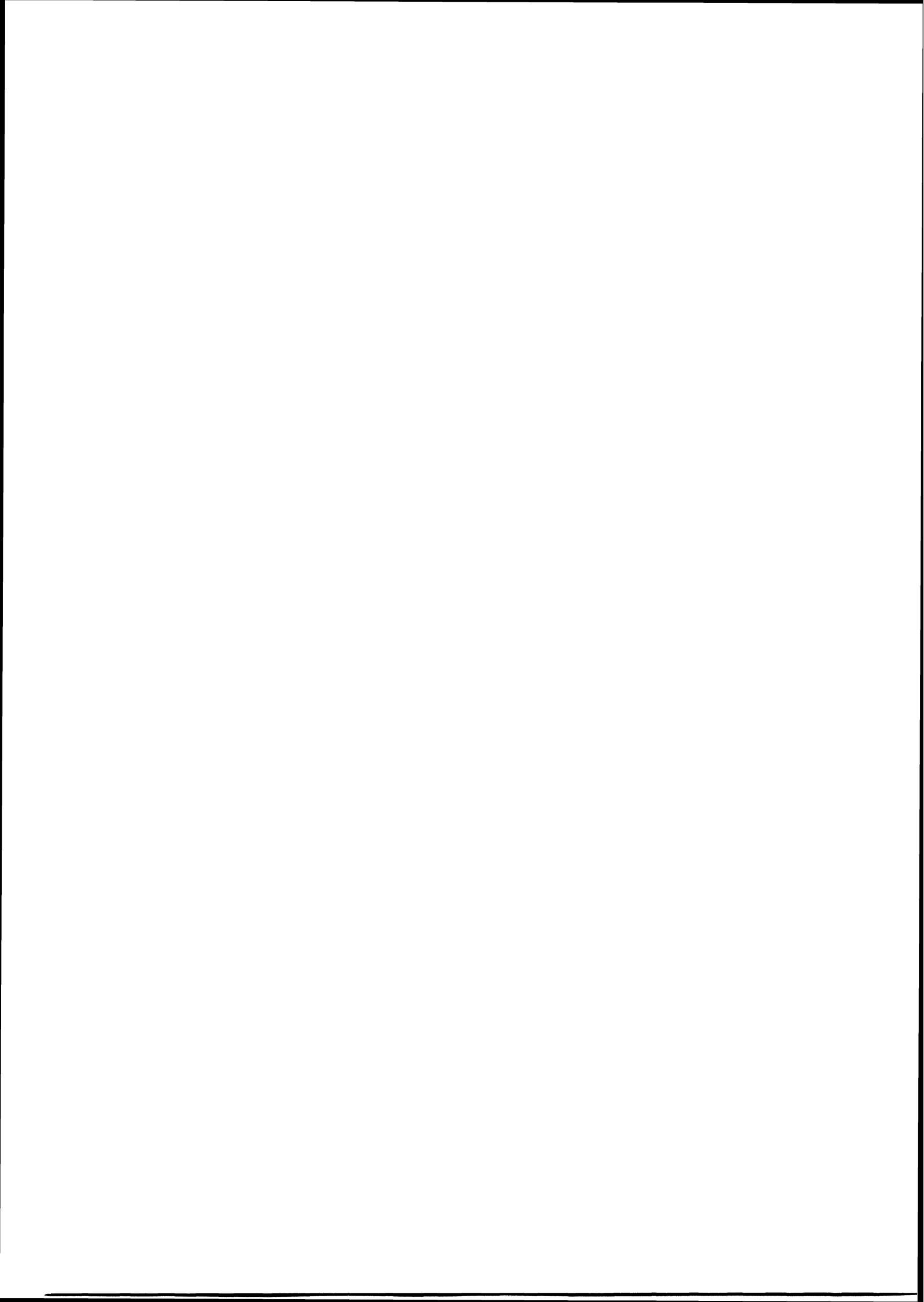
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Introduction

The annual number of victims of motor vehicle accidents in the United States include approximately 9,400 pedestrians who are killed, and 150,000 who are reported as suffering "disabling" injuries.¹ (This estimated injury figure is minimal, for by definition the victim's activity must be restricted for a full day beyond the day of the accident. Many injuries which require hospital attention but do not restrict activity are not included.) The 9,400 fatalities cited comprise 18% of the nation's annual traffic deaths. Of all pedestrians struck, 5.8% are fatalities; in contrast, only 2.4% of injuries to vehicle occupants are fatal.

The pedestrian is the most unprepared element in traffic.² Drivers must meet minimal age and licensing requirements; but the pedestrian is of almost any age, from the toddler to the debilitated geriatric member of society.

As Yaksich has stated: "Pedestrians are paradoxically apathetic and often arrogant. They exhibit no interest in themselves as a group; but, as individuals, they demand to an extreme all of their rights and privileges, without acknowledging their responsibilities. Pedestrians will go to extremes to circumvent devices and procedures set up for their protection and control. They frequently assume that they have little or no obligation to be orderly or predictable and take chances by deliberately violating a law or procedure, exhibiting great indignation when taken to task for such actions."² A common sight at night is the pedestrian walking on an unlit road, or crossing in the middle of a dimly lit block. It is not unusual to see a pedestrian standing in the middle of a street with cars passing him on both sides. This is an obvious example of deliberate risk. Many pedestrians, however, probably are not aware of the hazards involved in certain actions, and, as has been shown, alcohol intensifies one's tendency to overrate his ability in relation to his performance.³ The list of pedestrian risk-taking actions is endless.

Previous reports have indicated that accidents to young pedestrians are usually non-fatal, whereas the elderly are more often killed.^{4,5,6} In addition, a significant number of pedestrian fatalities have elevated blood alcohol levels.⁷

The data of this report indicate that in many of the accidents studied, the forces generated at impact were so great that several areas of the pedestrian's body sustained significant, life-threatening, or fatal injuries. In other cases, only one body area was sufficiently traumatized to cause death. In a number of elderly victims whose injuries alone were not necessarily fatal, later complications caused death.

Materials and Methods

The first step in this study was a review of all of the pedestrian fatality reports in the Medical Examiner's Office of Wayne County (Detroit area), Michigan, from January 1, 1965, to December 31, 1966. From these reports covering 286 fatalities, we obtained information on causes of death, body

areas injured, and alcohol content of body fluids and identified the police department which patrolled each accident. For each fatality, the appropriate police department was contacted to obtain the accident report and all available police photographs. All pedestrian accident reports for the same two-year period were obtained from each police department in the county for comparison. A total of 7,853 pedestrian accidents were policed by these agencies; the 286 fatalities in this report, therefore, represented 3.6% of all reported pedestrian accidents. No doubt some of the reported pedestrian accidents were not injury-producing. For this reason, the actual proportion of fatalities to injuries is probably slightly higher than our figures, although it is probably below the 5.8% pedestrian fatality estimate for the nation.¹

The scene of each fatal pedestrian accident was revisited to check on questionable details in the police reports, including the number of traveling lanes, lighting conditions, road surfaces, and the type of signal at the intersection.

In this series, 205 fatality victims (72%) were males and 81 (28%) were females. Of all the pedestrian accident victims, 65% were males and 35% females. Fatalities were 74% Caucasian; of the 74 non-Caucasian fatalities, all but two were Negroes. The ages of victims ranged from one to ninety-one years (Chart 1).

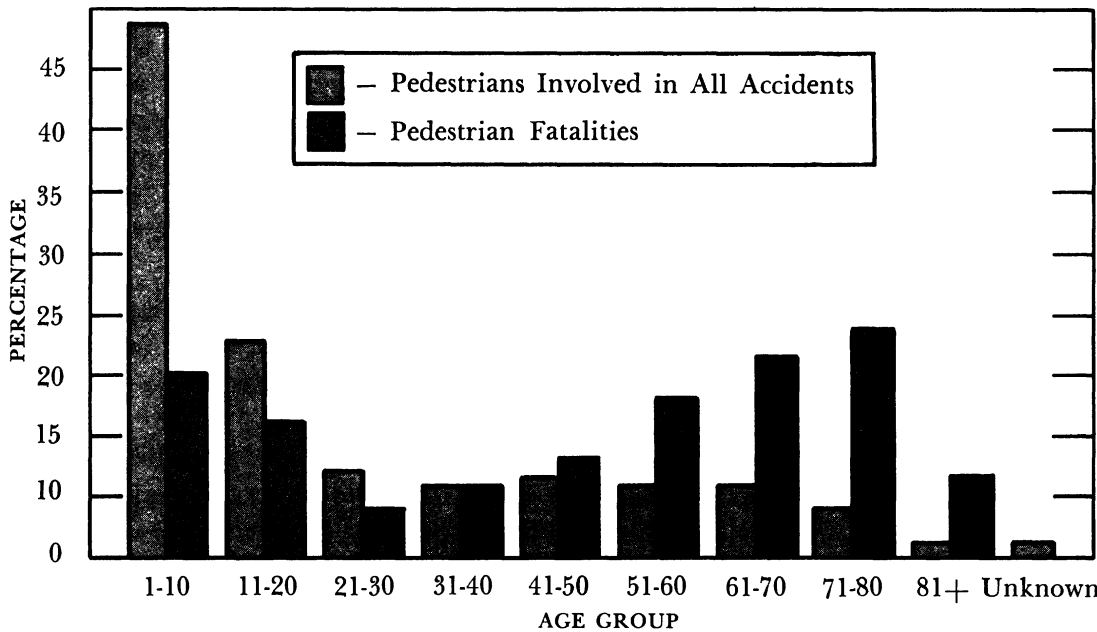


Chart 1. Age groups of pedestrian accident victims

Eighteen percent of the pedestrians killed were between twenty-one and fifty years of age. This age group was involved in 20% of all reported pedestrian accidents. The under-15 age group, although involved in 53% of all pedestrian accidents, included only 19% of all fatalities. On the other hand, pedestrians over fifty years of age were involved in only 17% of all

pedestrian accidents but accounted for 56% of pedestrian fatalities. This suggests that members of the 21-50 age group are more knowledgeable about potential pedestrian hazards than other age groups, or are not exposed to them as often. The fatality rate of the under-15 group is less than one-third of their involvement rate. This age group could have an exposure of body area to impact significantly different from that of the adult groups, or a significantly different pedestrian-vehicle weight ratio, or more resistance to trauma. Above fifty years of age, the percentage of fatalities is three times that of involvement, indicating such factors as less resistance to trauma, increased senility, pedestrian overconfidence, and higher usage of alcohol.

Factors in Accident Frequency or Severity

Pedestrian Actions Prior to Impact

In the fatality group, 37% were crossing the street outside the crosswalk or in the middle of the block when struck (Table 1). Of the 36% who were crossing at an intersection, approximately half were at an intersection where no signal control was present. In the other cases, a stop sign, a caution light, or a stop-and-go light was present. Of the 24 pedestrians killed when crossing at a stop-and-go light, 75% were walking with the light when they were struck.

Table 1. Pedestrian actions prior to fatal accidents

Action	Number	%
Crossing outside crosswalk or in mid-block	106	37
Crossing at intersection:		
no signal control present (45)		
stop sign (21)		
stop-and-go light (24)	102	36
diagonally (9)		
caution light (3)		
Standing or walking:		
in roadway (43)		
in parking lot (2)	58	20
on sidewalk (13)		
Lying in roadway	8	3
Crushed between vehicle and second object	7	2
Falling from vehicle	3	1
Leaping from vehicle	2	1
	<u>286</u>	

From the driver's view, more pedestrians were moving from right to left in front of the vehicle (49%) than from left to right (40%) when struck. A few were walking in the roadway parallel with the car (8%) or were standing in the road and not moving (3%).

Physical Factors

Approximately two-thirds of the pedestrian fatalities occurred on a roadway of four or more lanes (Table 2); one-fourth of the fatal accidents

Table 2. Road conditions at sites of fatal accidents

Type of Roadway	%	Locations	%
4 Lanes or More	64	Shopping or Business Area	58.4
2 Lanes	25	Single Dwelling Neighborhood	15.0
3 Lanes	9	Multiple Dwelling Neighborhood	14.3
Alley or 1 Lane	1	Industrial/Mfg. Area	2.8
Parking Lot	1	Expressway	2.4
Road Construction	%	Rural	1.8
Asphalt	86.0	School	1.8
Concrete	8.3	Park	1.0
Gravel	1.8	Other	2.5
Dirt or Sand	1.4	Road Character	%
Other	2.5	Straight Level	93.3
		Straight Grade	1.4
		Curve Level	1.4
		Curve Grade	1.4
		Other	2.5

Table 3. Weather and lighting conditions of fatal accidents

Weather	Lighting					Fatalities	
	Daylight	Darkness	Dusk	Dawn	Artificial Light	No.	%
Clear	47	13	3	1	79	143	61
Cloudy	12		3		38	53	23
Rain	4				25	29	12
Snow	3	1			2	6	3
Fog					1	1	1
Total No.	66	14	6	1	145	232	
Total %	28	6	3	1	62		100

occurred on a two-lane street. Most occurred in clear weather, at night, under artificial light, and on a dry, straight asphalt road (Tables 2, 3).

Ages of Drivers Involved in Pedestrian Fatalities

The age distribution of drivers who hit the pedestrians is shown in Table 4. Drivers under thirty years of age were involved in 42% of the accidents, and drivers between thirty-one and forty-five in 28%. Only 25.3% of the cars involved were driven by motorists over forty-five years of age.

Time of Accident

The time of each accident was plotted to the nearest hour (Chart 2). Less than 3% of pedestrian accidents occurred between 3 and 6 a.m., yet these included 8% of fatal pedestrian accidents. However, after 7 a.m. the number of pedestrian accidents increased, reaching a peak at 3 p.m. There is, however, a noticeable dip in the pedestrian accident curve at 9 a.m. At this time, pedestrian traffic seems to be low; most children are

Table 4. Ages of drivers involved in pedestrian fatalities

Driver Age	Fatalities	
	No.	%
15-20	45	15.7
21-25	41	14.3
26-30	33	11.5
31-35	22	7.7
36-40	28	9.8
41-45	29	10.1
46-50	23	8.0
51-55	18	6.3
56-60	8	2.8
61-65	13	4.6
66-70	7	2.5
71-75	3	1.1
76-80	0	0.0
Unknown	16	5.6
	286	100.0

in school, adults are at work, and many large stores are not yet open. Between 7 and 9 a.m., the incidence of pedestrian fatalities was just as low as in the very early morning hours. From about 2 p.m. the number increased gradually with the high point at 7-8 p.m., when the number killed was double that of any two-hour period. The number of fatalities then dropped sharply until 1 a.m. but increased again at 2 and 3 a.m. (The bars and taverns in Wayne County close at 2 a.m.) More pedestrians were killed between 6 and 9 p.m. than during any other three-hour period. Twenty-five percent of the pedestrian accidents and fatalities occurred between 1 a.m. and noon (Chart 2, Table 5). Between 3 and 7 p.m. 43% of the pedestrians were involved, but only 21% of those killed were struck during this time period. Among the fatalities, 27% of the accidents occurred between approximately 7 and 8 p.m.

As previously indicated, 3.6% of the reported pedestrian accidents involved a fatality. However, between 7 p.m. and 3 a.m., figures indicate a fatality rate generally between 8% and 12%, with a sudden rise to 31% at 3 a.m. (Chart 2, Table 5).

Comparison of the time of the accident with the age of the victim shows that almost all of the children under eleven years of age were struck between 9 a.m. and 8 p.m., approximately half of them between 4 p.m. and 7 p.m. (Chart 3). In this study, only two earlier or later pedestrian fatalities were found in this age group. In one case, a four-year-old alighted from a car at about 6 a.m. and ran behind it into the path of an oncoming car. The other case was that of a seven-year-old boy playing "dodge-'em" with speeding cars on an expressway near midnight.

Pedestrian involvement graphs are similar for those under eleven years of age and between eleven and twenty years. For all accidents involving pedestrians under eleven, there are three peak hours: 8 a.m., noon, and

3 p.m. (the highest). These correspond generally to the movement of students to and from grammar school. The 11-20 group had several slight peaks—7 and 8 a.m., noon, and 3 p.m.—also basically corresponding to student movement.

The peak hours for pedestrian fatalities in the under-11 age group (5

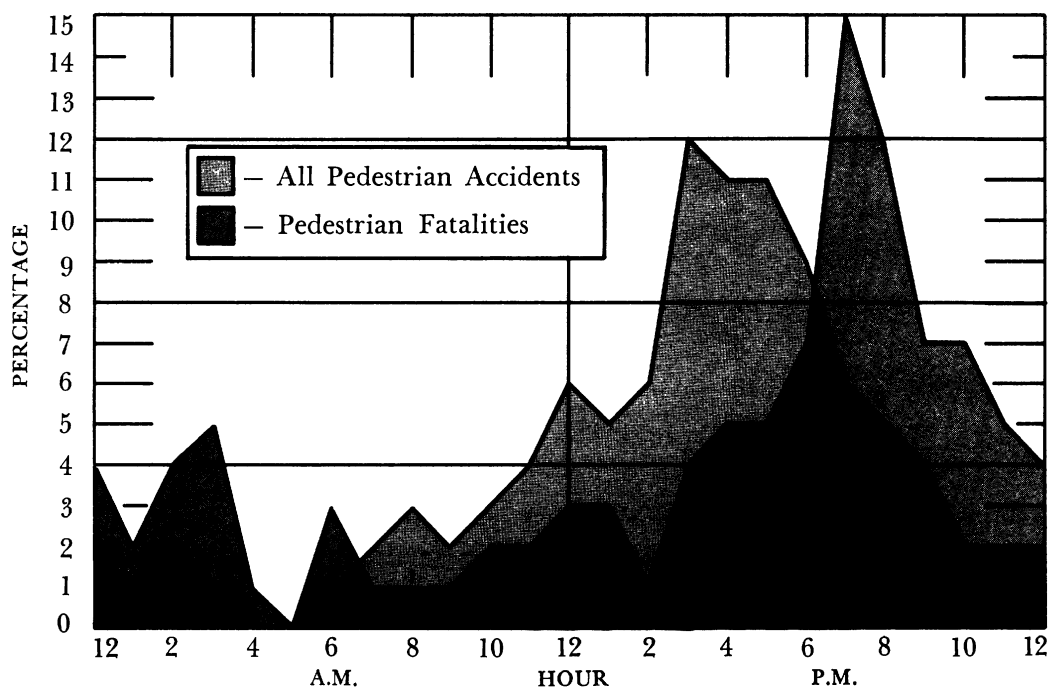


Chart 2. Pedestrian accident distribution by hour

Table 5. Distribution of pedestrian accidents by age group and hour

Hour	Age Group														Unknown*	Fatalities (%/hr.)	Total %		
	1-10	11-20	21-50		51-60		61-70		71-80		81+								
1 A.M.	0	0	1	0	3	1	2	3	1	4	0	2	0	0	5	0	5	1	2
2	0	0	1	0	5	6	3	3	3	6	1	4	0	5	3	0	8	2	4
3	0	0	0	0	2	24	0	5	1	0	0	2	0	0	0	0	31	1	5
4	0	0	0	3	1	0	1	0	0	0	1	0	0	0	2	0	4	0	1
5	0	0	1	0	1	0	1	0	2	0	0	0	2	0	0	0	0	0	0
6	0	3	1	3	3	0	4	5	4	2	3	2	4	5	2	0	7	1	3
7	1	0	4	0	4	0	3	0	4	2	4	0	0	10	4	0	2	2	1
8	2	0	5	7	3	1	2	0	3	0	3	2	2	0	2	0	2	3	1
9	1	2	1	0	2	0	2	0	2	2	5	0	4	0	3	0	2	2	1
10	2	5	1	0	2	0	2	3	7	4	9	2	7	0	5	0	4	3	2
11	6	2	3	0	3	0	3	0	4	2	4	5	9	0	3	0	2	4	2
12	8	7	5	3	4	0	4	0	4	2	5	5	4	0	1	0	2	6	3
1 P.M.	6	12	4	3	3	1	4	0	4	0	9	2	15	5	4	0	2	5	3
2	7	2	5	0	4	0	4	0	6	2	6	0	9	10	6	0	1	6	1
3	16	10	12	3	6	0	8	0	6	6	5	4	4	10	6	0	1	12	4
4	15	7	10	7	6	4	7	3	8	8	4	4	9	5	5	0	2	11	5
5	13	19	11	7	7	0	10	5	7	4	10	2	11	0	11	0	2	11	5
6	11	7	9	3	6	4	6	3	7	8	6	11	7	20	10	0	3	9	7
7	7	17	6	26	6	6	8	22	8	6	7	23	0	10	5	0	8	6	15
8	3	5	7	10	8	11	7	19	5	18	8	11	4	10	4	0	8	5	12
9	1	0	6	13	7	13	8	11	5	8	3	2	0	5	5	0	7	4	7
10	1	0	2	10	6	11	4	13	3	2	3	9	2	5	5	0	11	2	7
11	0	0	3	3	5	9	5	5	3	8	3	4	4	0	4	0	8	2	5
12	0	2	2	0	4	9	2	0	3	4	1	4	2	0	3	0	8	2	4

All Pedestrian Accidents Pedestrian Fatalities

*The ages of 98 of the 7,853 pedestrians involved in accidents are not known.

and 7 p.m.) and in the 11-20 group (7 p.m.) do not correspond with the peak hours for accident involvement of pedestrians of those ages.

Pedestrians between twenty-one and fifty years of age, involved in 20% of all accidents, comprised 18% of the fatalities (Chart 1). In Chart 3, a gradual increase is observable in the number of involvements of this age group as the day progresses, with a slight peak at 8-9 p.m. It was at this time that a significant number of pedestrians in this age group were killed. In the 23 accidents at 3 a.m. involving this group, half of the pedestrians were killed, the highest fatality-accident ratio for this age group at any specific period.

The 51-60 age group had few fatalities (13%) but were involved in only 6% of the accidents. The majority of those in this group were killed between 7 and 11 p.m.; peak hours were 7 and 8 p.m.

Pedestrians between sixty-one and eighty had a very level distribution of involvement throughout the 24-hour period. The peak hour for fatalities in this age group was 7-8 p.m.

Individuals over eighty years of age, involved in only 1% of the accidents, accounted for 7% of the fatalities. They were involved quite evenly throughout the day but showed fatality peaks at 7 a.m., midafternoon (2-3 p.m.), and 6 p.m.

Of the adult (over twenty years) fatalities, 54% were struck between 7 p.m. and midnight, and 14% between 1 and 3 a.m.

Day of Week

Approximately one-third (35%) of the pedestrian accidents and fatalities occurred on Friday and Saturday (Table 6). Approximately one-fourth (10/41) of Sunday fatalities were struck between midnight Saturday and 3 a.m. Sunday. Likewise, 37% (18/49) of the Saturday fatal injuries were incurred during those hours.

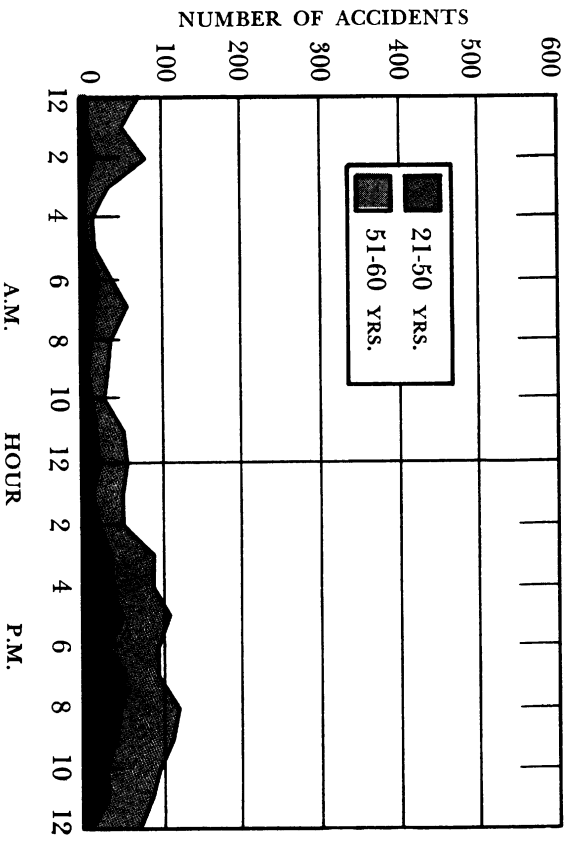
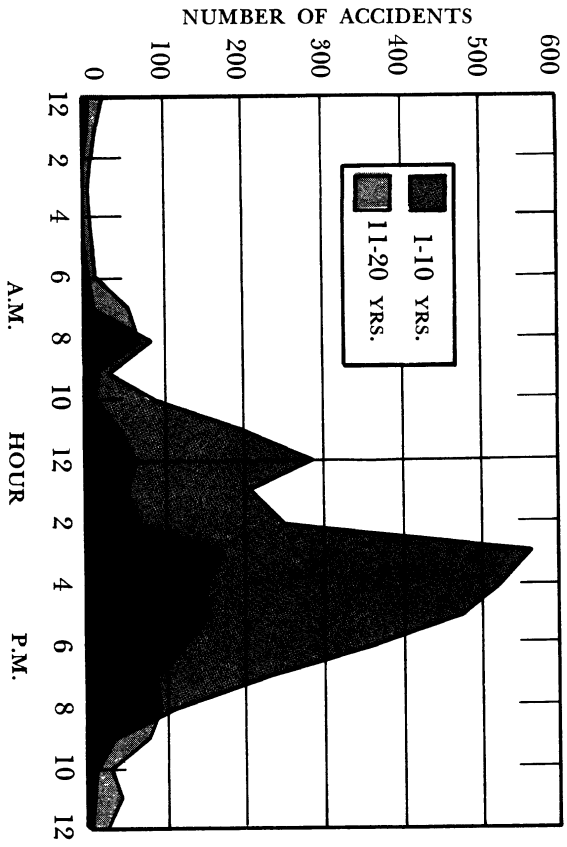
Table 6. Percent distribution of pedestrian accidents by day

Age Group	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	
1-10	12 21	11 12	14 31	11 14	14 5	18 12	14 5	
11-20	8 19	14 10	14 13	11 3	14 7	20 26	15 23	
21-30	10 8	10 8	12 15	11 15	14 23	23 15	20 15	
31-40	12 17	13 0	12 6	9 6	11 28	19 6	21 39	
41-50	12 18	12 0	12 18	12 5	14 27	19 18	19 14	
51-60	9 8	15 18	13 16	12 16	16 16	20 18	17 8	
61-70	9 10	15 16	14 4	11 14	13 16	20 25	16 14	
71-80	8 11	13 6	12 13	14 11	14 11	20 21	19 26	
81+	12 20	12 20	9 5	21 20	8 5	18 20	20 20	
Unknown	14 0	14 0	7 0	16 0	15 0	18 0	14 0	
All Ages	11 14	14 10	13 14	13 12	14 14	19 18	16 17	
	All Pedestrian Accidents				Pedestrian Fatalities			

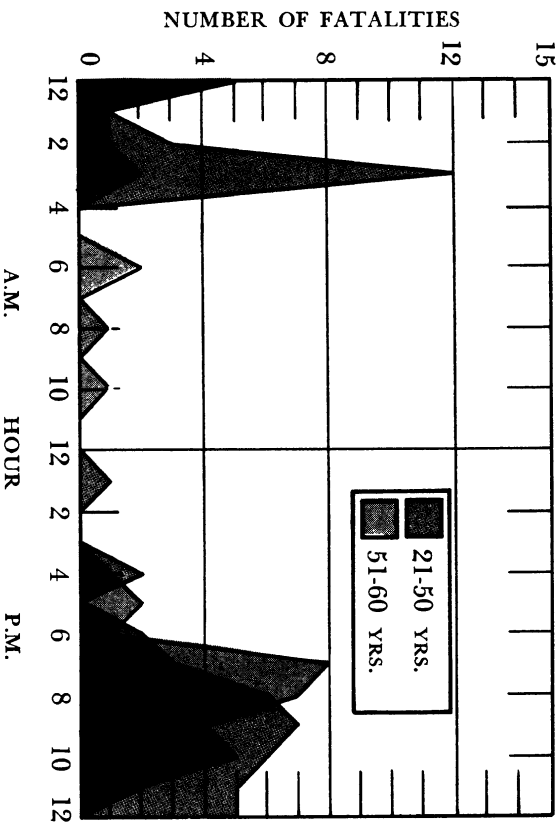
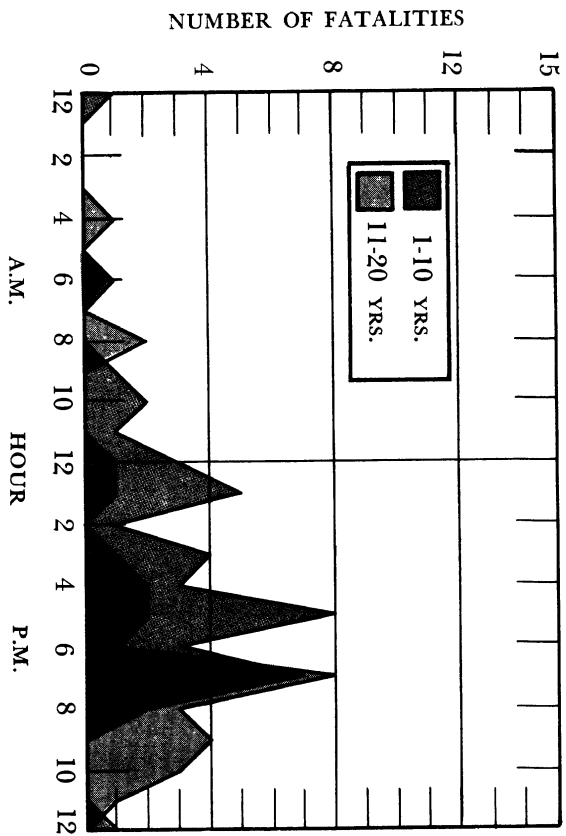
There are differences in the days on which accidents occurred to various age groups. Although only 26% of accidents involving children under eleven occurred on Tuesday or Sunday, 31% of fatal injuries to children occurred on Tuesday and 21% on Sunday. Although 28% of

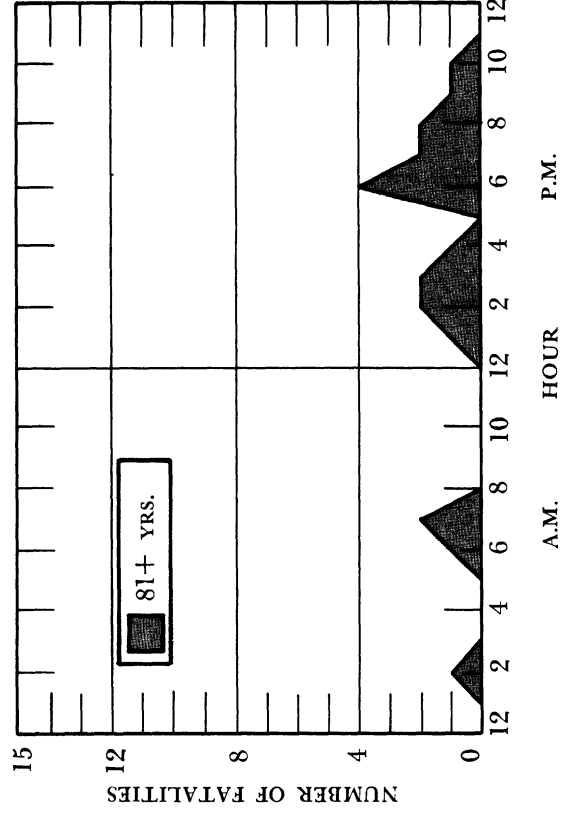
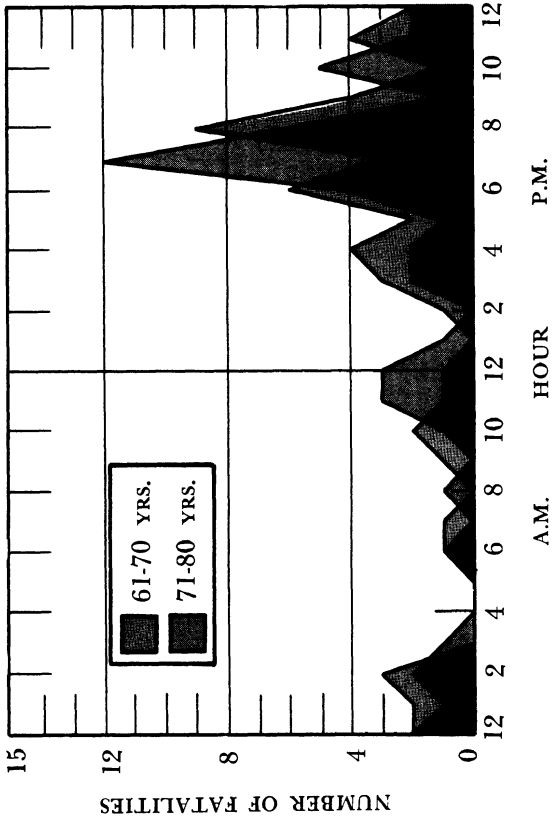
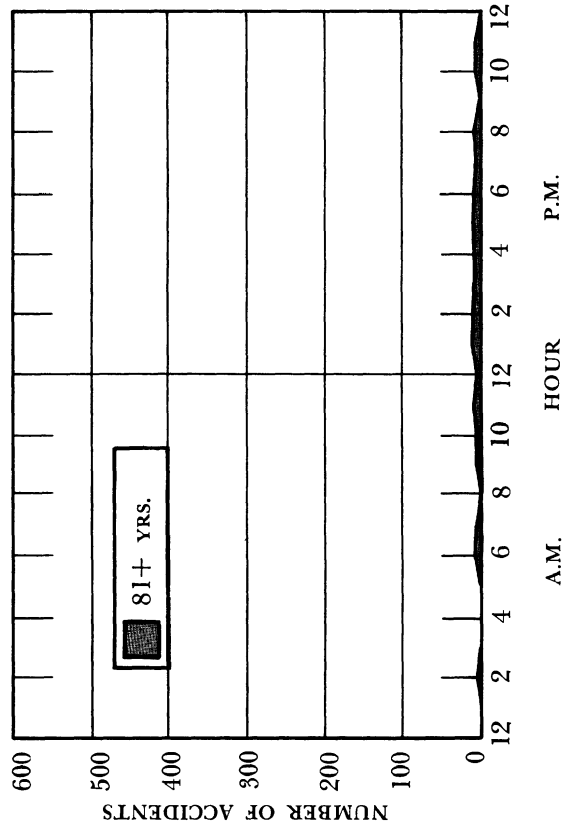
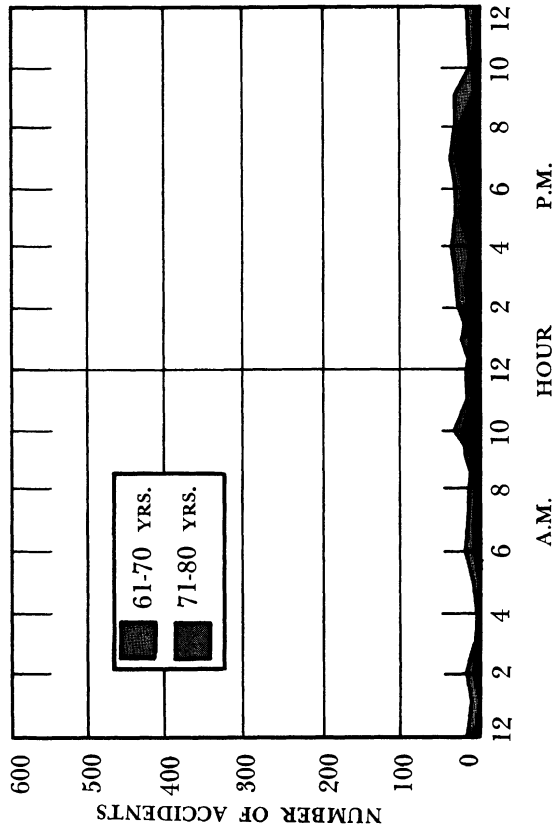
Chart 3. Hourly distribution of victims by age group

a. All pedestrian accidents



b. Fatal pedestrian accidents





the injured children were involved in accidents on Thursday and Saturday, only 10% of this age group died of their injuries.

In the 11-20 age group, 15% of accidents were on Saturday; but of those who died, 23% were struck on this day. In this group, 19% of fatalities were among the 8% who were struck on Sunday.

In the 21-30 age group, approximately 14% were struck on Thursday; 23% of the fatalities in this age group sustained their injuries on this day.

In the 31-40 age group, 21% were hit on Saturday, when 39% of their fatalities were sustained.

Although only 14% of the 41-50 age group were struck on Thursday, one-fourth of the group's fatalities were produced on that day.

In the 51-60 age group, accidents and deaths were evenly distributed throughout the week.

In the 61-70 age group, the percentage of fatalities (25%) from impacts on Friday was higher than the group's involvement on this day (20%). This is also true for Saturday accidents involving the 71-80 age group. Among the pedestrians over eighty-one years of age, 24% were struck on Sunday and Monday, yet 40% of fatal impacts were sustained on these two days.

Month

On the average, 8% of the pedestrian accidents and fatalities occurred each month (Table 7). However, more pedestrians (13%) were killed during December than in any other month. Child fatalities rose sharply in May, June, and July—from the beginning of warm weather into the summer vacation period. However, December was also a high fatality month for children; yet the pedestrian accident rate for children in December was half the monthly average. A greater percentage of fatalities involving 11- to 20-year-olds occurred in March, July, August, and December (10%-16% each month), yet only March and December had a slightly higher than average monthly involvement rate. Fifteen percent of the 21- to 30-year-olds were killed each month in March, June, August, and December, when their involvement rate per month was average. A two- to threefold increase in the proportion of fatalities to accidents is noted in May and December

Table 7. Percent distribution of pedestrian accidents by month

Month	Age Group																Total %					
	1-10		11-20		21-30		31-40		41-50		51-60		61-70		71-80			81+		Unknown*		
Jan.	4	2	8	6	9	8	10	6	11	14	8	8	10	12	11	9	14	20	11	0	7	9
Feb.	5	2	7	6	9	0	8	0	12	18	6	5	12	17	8	9	6	10	9	0	7	8
Mar.	7	5	10	16	8	15	8	11	8	9	9	16	6	2	7	8	8	10	10	0	8	9
April	10	7	7	6	6	0	8	0	6	0	7	5	7	17	8	4	6	15	12	0	9	7
May	15	19	10	6	11	8	9	22	7	0	9	5	8	14	7	6	4	5	6	0	12	10
June	13	14	7	3	6	15	8	6	7	5	7	11	8	10	6	2	9	0	13	0	10	7
July	12	12	7	13	6	8	8	11	6	9	4	0	5	2	8	6	4	0	3	0	8	6
Aug.	9	5	7	10	8	15	7	6	6	9	7	11	7	8	8	13	9	0	4	0	8	9
Sept.	9	14	8	7	7	8	9	0	8	5	10	16	7	0	6	13	8	5	6	0	9	8
Oct.	7	5	10	7	12	8	7	0	10	9	10	5	8	4	10	13	12	5	7	0	8	7
Nov.	4	2	9	7	8	0	8	0	6	6	10	11	7	4	8	8	8	10	7	0	6	7
Dec.	4	12	10	13	10	15	12	33	12	14	13	8	14	10	14	9	12	20	10	0	8	13

All Pedestrian Accidents

Pedestrian Fatalities

*The ages of 98 of the 7,853 pedestrians involved in accidents are not known.

for the 31-40 age group. In February, 12% of the 41- to 50-year-old pedestrians were involved in accidents, yet 18% of their fatalities occurred during this month. Thirty-two percent of the fatalities in the 51-60 age group occurred in March or September, but during these two months there was only a slight increase in the number of pedestrian accidents in this group. In April and May, 15% of the accidents involving the 61- to 70-year group occurred, producing 31% of this group's fatal injuries. A total of 39% of 71- to 80-year-old pedestrians were killed in August, September, and October, when their involvement rate was only 24%. Pedestrians over eighty-one incurred more than half of their fatalities during January, April, and December, when only one-third of their accidents occurred.

Alcohol Involvement

Analytic evidence of drinking by pedestrians prior to accident involvement and subsequent death indicates that the data from police reports are unreliable. The Medical Examiner's reports showed elevated body fluid alcohol in 42% of the fatalities, whereas police reports indicated only 7% had been drinking. Police reports and Medical Examiner's reports indicated that 44% and 26%, respectively, had not been drinking; 49% and 32%, respectively, were unknown. Medical Examiner's reports further showed that one out of five pedestrians had no alcohol in his body fluid and presumably had not been drinking. However, some of these individuals had lived long enough to eliminate alcohol from their systems or had undergone blood replacement which would have diluted any alcohol present. No test for alcohol was conducted in 32% of the Medical Examiner's cases: Either no autopsy was performed, or the individual had survived for a significant length of time after the accident, or the victim was under twelve years of age. (Routinely, no children were tested for alcohol.) (See Table 8.)

Of the 195 alcohol tests on individuals over twelve years of age, 61% were positive; the probability is that some of the 91 individuals not tested would have tested positively if their body fluids had been analyzed immediately after the accident. Therefore, 61% of pedestrian fatalities over twelve years of age is a minimum figure for positive alcohol tests. In a carefully controlled study of pedestrian fatalities in New York City, Haddon indicated that alcohol is a factor in three-quarters of all pedestrian accidents.⁷

Of the 120 positive tests, 98 were determined by analysis of spinal fluid, 21 by blood analysis, and one by urine analysis. In addition, in nine cases stomach contents or urine samples were analyzed as well as spinal fluid or blood (Table 9).

Results of the 120 positive alcohol tests, shown in Table 10, indicate that 11 of the 21 positive blood alcohol tests were over 0.11% by weight. Values for spinal fluid or urine alcohol have been shown to be higher than blood samples from the same individuals.^{8,9,10,11} With correction by a factor of 0.7, spinal fluid alcohol levels are equivalent to the more familiar blood alcohol levels. When this was done, 57% of the positive spinal fluid alcohols were above 0.10%. Of all the positive tests for alcohol (corrected spinal

Table 8. Body fluid alcohol test results

Age Group	Positive	Negative	No Test	Total
1-10	0	0	42	42
11-20	6	13	12	31
21-30	9	3	1	13
31-40	13	3	1	17
41-50	17	2	4	23
51-60	21	11	6	38
61-70	17	19	13	49
71-80	31	15	7	53
81+	6	9	5	20
	<u>120</u>	<u>75</u>	<u>91</u>	<u>286</u>

fluid and blood), 57% were above the 0.10% level, and 46% above the 0.16% level.

Analysis of Pedestrian Injuries

Fifty-four pedestrian fatalities were excluded from this part of the study for a variety of reasons. In 13 cases, for example, in which the victim had been struck by two or more vehicles, it could not be ascertained which vehicle had produced the fatal injury. Twelve pedestrians crushed against a wall or tree or against parked cars were excluded for the same reason. Eight persons who had been kneeling or lying in the road when struck, and eight who fell from or beneath a vehicle, were also excluded. Other cases not analyzed here are three persons struck and thrown into parked cars or a tree; three who ran into the sides of trucks; two who leaped in front of cars; two struck by cars which were backing up; one who was pushing a handcart; one who was in a wheelchair; and one struck while leaving a vehicle.

Table 9. Positive tests for alcohol in body fluids

Test Combination	Blood	Spinal Fluid	Urine
Alone	13	53	1
With Stomach Contents	2	12	
With Urine	2	17	
With Stomach Contents and Urine	4	16	
	<u>21</u>	<u>98</u>	<u>1</u>

Table 10. Body fluid alcohol levels of pedestrian fatalities

Type of Test	Alcohol Content* of Body Fluid											Total Cases
	.01-.05	.06-.10	.11-.15	.16-.20	.21-.25	.26-.30	.31-.35	.36-.40	.41-.45	.46-.50	.51-.55	
Blood	10		1	3	4	2	1					21
Spinal Fluid	36	5	9	11	12	9	5	4	4	2	1	98
Spinal Fluid Corrected (× 0.7)	37	5	10	16	13	6	4	5	1	1		
Urine		1										<u>1</u>
												<u>120</u>

* Percent by weight

Over half of the pedestrians killed were dead at the scene of the accident or on arrival at the hospital (Table 11). Three out of ten died within 24 hours of admission to the hospital. Only 15% of those who subsequently died had lived for more than 24 hours.

For statistical purposes, the body was divided into seven areas: head, neck, thorax, abdomen, pelvis, upper and lower extremities. Outright fatal injuries, those not compatible with life, are shown in Table 12 and Chart 4. Severe or life-threatening injuries, i.e., bone fractures, significant abdominal or thoracic hemorrhage, rupture or laceration of a viscus, extensive lacerations, abrasions, contusions, and significant hematomas, were tabulated separately. Minor injuries such as smaller lacerations, minor abrasions, contusions, and small hematomas were not tabulated.

Pedestrian fatal injuries, that is, those incompatible with life, were found to involve only one body area in 43% of the victims. In about half of the 232 pedestrian fatalities, however, more than one body area was "fatally" injured. Two body areas with fatal injuries were found in 27% of the victims; three body areas were involved in 8%, and four body areas in 3% (Table 12). The 25 victims (11%) in the category of "clinical deaths" were moderately to seriously injured; they lived for some time after the accident, usually days, a week, or longer, but later died of "complications." Pneumonia, pulmonary emboli or edema, peritonitis, brain necrosis, renal thrombi, or gangrene were usually listed, either separately or in combination, as cause of death. Of these 25 individuals, 22 were over fifty-eight years of age. The cause of death was not known in 8% of the 232 fatalities.

Table 11. Interval between accident and death

Time of Death	Fatalities	
	No.	%
At scene or on arrival at hospital	127	55
Within 3 hours of admission	33	14
3-24 hours after admission	38	16
More than 24 hours after admission	34	15
	<u>232</u>	<u>100</u>

Specific fatal injuries are known for 187 of the victims. The head, the single body area involved more often than any other, was fatally injured in 55% of the 187 victims. Of these 103 individuals, over half (54%) had a fatal injury only in the head. The neck and thorax were each involved in 42% of fatal injuries. Neck injuries were usually found above the third cervical level. Fatal abdominal injuries were found in 20% of the victims, and fatal pelvic injuries in 5%. No fatal injuries were found involving only the upper and/or lower extremities or only the pelvis (Table 12, Chart 4).

From a review of the available police photographs, it appears that in many instances the head is traumatized when the pedestrian strikes the roadway rather than by contact with the car. The relatively high frequency of

Table 12. Locations of fatal injuries in pedestrians

Body Areas	No.	Body Areas	No.
Head	56	Neck	25
Head Neck	14	Neck Thorax	18
Head Thorax	8	Neck Abdomen	3
Head Abdomen	2	Neck Pelvis	1
Head Pelvis	1	Neck Thorax Abdomen	3
Head Neck Thorax	7		50
Head Neck Thorax Abdomen	4		
Head Neck Thorax Pelvis	2	Thorax	16
Head Neck Abdomen	2	Thorax Abdomen	11
Head Thorax Abdomen	6	Thorax Abdomen Pelvis	1
Head Thorax Pelvis	1	Thorax Pelvis	1
	<hr/> 103		<hr/> 29
Abdomen	3	Clinical Deaths	25
Abdomen Pelvis	2	Unknown Cause	20
	<hr/> 5	Total	<hr/> 232

fractures (found in 42% of 187 victims) is also surprising. It is believed that the neck is fractured by hyperextension or by forceful sideward bending. One-third of the victims with only cervical vertebrae fractures as the cause of death were children under eleven years of age. In an Australian study, 13% of the pedestrians died of head injuries alone, and none of those killed had neck injuries.¹²

As indicated in Table 12 and Chart 4, a variety of body area combinations sustained fatal injuries. The combination of neck and thorax occurred more than any other grouping. The head-neck and thorax-abdomen combinations were found less often.

Of the 306 body areas with fatal injuries (some victims had as many as four), 206 (67%) of them in combination with other areas, one-third were in the head area, one-fourth in the neck, and one-fourth in the thorax. Abdominal and pelvic injuries were found less often (Chart 5). The low frequency of involvement of the abdomen and pelvis may, in part, reflect the facts that not all victims underwent autopsy and that these areas, although exposed to direct impact, were not traumatized sufficiently to cause fatal injuries.

When body areas with fatal and severe injuries were tabulated, a total of 639 areas was found with significant injuries (Chart 6). The multiply injured pedestrian is the rule rather than the exception: 78% of all victims had severe injuries in two or more body areas, including 12% involving five or six body areas. In McCarroll's New York City study,¹³ 80% of the pedestrian fatalities had significant injuries in two or more body areas. Of all 639 body areas injured, one-fifth of the injuries were to the head (22%) and one-fifth to the lower extremities (21%). The thorax (16%), pelvis (14%), and abdomen (10%) were less frequently injured. McCarroll found a higher frequency of serious injuries in these areas, between 42% and 49%.¹³ Neck injuries accounted for 12% of all body areas injured. Infrequently, the upper extremities were involved (Chart 7).

Chart 4. Locations of fatal pedestrian injuries

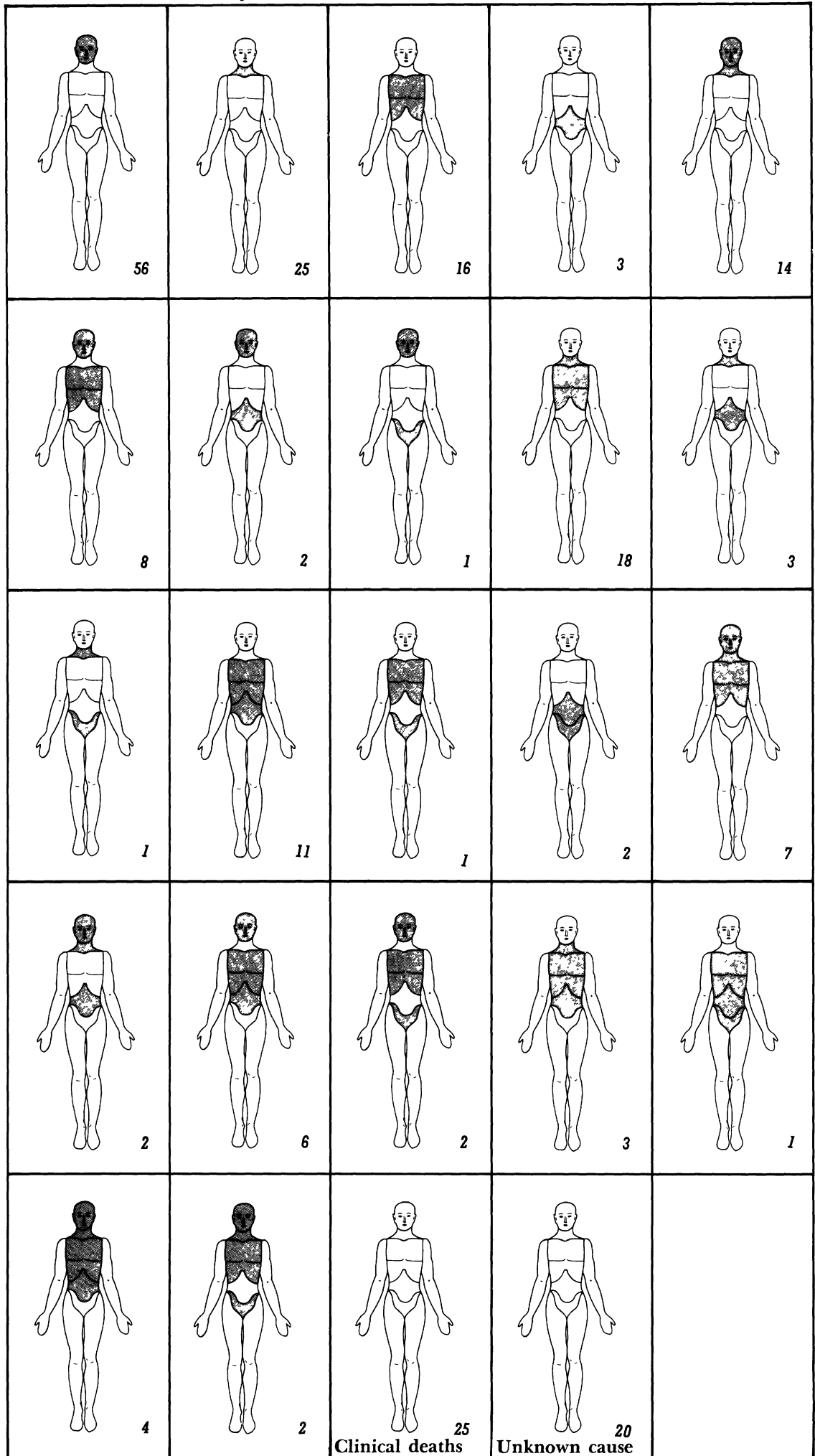


Chart 5. Area distribution of fatal injuries in 187 pedestrians (306 body areas)

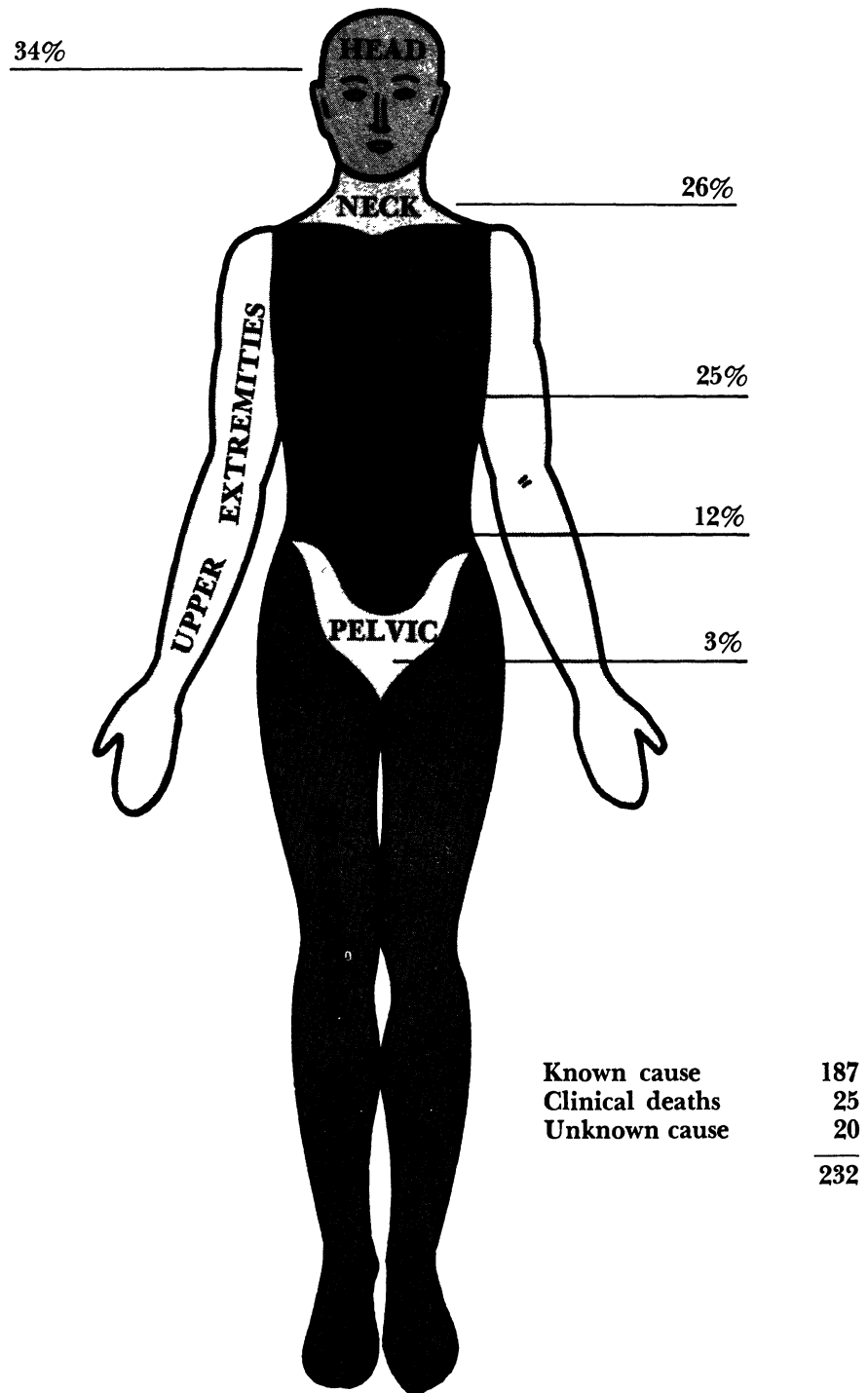


Chart 6. Locations of serious and fatal injuries

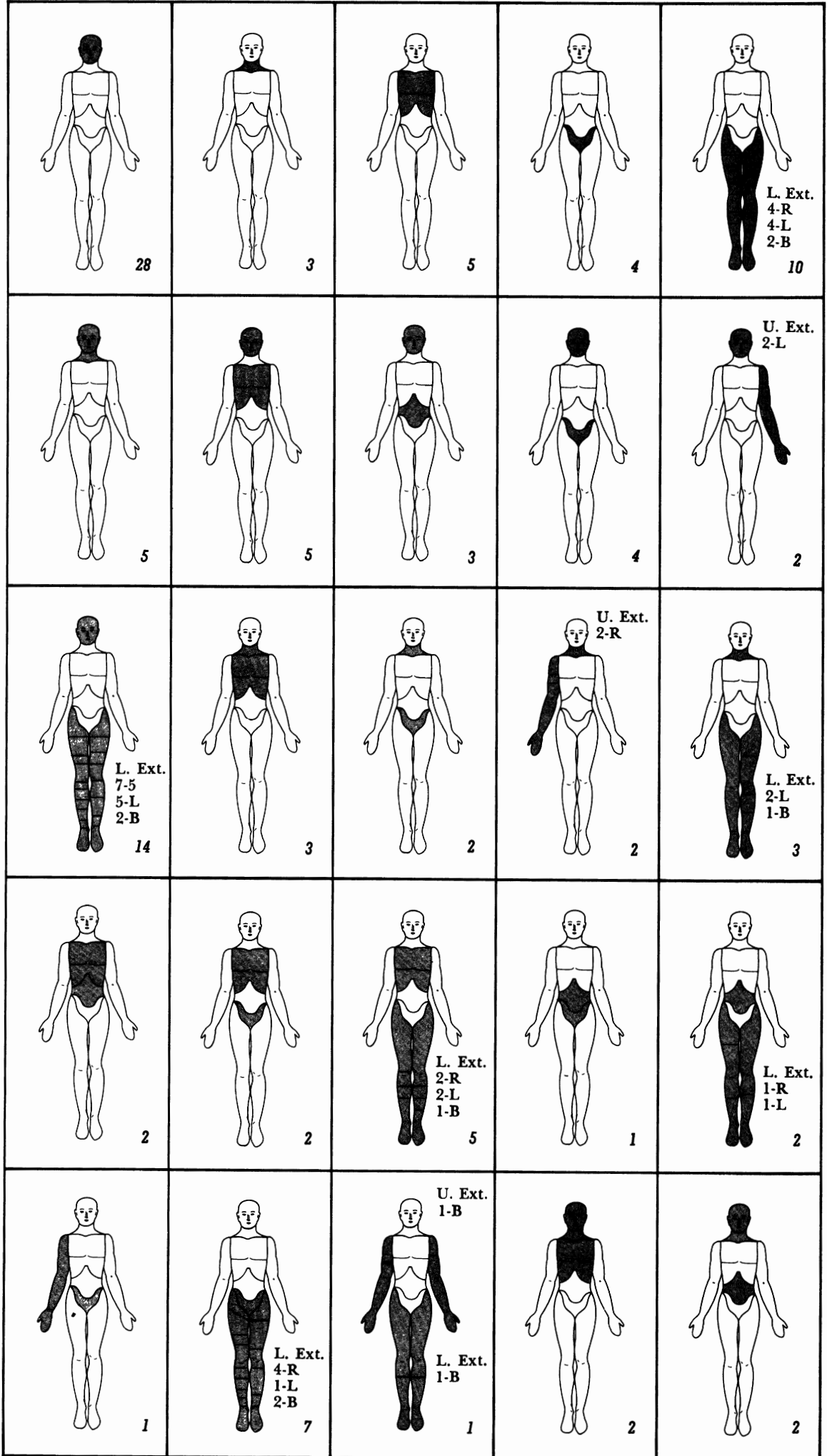


Chart 6 (continued)

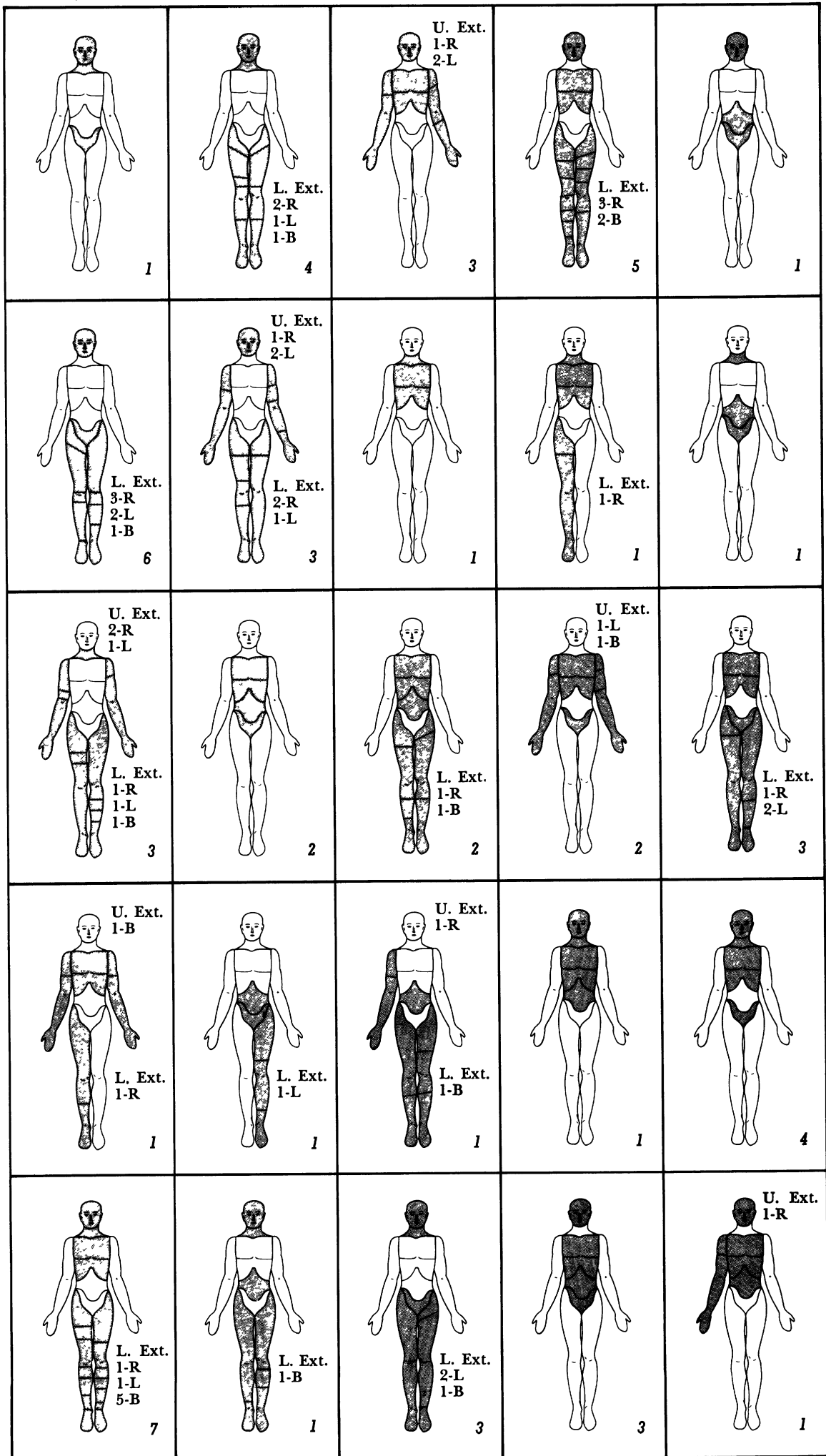
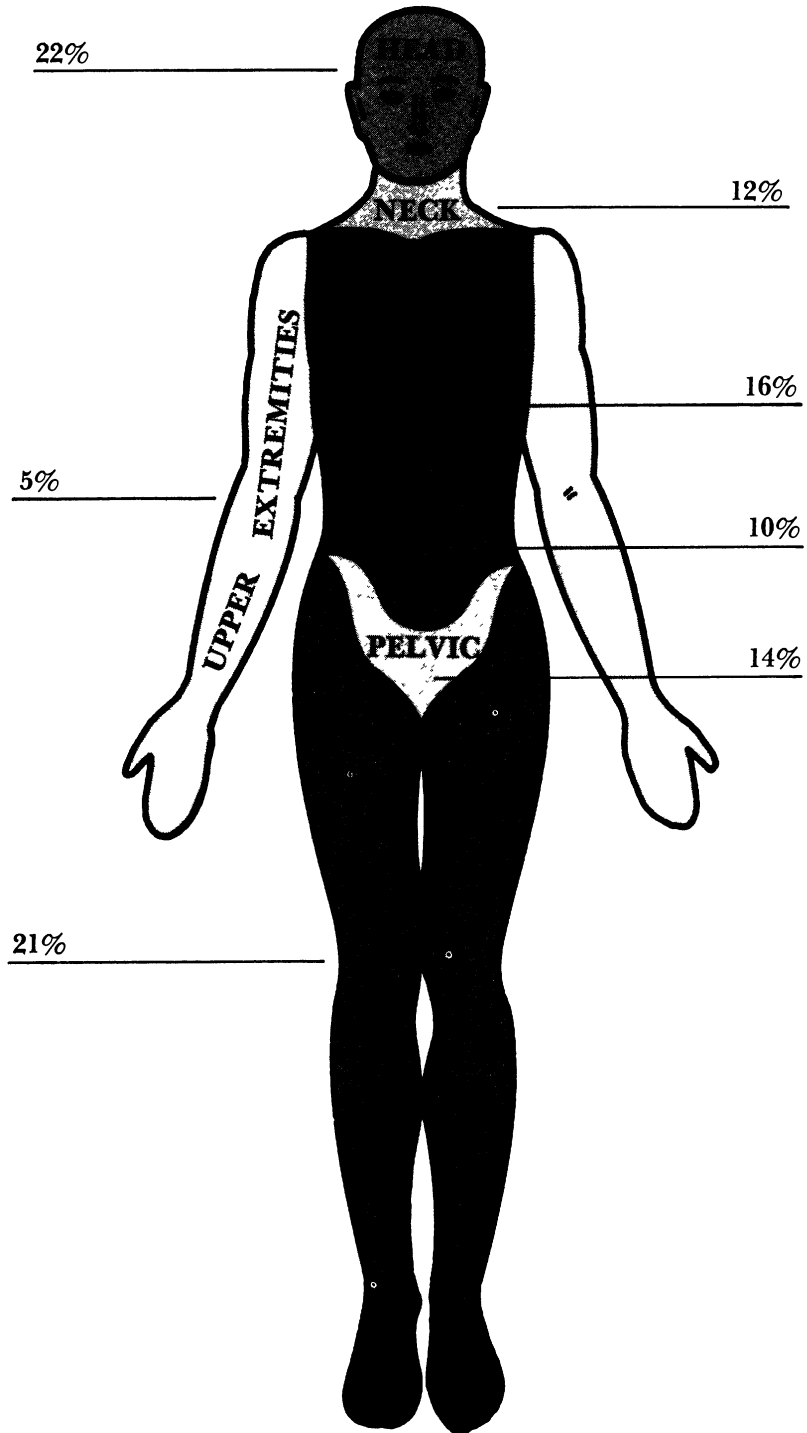


Chart 6 (continued)

<p>L. Ext. 1-L 3-B 4</p>	<p>L. Ext. 1-R 1-L 2</p>	<p>U. Ext. 1-L 1</p>	<p>L. Ext. 1-R 1-B 2</p>	<p>L. Ext. 1-L 1-B 2</p>
<p>L. Ext. 1-L 1-B 2</p>	<p>L. Ext. 1-R 1-B 2</p>	<p>U. Ext. 2-R L. Ext. 1-R 1-B 2</p>	<p>U. Ext. 1-R L. Ext. 1-B 1</p>	<p>L. Ext. 1-R 2-B 3</p>
<p>L. Ext. 1-L 2-B 2</p>	<p>L. Ext. 1-R 1-B 2</p>	<p>L. Ext. 2-B 2</p>	<p>L. Ext. 2-R 1-L 1-B 4</p>	<p>L. Ext. 1-L 1-B 2</p>
<p>L. Ext. 2-R 1-L 1-B 4</p>	<p>U. Ext. 1-R 1-B L. Ext. 1-R 1-B 2</p>	<p>L. Ext. 1-B 1</p>	<p>U. Ext. 1-R 1-L L. Ext. 2-B 2</p>	<p>U. Ext. 1-R 2-L L. Ext. 2-R 1-B 3</p>
<p>U. Ext. 1-R L. Ext. 4-B 4</p>	<p>U. Ext. 3-R 1-L L. Ext. 1-R 3-4 4</p>	<p>Unknown 1</p>		

Chart 7. Area distribution of all serious and fatal injuries (639 body areas)



Remarks

It has been indicated previously that certain design features of the vehicle—hood ornaments, fender protrusions over the headlights, bumpers, tail fins, etc.—have been specific impact areas causing fatal injuries.¹⁴ Using the police photographs and the injury descriptions of the victims involved, such specific items could not be identified in this study, which involved a cross-section of various vehicle types, front end designs, and vehicle speeds. Thus we agree with McCarroll that “in most cases no specific feature of external automotive design can be incriminated as the direct agent of injury.”¹³

From the police photographs (see Appendix), it is obvious that the pedestrians contact not only the front of the car but also, at times, the top of the hood, windshield, and parts of the windshield frame. In addition, striking the road surface should be considered one of the prime sources of fatal injuries. That pedestrians can and do strike the various front end structures and that pavement contact is extremely violent have been clearly shown in experimental car-pedestrian (anthropomorphic dummy) impacts by Severy and Brink.¹⁵ The high frequency of violent road impact suggests that change in the exterior design of vehicles cannot be expected to be a high-payoff area for the reduction of pedestrian fatalities.

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Appendix

This section contains 58 capsule case descriptions indicating each accident situation, vehicle type, police estimated vehicle speed, and the fatal injuries of pedestrians. These cases were chosen on one basis only: Police photographs were available and of sufficient clarity for reproduction. Arrows were placed on certain photographs to indicate pedestrian contact areas on the vehicle.

Figure 1. A 1963 Ford, traveling at a police estimated speed of 35 mph, hit a 65-year-old male who was crossing a two-lane rural roadway (8 p.m., October). The pedestrian died at the scene of multiple fractures of the head, neck, chest, pelvis, and legs (no autopsy). Blood alcohol was 0.22%.
(Case # 89/66)



Figure 2. A 1965 VW microbus struck a 57-year-old female who walked into the left corner of the vehicle as she crossed a three-lane street against the traffic signal (9 p.m., December). She died at the scene of a compound skull fracture (no autopsy). Spinal fluid alcohol was 0.24%.
(Case # 103/66)



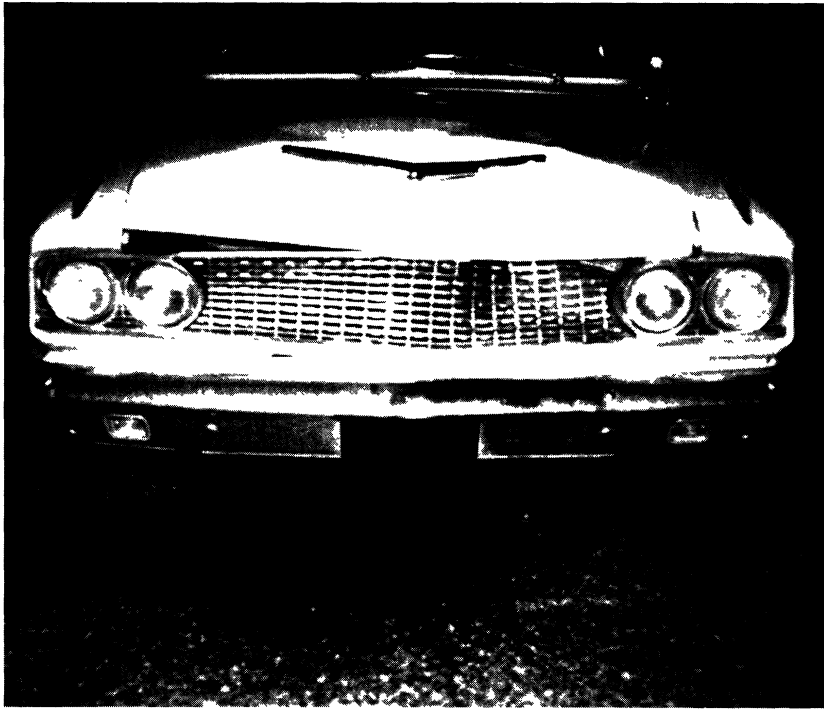


Figure 3. A 1963 Ford struck a 77-year-old male who was crossing a six-lane boulevard in the middle of the block (10 p.m., November). The pedestrian was dead on arrival at the hospital. He died of crushing injuries to the thorax and pelvis (no autopsy). Blood alcohol was 0.05%. (Case # 98/66)

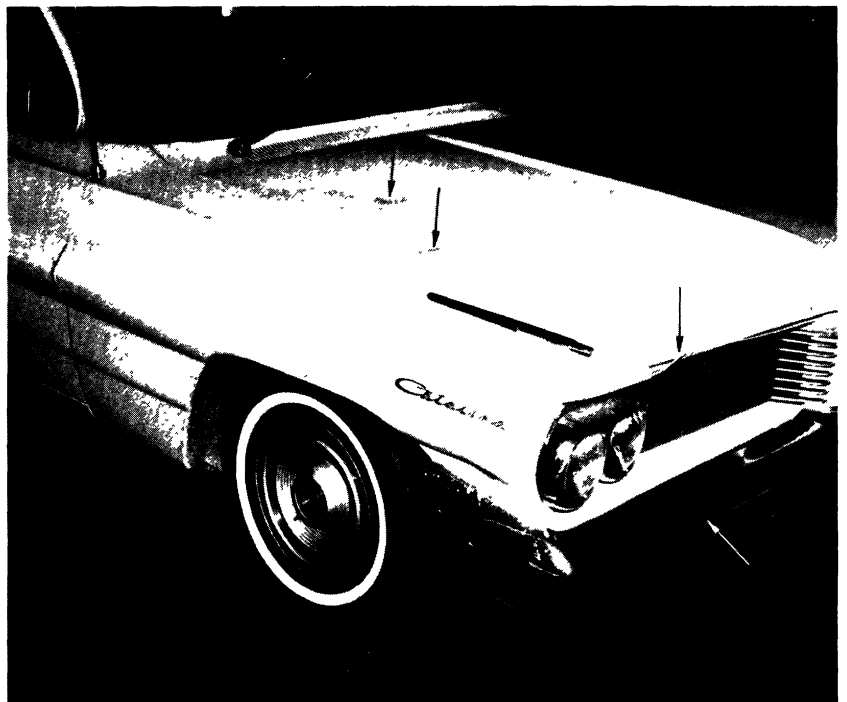


Figure 4. A 1965 Oldsmobile, traveling at a police estimated speed of 30 to 35 mph, struck a 67-year-old female who was crossing a two-lane street outside the crosswalk (12 a.m., May). The pedestrian was dead on arrival at the hospital. She died of a crushed chest and aortic lacerations. Spinal fluid alcohol was 0.23%. (Case # 44/66)

Figure 5. A 1962 Chevrolet, traveling at a police estimated speed of 40 to 50 mph, hit a 68-year-old male who was crossing a four-lane avenue in the crosswalk with no control present (1 a.m., April). The pedestrian was dead on arrival at the hospital. He died of multiple crushing injuries to the head, neck, pelvis, and extremities. Blood alcohol was 0.25%.
(Case # 41/66)



Figure 6 (note arrows). A 1962 Pontiac, traveling at a police estimated speed of 40 to 45 mph, hit a 34-year-old female who was crossing a six-lane avenue in the crosswalk with no control present (3 a.m., May). The pedestrian was dead on arrival at the hospital. She died of crushing injuries to the head, neck, chest, and abdomen. Spinal fluid alcohol was 0.18%.
(Case # 44/65)



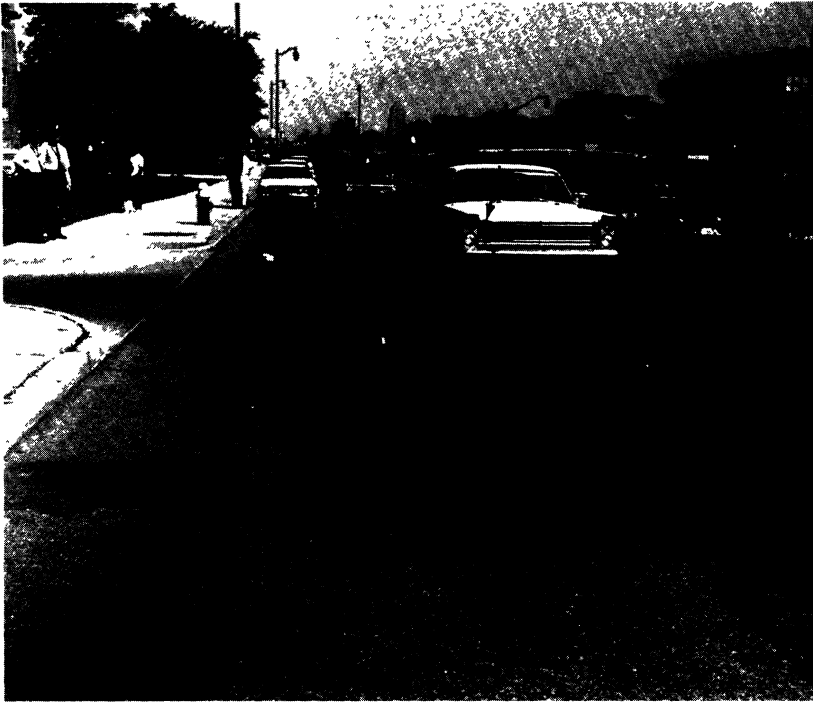


Figure 7 (note arrows). A 1965 Ford, traveling at a police estimated speed of 30 mph, hit a 4-year-old boy who darted out from between parked cars in the middle of the block (9 a.m., May). The pedestrian was dead on arrival at the hospital. He died of multiple fractures of the head, neck, and lower extremities (no autopsy). (Case # 48/65)



Figure 8 (note arrows). A 1963 Chevrolet, traveling at a police estimated speed of 40 to 45 mph, hit a 13-year-old boy who ran from behind parked cars in the middle of the block (8 a.m., July). He died of a skull fracture and intracranial injury. (Case # 69/65)

Figure 9. A 1965 Ford, traveling at a police estimated speed of 35 mph, hit a 73-year-old female who was crossing a two-lane street in the middle of the block (8 p.m., November). The pedestrian was dead on arrival at the hospital. She sustained fractures of the head, neck, chest, and knee (no autopsy). (Case # 102/65)

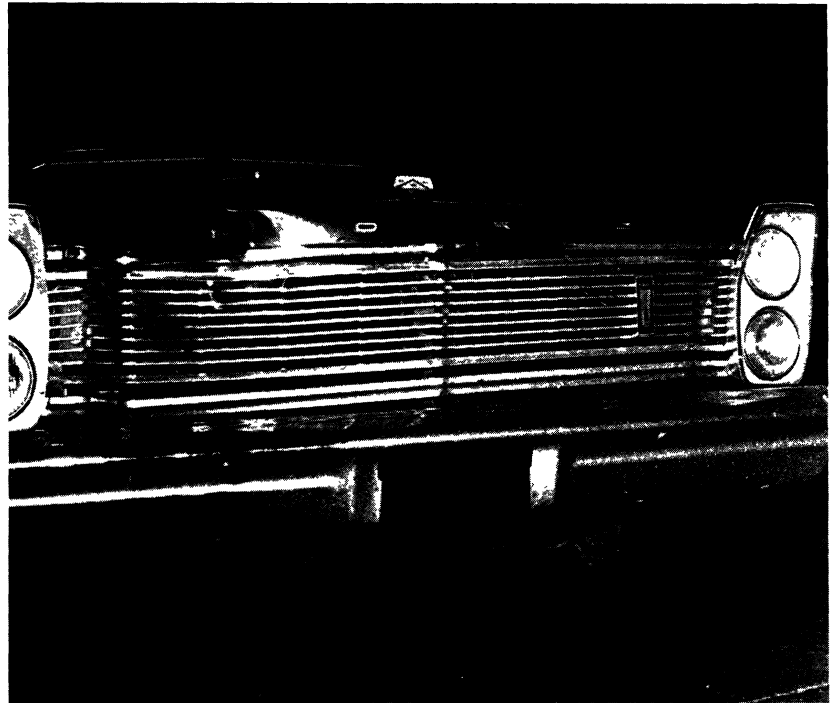


Figure 10. A 1965 Pontiac, traveling at a police estimated speed of 35 mph, hit a 45-year-old male who was crossing an eight-lane boulevard outside the crosswalk (9 p.m., July). The pedestrian was dead on arrival at the hospital. He died of multiple fractures of the head, chest, and lower extremities (no autopsy). Spinal fluid alcohol was 0.35%. The driver tried to avoid hitting the pedestrian by cutting sharply to the left, but the right fender struck him. (Case # 72/65)



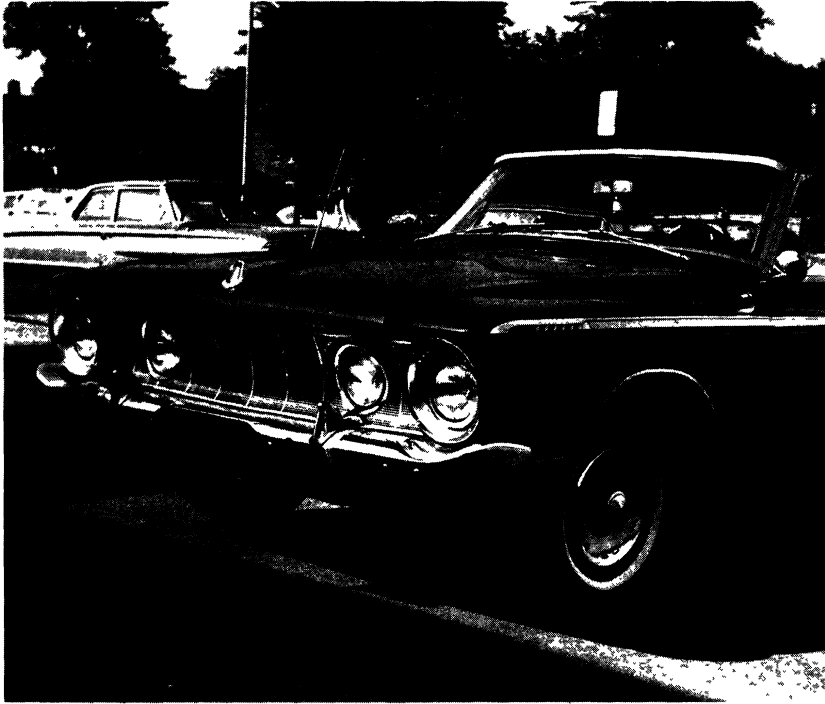


Figure 11 (note arrows). A 1962 Plymouth, traveling at a police estimated speed of 30 mph, hit a 5-year-old girl who ran from between parked cars in the middle of the block (3 p.m., June). The pedestrian was dead on arrival at the hospital. She died of fracture dislocation of the cervical spine with transection of the spinal cord. Note the remnants of an ice cream cone covering headlights of the car. (Case # 57/65)



Figure 12. A 1963 Chevrolet, traveling at a police estimated speed of 35 mph, hit a 50-year-old female who was crossing an eight-lane boulevard walking against a red blinker light (1 a.m., September). The pedestrian died four hours after impact. She died of skull, pelvic, and femoral fractures and had contusions of lungs and abdomen. Spinal fluid alcohol was 0.04%. (Case # 91/65)

Figure 13 (note arrows). A 1964 Buick, traveling at a police estimated speed of 25 mph, hit a 79-year old male wearing dark clothing who was crossing a two-lane street in the middle of the block (8 p.m., October). The pedestrian was dead on arrival at the hospital. He died of crushing injuries to the head, neck, and chest, and lacerations of the brain and lungs. Note the broken radio antenna, indicating body contact.
(Case # 96/65)

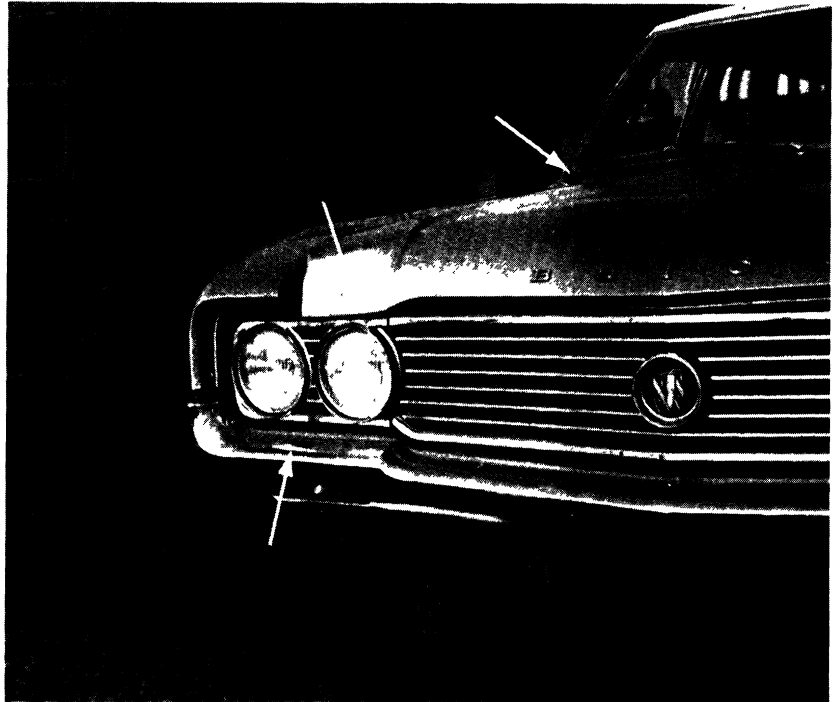


Figure 14 (note arrows). A 1960 Pontiac, traveling at a police estimated speed of 40 mph, hit a 57-year-old female who was crossing a four-lane avenue in the middle of the block (7 p.m., November). The pedestrian was dead on arrival at the hospital. She died of multiple fractures of the skull, cervical spine, pelvis, and lower extremities (no autopsy). Blood alcohol was 0.18%. Note broken windshield from pedestrian contact.
(Case # 107/65)

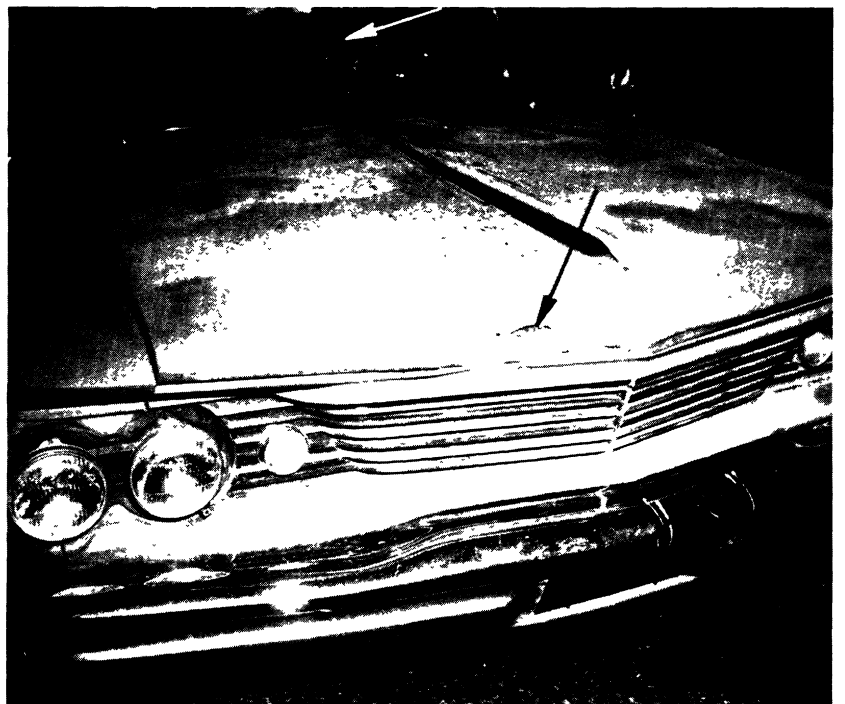




Figure 15. A 1960 Ford, traveling at a police estimated speed of 30 mph, hit a 68-year-old female who was crossing a six-lane boulevard diagonally at the intersection (7 p.m., February). The pedestrian was dead on arrival at the hospital. She died of basilar skull fracture and intracranial injury (no autopsy).

(Case # 16/66)

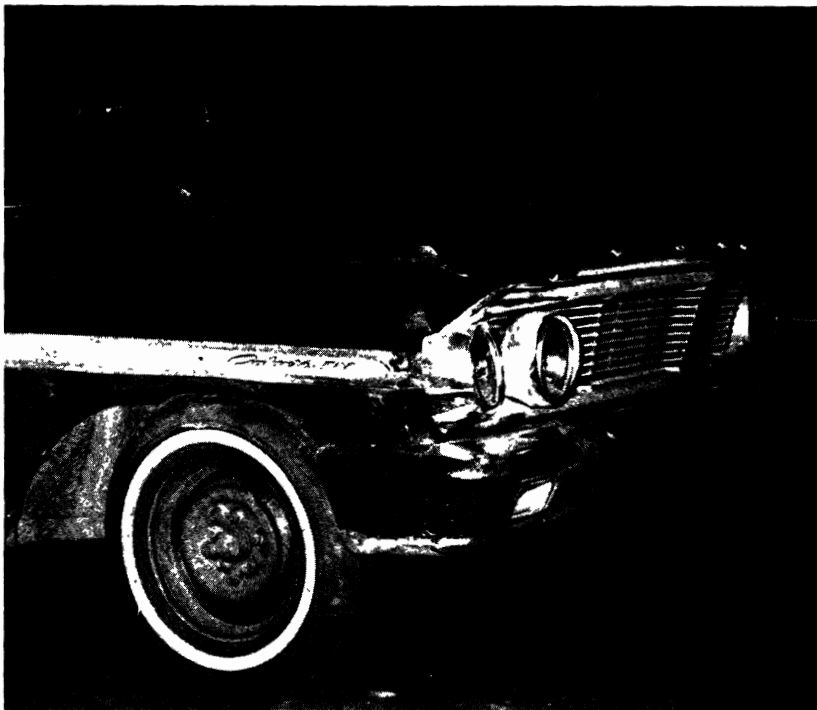


Figure 16. A 1964 Ford, traveling at a police estimated speed of 65 mph, hit an 8-year-old boy who was running across an expressway (7 p.m., February). He died at the scene of multiple fractures of the cervical vertebrae, humerus, femur, tibia, and fibula, and had severe intra-abdominal injuries (no autopsy).

(Case # 18/66)

Figure 17. A 1961 Chevrolet, traveling at a police estimated speed of 25 mph, hit a 65-year-old male who was crossing a two-lane street at an unmarked intersection (6 a.m., March). The pedestrian died seven hours after impact of multiple fractures of the ribs, shoulder, pelvis, and tibia, and of severe intra-abdominal injuries.
(Case # 19/66)

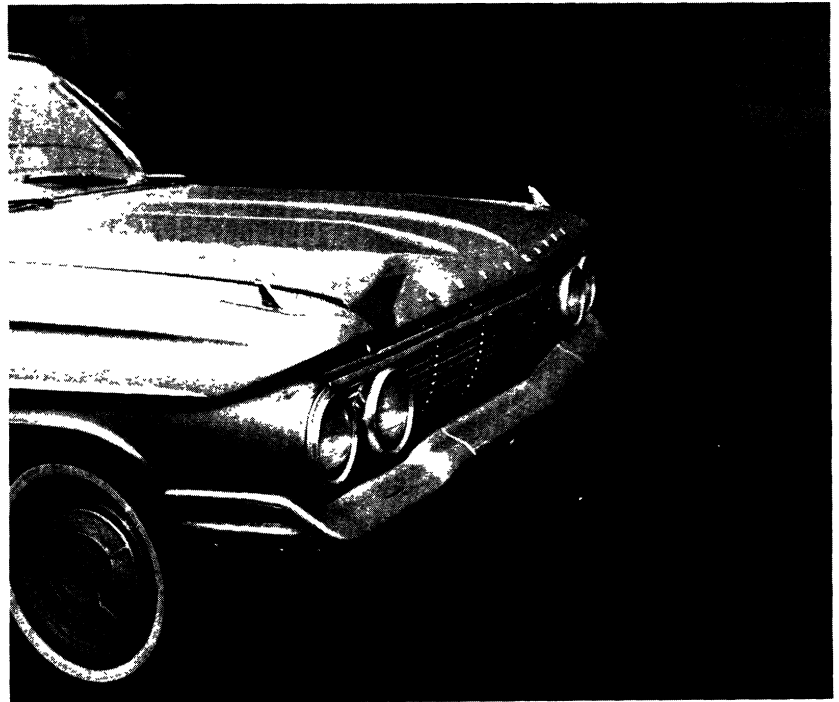


Figure 18. A 1964 Pontiac, traveling at a police estimated speed of 35 mph, hit a 74-year-old male who was crossing a six-lane avenue in the middle of the block (3 a.m., August). The pedestrian died at the scene, having sustained multiple thoracic and abdominal injuries (no autopsy). Spinal fluid alcohol was 0.17%.
(Case # 68/66)

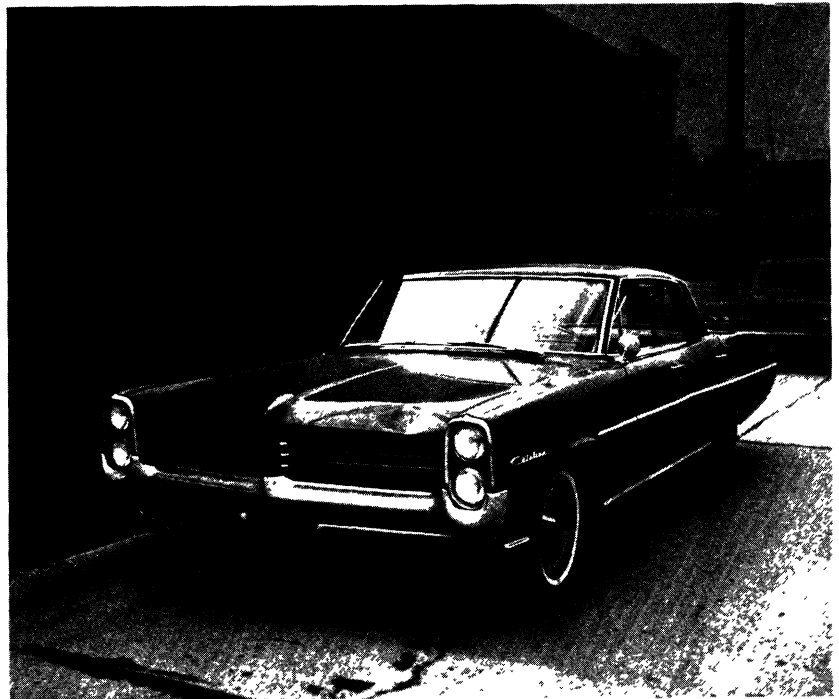




Figure 19. A 1962 Corvair, traveling at a police estimated speed of 35 mph, hit a 15-year-old girl who was crossing an eight-lane boulevard in the crosswalk with the traffic signal (9 p.m., May). She died 34 hours after impact of contusions of the brain and left lung, a skull fracture, and intracranial hemorrhage.

(Case # 42/66)



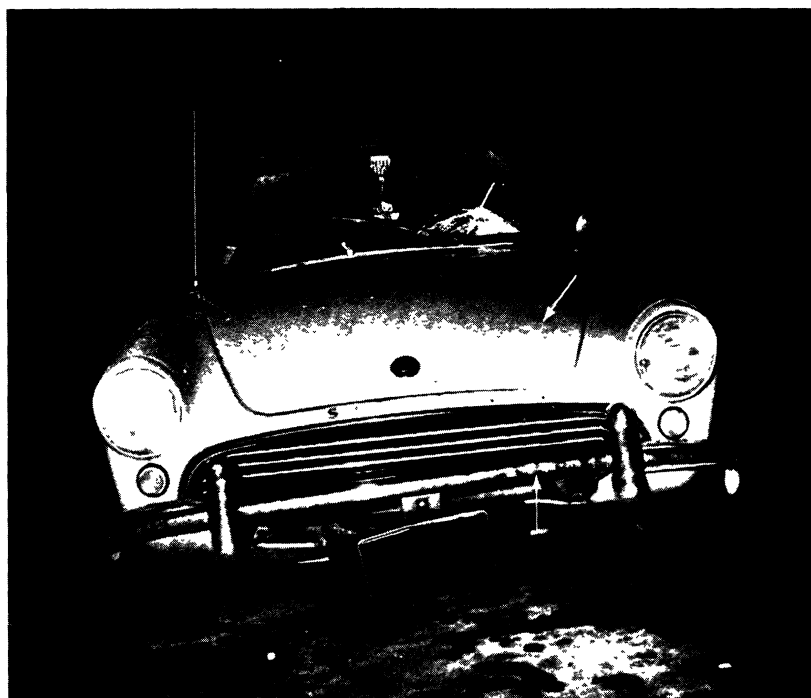
Figure 20. A 1964 Chevrolet, traveling at a police estimated speed of 60 mph, hit a 60-year-old male who was crossing a three-lane street at an unmarked intersection (3 a.m., April). He died at the scene of multiple fractures of head, neck, ribs, pelvis, and lower extremities. Note broken windshield from pedestrian contact.

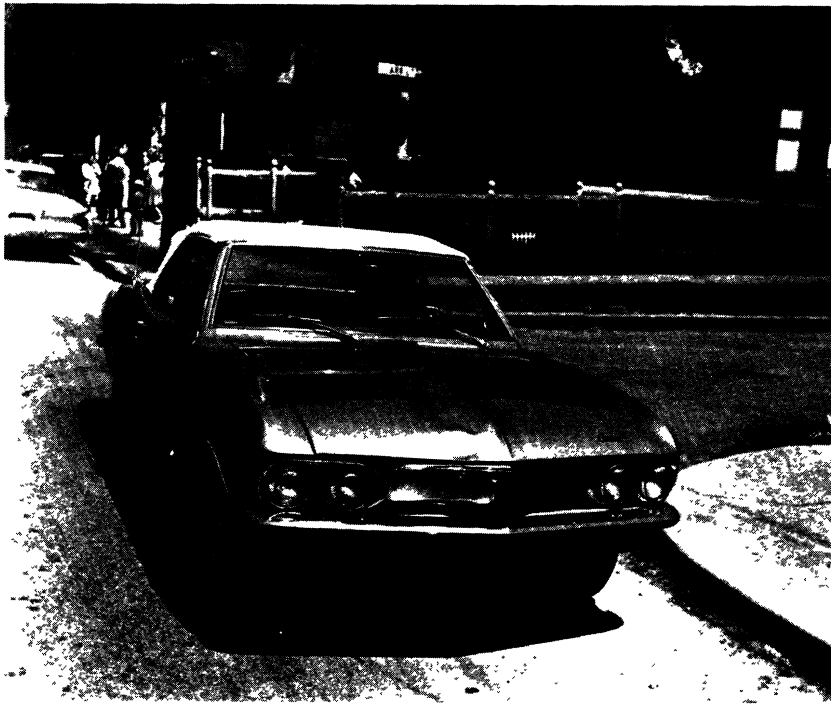
(Case # 39/65)

Figure 21 (note arrows). A 1959 Pontiac, traveling at a police estimated speed of 30 mph, hit a 74-year-old male who was crossing a six-lane boulevard in the crosswalk with the traffic signal (10 p.m., May). The pedestrian was dead on arrival at the hospital. He died of multiple fractures of the cervical vertebrae, right shoulder, right pelvis, and right leg; he sustained a tear of the aorta and pulmonary arteries. Spinal fluid alcohol was 0.04%.
(Case # 45/65)



Figure 22 (note arrows). A 1963 Sunbeam, traveling at a police estimated speed of 30 mph, hit a 65-year-old female who was crossing a six-lane boulevard in the crosswalk with no control present (6 p.m., December). The pedestrian was dead on arrival at the hospital. She died of fracture dislocation of the upper cervical spine with transection of the spinal cord.
(Case # 117/65)





Figures 23 & 24. A 1965 Corvair, traveling at a police estimated speed of 35 mph, hit a 4-year-old girl who ran from a fenced-in playground between parked cars and into the line of traffic (10 a.m., May). She died at the scene of multiple fractures of the skull and left ribs, dislocation of the cervical spine, and intrapulmonary hemorrhage.
(Case # 51/65)



Figure 25. A 1956 Ford, traveling at a police estimated speed of 30 mph, hit a 10-year-old boy who was crossing a seven-lane boulevard in the crosswalk. After reaching the center of the roadway, the boy turned and ran back (5 p.m., January). He died one hour after impact of a fracture dislocation of the cervical spine (no autopsy). (Case # 1/65)

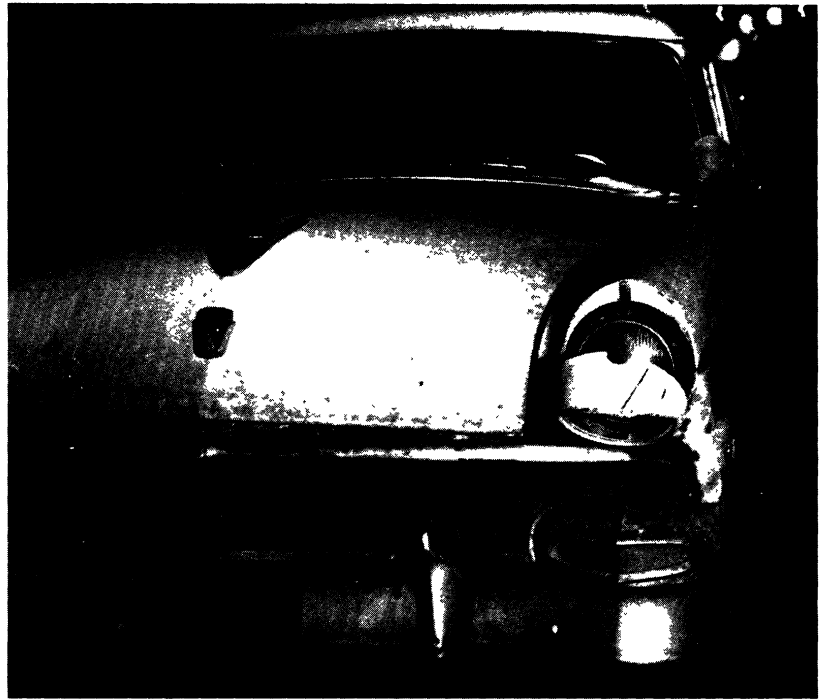


Figure 26. A 1958 Oldsmobile, traveling at a police estimated speed of 10 mph, hit an 80-year-old male who was crossing a six-lane boulevard in the crosswalk with the traffic signal (8 a.m., January). The pedestrian died four days and nine hours after impact of a brain contusion and skull fracture. (Case # 8/65)



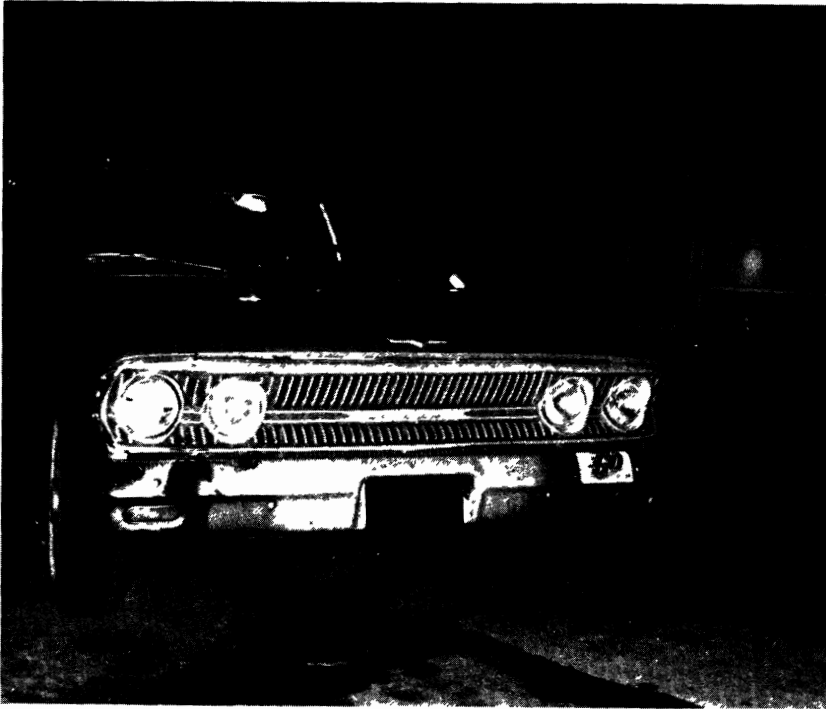


Figure 27. A 1963 Rambler, traveling at a police estimated speed of 40 mph, ran a red stop light and hit a 64-year-old female who was crossing a four-lane avenue in the crosswalk with the traffic signal (9 p.m., February). The pedestrian was dead on arrival at the hospital. She died of multiple fractures of the skull, cervical vertebrae, and legs, and had contusions of the brain.

(Case # 10/65)

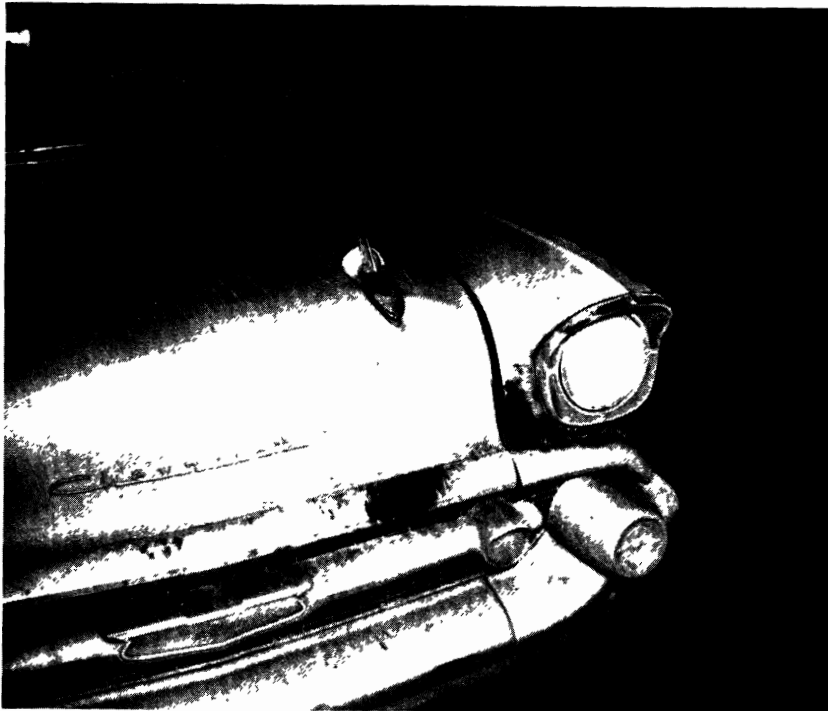


Figure 28. A 1957 Chevrolet, traveling at a police estimated speed of 20 mph, hit a 78-year-old male who was crossing an eight-lane boulevard against the traffic signal (12 a.m., February). The pedestrian died three hours post impact of multiple crushing injuries of the chest and neck. Spinal fluid alcohol was 0.18%.

(Case # 11/65)

Figure 29. A 1964 Pontiac, traveling at a police estimated speed of 60 mph, hit a 17-year-old female crossing an eight-lane boulevard with the traffic signal (4 p.m., February). The pedestrian was dead on arrival at the hospital. She died of multiple fractures and crushing injuries of the head, neck, thorax, pelvis, and lower extremities.
(Case # 18/65)

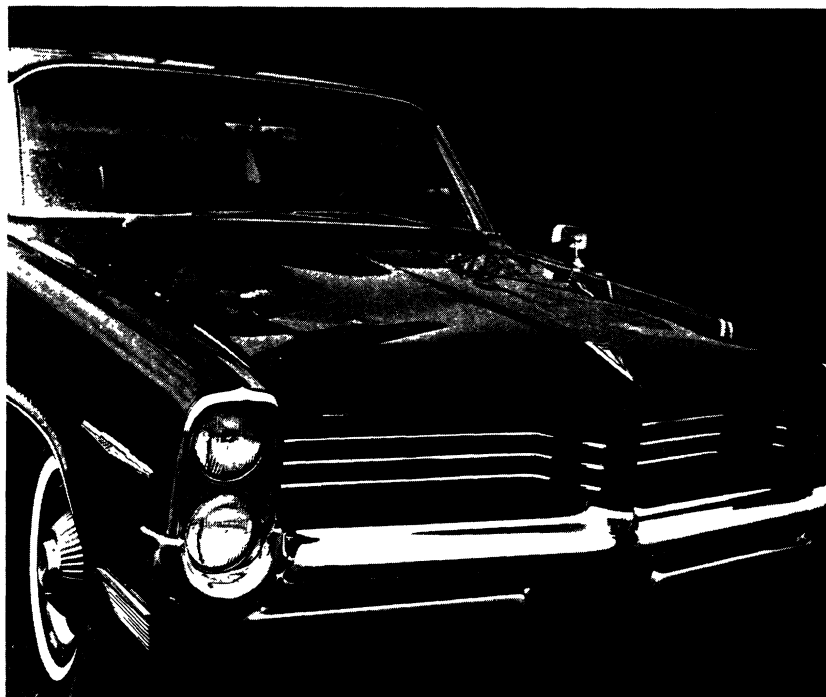


Figure 30. A 1958 Chevrolet, traveling at a police estimated speed of 25 mph, hit a 52-year-old male who was crossing an eight-lane boulevard outside the crosswalk (7 p.m., February). The pedestrian was dead on arrival at the hospital. He died of multiple fractures of the skull, cervical vertebrae, and legs, and had a laceration of the left kidney.
(Case # 20/65)





Figure 31 (note arrows). A 1961 Chevrolet, traveling at a police estimated speed of 40 mph, hit a 52-year-old female who was walking with traffic in a two-lane street because of heavy unshoveled snow on the sidewalk (6 a.m., March). The pedestrian was dead on arrival at the hospital. She died of crushing injuries to the neck, chest, pelvis, and leg, and had a laceration of the right lung. (Case # 22/65)



Figure 32. A 1960 Dodge, traveling at a police estimated speed of 10 mph, ran over a 58-year-old male who was walking on the sidewalk at an entrance to a parking lot (11 p.m., March). The pedestrian died one hour after impact of a fracture of the cervical spine with transection of the spinal cord. No pedestrian contact marks were found on the front of the car. Spinal fluid alcohol was 0.39%. (Case # 26/65)

Figure 33. A 1960 Falcon, traveling at a police estimated speed of 35 mph, hit a 6-year-old girl who was on a sidewalk on her way home from school (3 p.m., March). The child died nine hours after impact of a subdural hematoma and brain contusion. After striking the child the car struck a parked vehicle, obliterating any pedestrian contact marks.

(Case # 29/65)



Figure 34. A 1958 Plymouth, traveling at a police estimated speed of 25 mph, hit a 76-year-old female who was crossing a four-lane avenue in the middle of the block (8 p.m., April). The pedestrian was dead on arrival at the hospital. She sustained fractures of the arms, legs, and ankles (no autopsy). Spinal fluid alcohol was 0.26%.

(Case # 31/65)



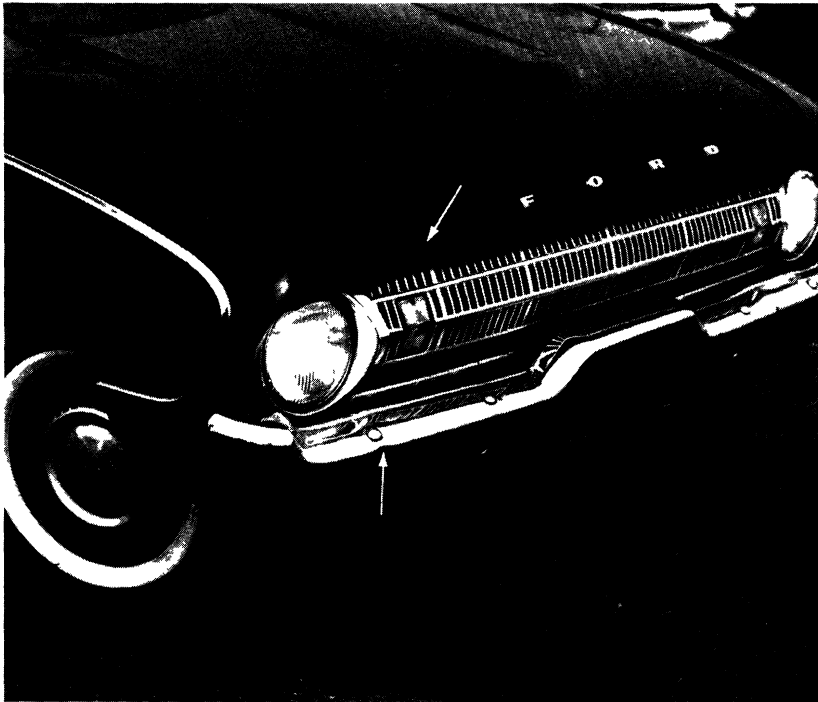


Figure 35 (note arrows). A 1961 Falcon, traveling at a police estimated speed of 40 mph, hit a 72-year-old male crossing a two-lane street in the middle of the block (9 p.m., May). The pedestrian died one hour after impact of fractures of the skull, torso, pelvis, and lower extremities.

(Case # 53/65)



Figure 36. A 1957 Plymouth, traveling at a police estimated speed of 40 mph, hit a 67-year-old female who was walking in the center of a four-lane avenue (12 a.m., June). The pedestrian was dead on arrival at the hospital. She died of open skull fracture and brain injury (no autopsy). Spinal fluid alcohol was 0.28%.

(Case # 58/65)

Figure 37 (note arrows). A 1962 Rambler, traveling at a police estimated speed of 40 mph, struck a 41-year-old female who was crossing an eight-lane boulevard outside the crosswalk (10 p.m., June). The pedestrian was dead on arrival at the hospital. She died of multiple fractures and crushing injuries, including fracture-dislocation of the cervical spine with laceration of the cervical cord. Spinal fluid alcohol was 0.17%.
(Case # 62/65)



Figure 38 (note arrows). A 1959 Oldsmobile, traveling at a police estimated speed of 25 mph, hit a 3-year-old boy who ran from between parked cars (5 p.m., July). The child was dragged by the car. He died at the scene of multiple fractures and internal thoracic injuries (no autopsy).
(Case # 63/65)





Figure 39 (note arrows). A 1965 Ford, traveling at a police estimated speed of 30 mph, hit a 47-year-old male who was crossing a four-lane avenue outside the crosswalk (10 p.m., July). The pedestrian died two hours after impact of shock and hemorrhage due to rupture of thoracic aorta, spleen, and urinary bladder. Spinal fluid alcohol was 0.29%. (Case # 64/65)

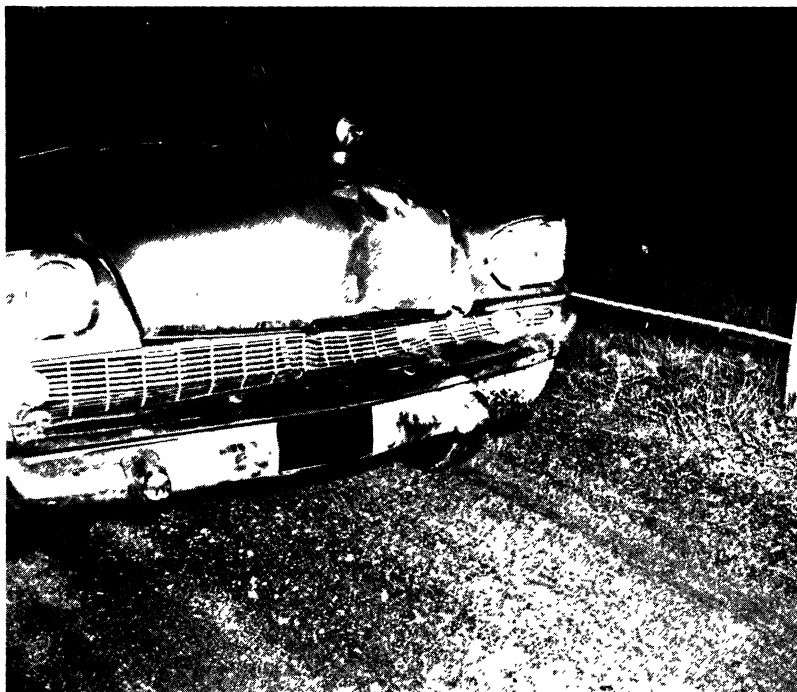


Figure 40. A 1958 Chrysler, traveling at a police estimated speed of 50 mph, hit a 34-year-old female who was running down the center of the expressway (11 p.m., July). The pedestrian was dead on arrival at the hospital. She died of fracture dislocation of the cervical spine with transection of the spinal cord. Blood alcohol was 0.28%. (Case # 66/65)

Figure 41. A 1964 Pontiac, traveling at a police estimated speed of 35 mph, hit a 13-year-old boy who was crossing a four-lane avenue in the middle of the block (1 p.m., August). The boy died at the scene of multiple fractures of the cervical vertebrae, humerus, tibia, and fibula, and had multiple intra-abdominal injuries (no autopsy). The boy was truck by the outer end of the front bumper and hit the right "A" pillar and windshield. (Case # 80/65)



Figure 42 (note arrows). A 1960 DeSoto, traveling at a police estimated speed of 45 mph, struck a 71-year-old male who was crossing a four-lane avenue in the middle of the block (4 p.m., October). He was dead on arrival at the hospital. He died of fracture-dislocation of the cervical spine with transection of the spinal cord. Spinal fluid alcohol was 0.19%. (Case # 101/65)





Figure 43. A 1959 Ford, traveling at a police estimated speed of 10 to 15 mph, made a left turn and hit a 58-year-old male who was crossing a three-lane street in the crosswalk with the traffic signal (8 p.m., September). He died 37 hours after impact of bronchopneumonia, having sustained pelvic fractures with severe pelvic hemorrhage.

(Case # 84/65)



Figure 44. A 1964 Plymouth, traveling at a police estimated speed of 30 mph, hit a 72-year-old male who was crossing a four-lane avenue in the crosswalk with no signal present (1 a.m., December). The pedestrian was dead on arrival at the hospital. He died of fracture of the skull with intracranial hemorrhage, and lacerations of the liver and kidneys. Spinal fluid alcohol was 0.22%.

(Case # 112/65)

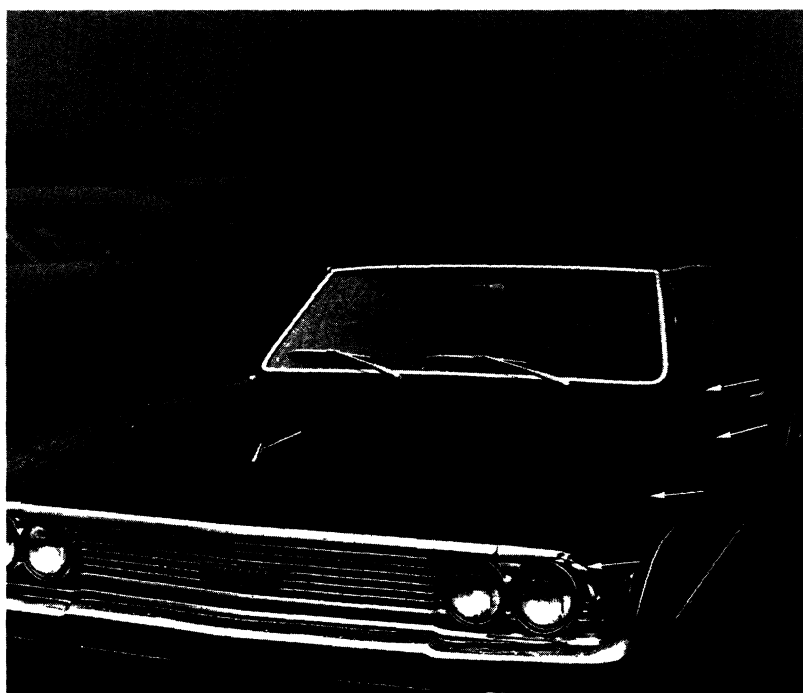
Figure 45 (note arrows). A 1965 Ford van truck, traveling at a police estimated speed of 25 mph, struck two boys, seven and eleven years old, who were crossing a two-lane street in the crosswalk with no signal present (7 p.m., December). The 11-year-old died on arrival at the hospital. He sustained an open fracture of the skull and brain contusions. The 7-year-old died three hours after impact of skull, neck, and rib fractures (no autopsy).

(Case # 119/65, 120/65)



Figure 46 (note arrows). A 1966 Chevrolet, traveling at a police estimated speed of 60+ mph, hit a 29-year-old male who was running across a four-lane avenue in mid-block (9 p.m., December). The pedestrian died three hours after impact of compound comminuted fractures of the face and skull, brain hemorrhage, and multiple lacerations of the liver. Spinal fluid alcohol was 0.22%.

(Case # 122/65)



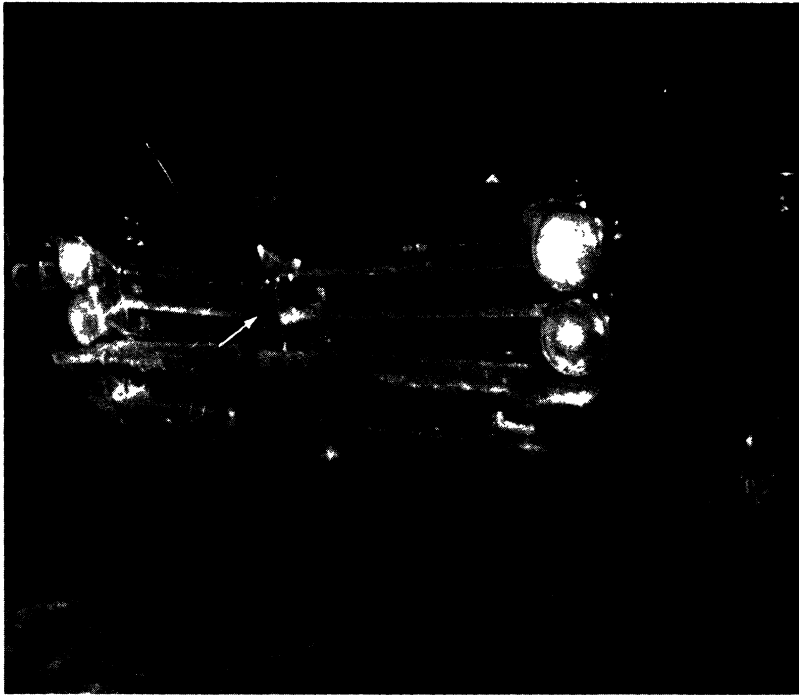


Figure 47 (note arrows). A 1965 Pontiac, traveling at a police estimated speed of 45 mph, hit a 12-year-old boy who was running across a two-lane street in the crosswalk with no signal present (7 p.m., January). He died of a fractured neck and cervical cord.
(Case # 10/66)

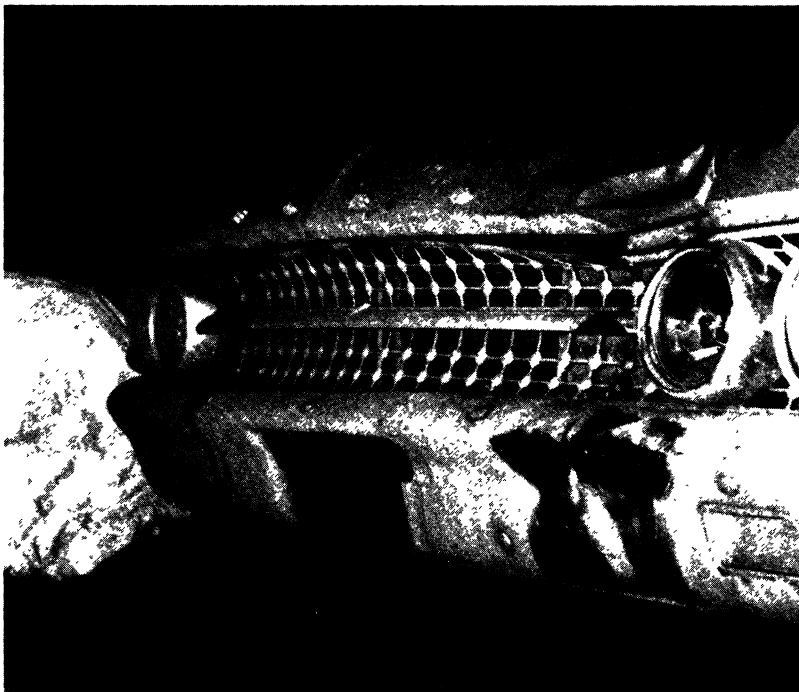


Figure 48. A 1961 Ford, traveling at a police estimated speed of 55 mph, hit a 43-year-old female who was crossing a four-lane avenue in the crosswalk with no signal present (8 p.m., February). She died at the scene of crushing injuries to the head, neck, chest, abdomen, pelvis, and legs.
(Case # 12/66)

Figure 49. A 1964 Chevrolet hit a 73-year-old female who was crossing a two-lane street in the crosswalk, against the signal (10 a.m., February). The pedestrian was dead on arrival at the hospital. She died of multiple fractures of the skull, ribs, pelvis, and legs. (Case # 15/66)



Figure 50. A 1957 Oldsmobile, traveling at a police estimated speed of 45 mph, hit a 45-year-old male who was walking in a two-lane street with traffic (3 a.m., March). The pedestrian was dead on arrival at the hospital. He died of a fractured neck and cervical cord (no autopsy). (Case # 24/66)

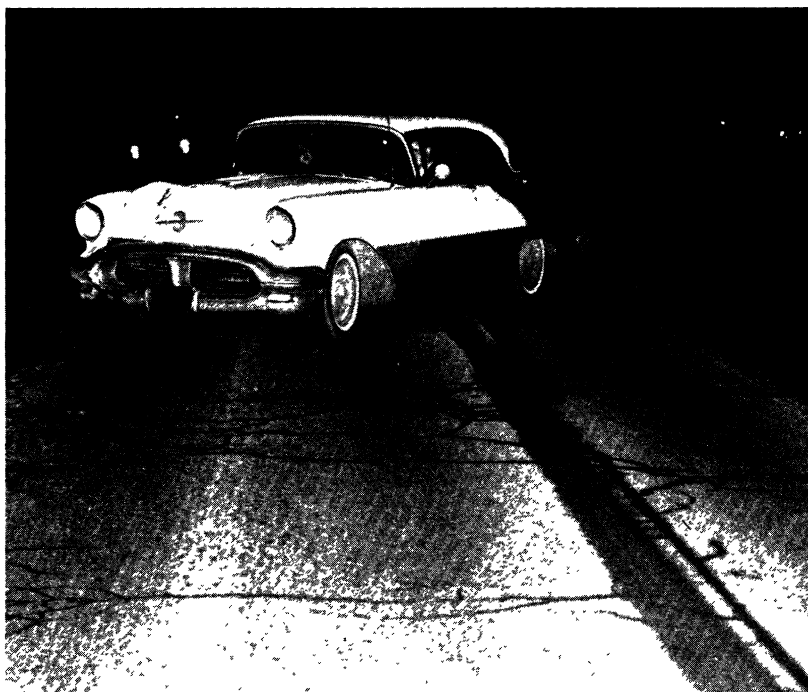




Figure 51. A 1964 Ford, traveling at a police estimated speed of 35 mph, hit a 43-year-old male who was crossing a two-lane street in the crosswalk with no signal present (8 p.m., March). The pedestrian was dead on arrival at the hospital. He died of multiple fractures of the head and chest, and intra-abdominal injuries (no autopsy). Spinal fluid alcohol was 0.22%.
(Case # 29/66)



Figure 52 (note arrows). A 1959 Pontiac, traveling at a police estimated speed of 30 mph, hit an 82-year-old male who was crossing a two-lane street in the crosswalk with no signal present (9 p.m., April). The pedestrian died at the scene of fractures of the neck and pelvis, and had a laceration of the thoracic aorta.
(Case # 34/66)

Figure 53. A 1966 Ford, traveling at a police estimated speed of 15 mph while making a left turn, hit a 58-year-old male who was crossing a six-lane boulevard in the crosswalk with no signal present (9 p.m., April). The pedestrian died nine hours after impact of fractures of the skull and severe intracranial hemorrhage.

(Case # 35/66)



Figure 54. A 1964 Ford, traveling at a police estimated speed of 40 mph, hit a 77-year-old female who was crossing a two-lane street in the crosswalk with no signal present (8 p.m., May). The pedestrian died three hours after impact of multiple fractures of the chest and pelvis with intra-abdominal injuries. Spinal fluid alcohol was 0.09%.

(Case # 40/66)



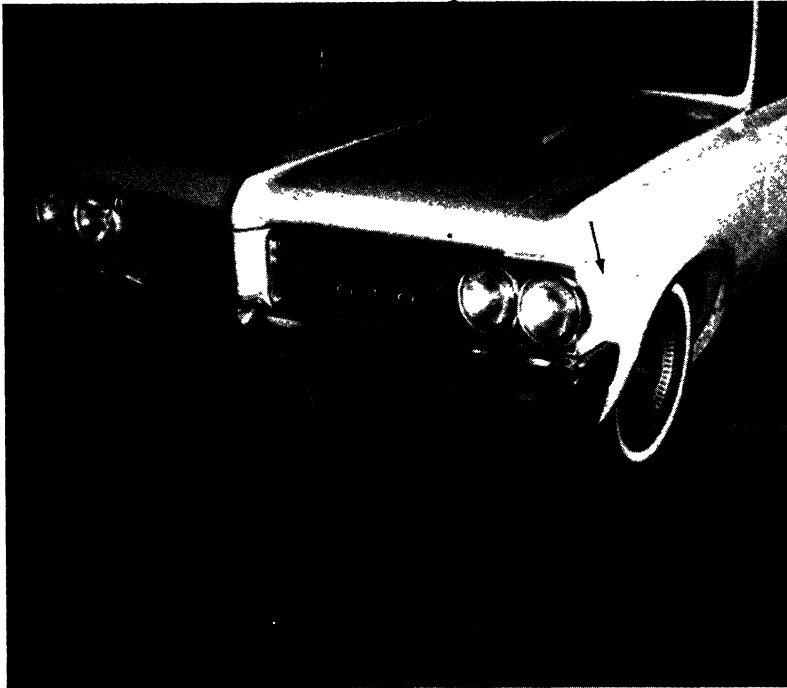


Figure 55 (note arrows). A 1964 Pontiac hit a 67-year-old male who was crossing a two-lane street in the crosswalk with no signal present (8 p.m., April). The pedestrian died 19 days after impact of lobar pneumonia; he had sustained fractures of the ribs and pelvis. (Case # 41/66)



Figure 56. A 1959 Chevrolet, traveling at a police estimated speed of 55 mph, hit a 16-year-old girl who was walking in the roadway with traffic on a rural two-lane roadway (9 p.m., June). The pedestrian died two hours after impact of crushing injuries to the head and a laceration of the right kidney. (Case # 53/66)

Figure 57. A 1963 Plymouth, traveling at a police estimated speed of 45 mph, hit a 23-year-old male who was walking diagonally across a four-lane rural roadway (10 p.m., July). He died at the scene of head injuries (no autopsy).
(Case # 59/66)



Figure 58. A 1959 Ford hit a 30-year-old male who was crossing a two-lane street in mid-block (3 a.m., August). The pedestrian was dead on arrival at the hospital. He died of a crushed skull with compression of the brain and spinal cord. Spinal fluid alcohol was 0.42%.
(Case # 65/66)

