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Fatal crash types. Analysis of 1988 Fatality File.


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**Abstract**

This report describes different types of fatal road crashes based on Australian data from 1988 in the FORS Fatality File.

Fatal pedestrian, bicycle, motorcycle, bus and articulated truck crashes, single and multiple vehicle crashes involving passenger vehicles and/or rigid trucks in rural high and urban low speed zones, and crashes involving children are characterised in terms of frequency, timing, location, prevailing road and driving conditions, vehicle movements, fault, contributory factors (such as alcohol and speed), persons involved and medical details of the fatalities and injuries.

Report CR 104 is a summary report of this report.



**Keywords**
Fatal crash; pedestrian crash; bicycle crash; motorcycle crash; bus crash; articulated truck crash; single vehicle crash; multiple vehicle crash; crashes involving children

# FATAL CRASH TYPES
# ANALYSIS OF 1988 FATALITY FILE

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1992

# Executive summary

This report characterises different types of fatal road crashes. It is based on the 1988 FORS Fatality File for Australian road crashes. Each crash type is described in terms of frequency, timing, location, prevailing conditions, vehicles involved, crash events, fault, contributory factors, persons involved and details of injuries received and cause of death for those killed.

There is also a separate, shorter summary report (CR 104).

## Fatal crashes in Australia 1988

There were 2561 road crashes in 1988 in which at least one person was killed or died within 30 days. These crashes resulted in 2875 fatalities and involved 3718 vehicles.

## Pedestrian crashes

Pedestrians accounted for 19% of all road fatalities and these crashes generally occurred in the afternoons and evenings on weekdays, and at night on weekends. A disproportionately high number occurred in Winter. Most pedestrians were killed in urban areas, away from intersections and while crossing the road where there were no marked crossings. Most (69%) of the pedestrians were considered to be responsible for the crashes. The pedestrians killed included children who did not look before crossing, young alcohol affected adults and the largest group (40%) comprised older persons who generally made misjudgments. Pedestrians, like cyclists, had a high incidence of death due to head injuries; 19% died instantly and half died in hospital. Many had lower extremity injuries. The drivers involved in these crashes tended to be younger, but not speeding or driving under the influence of alcohol.

## Bicycle crashes

Bicycle crashes comprised only 3% of all fatal crashes. There were 86 cyclist fatalities. Most occurred in urban areas (81%), similar to pedestrian crashes. An after school peak was also observed. Almost half occurred within or near intersections and 44% were rear end collisions. Cyclists were often at fault (67%) and visibility played a role, both at night and during the day. Two thirds of the bicycles involved at night had no lights. Alcohol (15%) and speed (3%) were less common than in other fatal crashes. The cyclist fatality characteristics resembled those of pedestrian fatalities, though there were more school aged children (22%) and proportionally more males (86%). Almost half died of head injuries. Only 3% wore helmets.

## Motorcycle crashes

Thirteen percent of fatal crashes involved motorcycles. Motorcyclists accounted for 10% and pillion passengers 1% of road fatalities. Motorcycle crashes often occurred on Fridays and weekends (60%), in urban areas (67%), and in fine conditions (92%). The motorcyclist often lost control on curves and collided head-on with another motor vehicle. The motorcyclists were generally young males, often inexperienced and considered solely responsible for just over half the fatal crashes with other vehicles. Speeding and alcohol were common contributory factors with 40% of motorcyclists involved in fatal crashes over 0.05 gm/100 ml blood alcohol (compared with 24% of other drivers) and 32% of motorcyclists were speeding (vs 10% other drivers). The other persons involved in these crashes often failed to observe the motorcycle. Approximately 80% of motorcyclists killed were wearing helmets.

## Bus crashes

The 53 fatal crashes involving buses (>9 seats) comprised only 2% of all fatal crashes. Most occurred during the day in urban regions. One third involved the death of pedestrians. Bus drivers were older and less often responsible for multiple vehicle crashes than other drivers. Speeding, fatigue, alcohol and drugs were rarely contributory.

## Articulated truck crashes

Eleven percent of fatal crashes (289) involved articulated trucks. Most occurred on weekdays (81%) and involved more than one vehicle (75%). Two thirds occurred on rural roads with speed limits at least 80 km/h. Many urban articulated truck crashes occurred within or near intersections (41%). Only 22% of the drivers of these trucks were at fault in collisions with other types of vehicles. Speeding, alcohol and drug use were uncommon. The truck drivers were older than other drivers. Only 23% of truck drivers wore seat belts. However, most (79%) of the 353 resultant fatalities were persons external to the trucks.

## Rural and urban crashes involving passenger vehicles (& rigid trucks)

Single vehicle crashes involving passenger cars or rigid trucks accounted for more fatal crashes (28%) and more fatalities (28%) than multiple vehicle crashes involving these vehicles (18% of all fatal crashes and 20% of fatalities). They generally occurred on the weekend, unrelated to intersections with the car running off a level road. The drivers were generally young males, coming home from recreational activities, often affected by alcohol and not wearing seat belts.

Multiple vehicle, passenger car crashes generally occurred in day light on weekdays and within intersections. Though the drivers were older and more experienced, driver errors or bad visibility often contributed to these crashes. There was a high incidence of death due to chest injury (19%).

Single vehicle, passenger car, rural high speed (>=80 km/h) (SVR) crashes (19% of all fatal crashes and fatalities) generally occurred in good conditions, with the driver losing control on the road shoulder and overturning. Alcohol and fatigue were common contributory factors.

Single vehicle, passenger car crashes in urban low speed (<80 km/h) areas (SVU) (8% of fatal crashes) occurred mostly at night. Speed and alcohol were common contributory factors.

Multiple vehicle, passenger car, rural high speed (MVR) crashes (11% of road fatalities) were generally head-on, non-intersection crashes occurring during daylight hours on weekdays resulting in multiple fatalities. The road surface contributed to a disproportionately high number of these crashes (12%).

Multiple vehicle, passenger car, urban low speed (MVU) crashes (9% of all fatal crashes) were mostly weekday, daytime crashes, occurring within intersections as a consequence of driver errors.

## Crashes involving children

Children up to 12 years of age, though constituting only 6% of road fatalities overall, accounted for a significant proportion of bicycle fatalities (22%), 13% of pedestrian fatalities and 10% of passenger fatalities. Both child pedestrians and cyclists were often killed in coming out from behind a parked vehicle or entering the road from the footpath or driveway. They were more likely than adult pedestrians or cyclists to die of head injuries. Child pedestrians killed were also more likely to sustain serious injuries to the abdomen or spine.

Children killed were more likely than other passengers to be in the rear of a vehicle, particularly the centre back seat. Child passengers were more likely to die of head injuries than other motor vehicle occupants, and less likely to sustain serious chest injuries.

## CONTENTS

# Chapter 1. Introduction

## 1.1 Objectives

The major aim of this project was to describe and characterise different types of fatal crashes occurring in Australia based on detailed data from the 1988 Fatality File. The ten crash types reported here are pedestrian, bicycle, motorcycle, bus, articulated truck, single passenger vehicle rural high speed, single passenger vehicle urban low speed, multiple passenger vehicle rural high speed, multiple passenger vehicle urban low speed crashes, and crashes involving children.

## 1.2 Report structure

This report provides a full description of all analyses undertaken. A separate shorter summary report is also available".

Each of the chapters on the different fatal crash types is relatively self contained and can be read independently. However, some tables in the pedestrian chapter (Chapter 2) contain information on different road user categories and are referred to in the later chapters.

The salient features of each crash type are listed in point form on a summary page at the beginning of each chapter.

Each crash type is defined and described in terms of its size relative to the total number of fatal crashes and fatalities in 1988. Contrast groups in the form of other crashes, vehicles and persons are also defined.

The main body of text in each chapter is the presentation of the characteristics of the particular crash type which distinguish it from the contrast groups. The results are presented in the form of text, tables and graphs. Since the sizes of the groups being compared vary, the most appropriate comparison measures are percentages.

The different aspects of each crash type dealt with in each chapter are:

- Timing
- Location
- Road and driving conditions
- Vehicle characteristic
- Crash description
- Contributory factors
- Persons involved
- Medical details

The Timing section reports differences in time of year, day of the week and hour of the day of the crash. Location deals with where the crashes occur with respect to State, population density, road types and intersections. Weather, road and driving conditions are covered in the Road and driving conditions section. The type, age, condition of vehicles involved in the crashes are described in Vehicle characteristics. The Crash description details the events of the crash and paths of the vehicles according to the definitions for classifying accidents coding scheme (LICA) and the direction and point of impact of the vehicles involved. The Contributory factors include factors such as speeding, alcohol, road rule breaches, surface conditions, vehicle defects and visibility and the assessment of who caused the accident. Characteristics of the persons involved in the crashes include age, sex, driving experience, purpose of the trip, distance from home and distance from commencement of the trip, blood alcohol levels, drug testing. Timing and cause of death and injuries in terms of the abbreviated injury scale (AIS) are compared in the last section.

Where appropriate, a section describing homogeneous subgroups of the crash type under study is included.

A summary concludes each chapter.

## 1.3 Data sources

All crash data come from the Federal Office of Road Safety's (FORS) Fatality File for 1988. This includes details of all fatal road crashes reported in all States and Territories of Australia in 1988. The Fatality File is the only comprehensive, nationally consistent data base for fatal crashes. It includes over 100 variables relating to the crash (timing, location etc), vehicles involved (make, model etc) and people involved (age, sex etc). The Fatality File draws on data not only from the police, but also from coroners' courts and in some cases original reports were read.

A fatal road crash is defined as a collision in which at least one person is killed or dies within thirty days of the crash as a result of injuries sustained. A total of 2561 crashes are reported in this file, with details of the 3718 vehicles and 7498 persons involved in these crashes. Of these persons, 2875 died.

The source of coding details is the FORS Fatal File 1988 Documentation of File

Some additional data on the Australian work force is reported in Chapters 2 and 7 and was obtained from ABS[3].

## 1.4 Statistical methods

Chi-square tests were used to test whether the number of crashes, vehicles or persons with particular characteristics were unevenly distributed between the particular crash types.

Pearson's chi-square with continuity correction was used for 2x2 tables (i.e. presence or absence of one Characteristic compared between two crash types). If the expected number of units in any cell was less than 5, then Fisher's 2-sided exact test was used instead.

For larger tables, Pearson's chi-square was used.

Quantitative characteristics, such as age or years of driving experience, were compared using the non-parametric Mann-Whitney's U-test. Medians were generally used as summary measures for such variables.

In general unless stated otherwise, only statistically significant differences with $p < 0.05$ were reported. It should be noted that the size of the groups being tested and the frequency of the characteristic being tested within the groups affects the power of the test. The ability to detect a difference at the 5% level increases with the group sizes. Thus, in the smaller crash types, it is possible to detect only large differences, whereas, in the larger crash types, finer distinctions can be detected.

Statistically significant differences are usually indicated in tables by highlighting the larger of the percentages which are statistically significantly different at the 5% level.

## 1.5 Interpretation

A full understanding of the distinguishing characteristics of each type of fatal crash depends to a certain extent on the assimilation of them all.

The method of reporting only those crash characteristics which significantly distinguish each crash type from the contrast group is limited by the readers' knowledge of the contrast group, or, of fatal crashes in general. The data in the fatal file is summarised for all crashes in standard tables in another FORS publication[4].

It must be remembered in the interpretation of these results that all comparisons are always within the context of fatal crashes. The frequency of fatal crashes of various types is reported, not the risk of being involved in a fatal crash. Often the frequencies reported reflect the travel characteristics of the road users and vehicles involved. For example: fewer multiple vehicle urban crashes occur at night since there are fewer cars on such roads at this time; similarly, the small number of female truck drivers involved in fatal crashes probably just reflects that few women drive trucks, not necessarily that they are 'safer' drivers.

The analyses reported were generally univariate, that is, each type of characteristic was analysed separately. Some multivariate analyses were also included, such as detailing the time of day for weekends and weekdays, separate analyses in rural areas and considering age and alcohol levels together.

Due to the considerable detail contained in the fatal file, this report cannot purport to be an exhaustive list of significant results. For the larger crash types, additional significant results could possibly be obtained by further multivariate analyses or finer crosstabulation.

Due to the large number of tests conducted, however, the reader should be aware that some results may be spurious. It should be remembered that quoting results significant at the 5% level means that for each test, a significant result may be obtained for one of twenty even if there is no true difference. Results based on small numbers thus need to be replicated on further data sets.

## 1.6 Missing data

For the major variables, the proportion of missing information was negligible. In other cases, the level of missing information is reported. If data was inconsistent, it was treated as missing, and thus excluded from the analyses.

Percentages are calculated excluding missing data. Thus, x% of crashes with a particular characteristic means x% of crashes where information was available. In most tables and graphs, the actual denominators for the percentages are given.

## 1.7 Notation

If both the number and percentage of units with a particular characteristic are given within the text, the following format is used (n; x%), where n is the number of units with a particular characteristic, and x% is the percentage of units with a particular characteristic. It should be obvious from the context which denominator is used (i.e. the total number of units of a particular type, or the corresponding contrast group). It should be also obvious from the context, but should be kept in mind, that the unit being discussed may be a crash, vehicle, person or fatality.

Percentages are expressed as integers after appropriate rounding. In some tables percentages may not sum to 100% as a consequence of this.

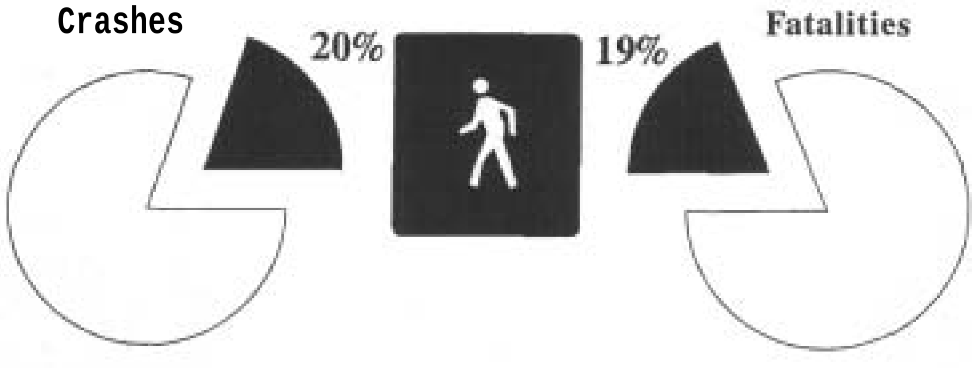
## 1.8 Terminology

Definitions of terms used in the report are detailed in the glossary. Details are also given in terms of the computer coding, so that the analyses may be reproduced.

Crash events are described in terms of "DCA" codes (Definition for Classifying Accidents). For example, a single DCA event may describe a head-on collision between two vehicles. DCA events have, for ease of presentation, been grouped into a number of categories. Thus, for example, crashes involving "vehicles from opposing directions" will include a number of specific crash types (including head-on collisions). In addition to the "DCA" event, complex crashes often have "prior" and "subsequent" events. For example, if vehicle A were to hit an animal, lose control and hit vehicle B and then hit vehicle C, (killing the driver of vehicle C), the crash would have a prior (hit animal), DCA (A hits B) and a subsequent (A hits C) event.

Diagrams detailing all DCA, prior and subsequent event codes are given in the Appendix.

# Chapter 2: Fatal pedestrian crashes




**Timing**

- Proportionally more fatal pedestrian crashes than other fatal crashes occurred in Winter.
- A high percentage of fatal pedestrian crashes occurred in the afternoon and evening (46% between 3 pm and 8 pm).
- An after school peak was observed on weekdays.

**Location**

- Most fatal pedestrian crashes (89%) occurred in urban areas.
- 71% of fatal pedestrian crashes occurred more than 10m from intersections.
- For 76% of the crashes, the pedestrian was crossing the road.
- 87% of fatal pedestrian crashes occurred where there were no marked crossings.

**Crash conditions**

- Most fatal pedestrian crashes (87%) occurred in fine/dry conditions.
- 23% of night time urban pedestrian crashes occurred in areas with no lights.

**Vehicle characteristics**

- In 78% of pedestrian crashes, a passenger vehicle hit the pedestrian and no other vehicles were involved.

**Contributory factors**

- A high proportion (69%) of the pedestrians were considered solely responsible for the crash.
- Alcohol/drug use by pedestrians was considered contributory for 28% of the fatal pedestrian crashes. A higher percentage of pedestrians tested had blood alcohol values (BAC) >0.15 gm/100 ml than drivers/riders (30% vs 24%).
- Factors such as speed, fatigue, driver intoxication, driver errors, vehicle defects and surface conditions were less likely in pedestrian than in other fatal crashes.

**Pedestrians**

- There were relatively high percentages of older persons and children among the pedestrians killed; (40% were 60 years or older, 13% were 12 or younger).
- There was a significantly higher percentage of females among the pedestrians killed (33%) than among other road fatalities (28%).

**Medical details**

- Death from head injuries was more common for pedestrians than other fatalities.
- Similar to other road accident victims, one third of pedestrians died from multiple injuries.
- Pedestrians killed were more likely to sustain serious lower extremity injuries (39%) than other road user groups.
- 53% of the pedestrians involved in these crashes died in hospital.

**Drivers**

- Drivers involved in pedestrian crashes were younger than drivers involved in other fatal crashes.
- Drivers of vehicles striking pedestrians were less likely to be intoxicated than other drivers involved in fatal crashes.

## Definition

A pedestrian crash was defined as any crash in which at least one pedestrian was killed or died within 30 days as a result of injuries sustained in the crash.

## Frequency

There were 535 such crashes in 1988 with 542 pedestrians killed. This represents 20% of all fatal crashes and 19% of road fatalities in Australia that year. Pedestrians are thus the third largest fatality group, behind drivers (40% of all fatalities) and passengers (27%) and larger than motorcyclists (11%) and bicyclists(3%). Pedestrian crashes involved a total of 561 vehicles (15% of all vehicles involved in fatal crashes. The predominant crash form involved a single, passenger vehicle (78%).

## Contrast groups

Pedestrian crashes were compared with all other fatal crashes, unless otherwise stated.

In the comparison of vehicle characteristics, in general, only moving vehicles were considered. Thus, non-stationary vehicles involved in pedestrian collisions were compared with all non-stationary vehicles involved in other fatal accidents.

At the person level, pedestrian deaths were compared with all other fatalities. Additionally, drivers of moving vehicles involved in pedestrian accidents were compared with drivers of moving vehicles involved in other fatal accidents.

## Timing

Figure 2.1 shows the percentage of pedestrian and other crashes in each month. Proportionally more pedestrian crashes occurred from April through July; the cooler months. The smallest number occurring in any one month was 28 (5%) in January, compared with 9% of other crashes.

Figure 2.2 shows the percentage of pedestrian and other crashes on each day of the week. As with other fatal crashes, most pedestrian crashes occurred on Saturdays. However, there were proportionally more pedestrian crashes than other fatal crashes earlier in the week (Wednesday and Thursday) and fewer on Sunday.

Approximately equally many pedestrian (50%) and other crashes (51%) occurred during the day, Most pedestrian crashes occurred in the afternoon and evening, between 3 and 8 pm. This peak is more pronounced than for other types of crashes (Figure 2.3).

Further examination of the data revealed that the pattern of crashes with hour of the day depended on the day of the week and whether the crashes occurred in urban or rural areas. As for other fatal crashes, more pedestrian crashes occurred at night on weekends (56% weekend vs 31% during the week). Figure 2.4 comprises separate bar charts for weekday/weekend urban/rural pedestrian/other crashes by hour of day grouped 0-5, 6-9,10-14,15-18,19-23. (Note that 0-5 includes all crashes occurring from midnight (0000) to 0559).

The urban weekday pedestrian crashes differed from the other crashes with a pronounced afternoon peak, whereas the urban weekend pedestrian crashes followed a similar time pattern to other fatal crashes.

The rural weekday pedestrian crashes also showed a pronounced 'after school' peak. However, major differences in the rural regions occurred also on the weekends with both an early morning (0-5am) and afternoon peak (15-18).

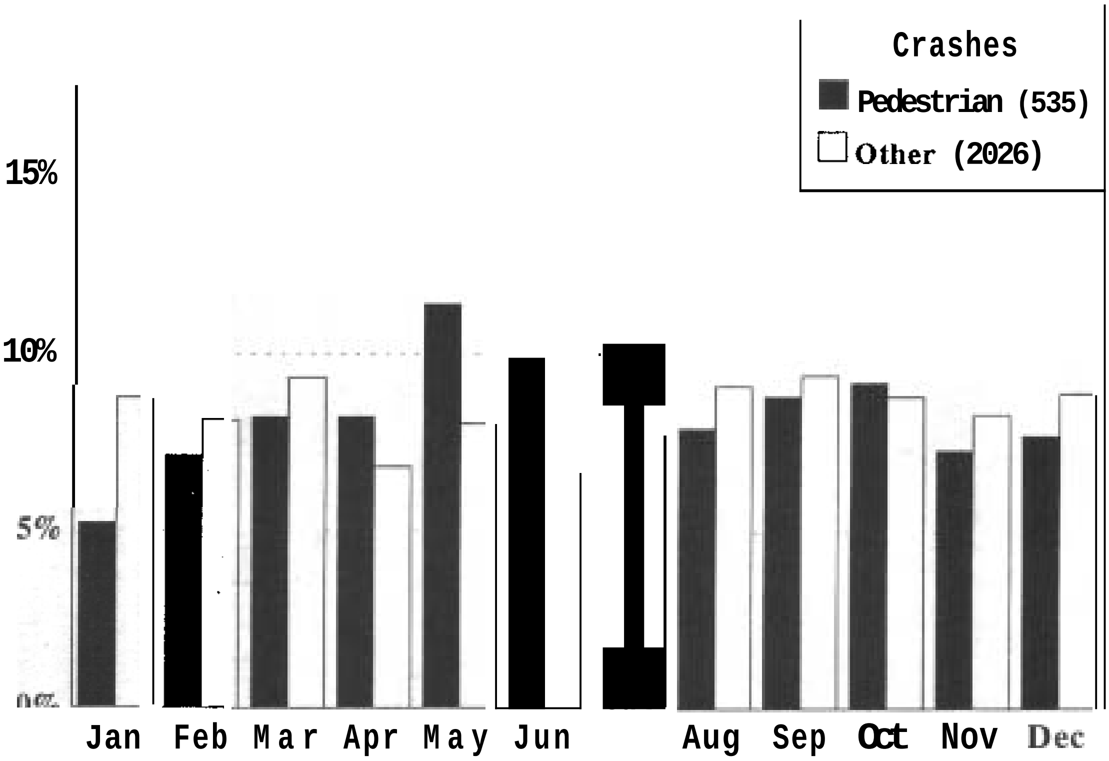
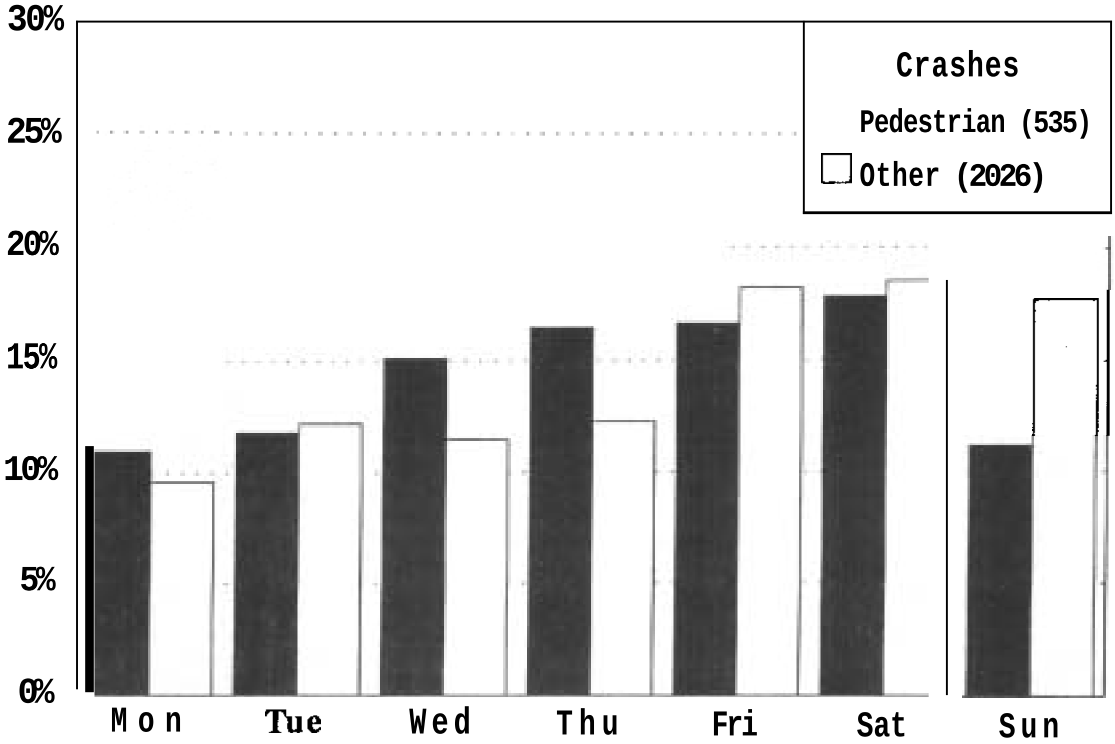



Figure 2.2 Pedestrian and other fatal crashes by day of week




Source: FORS 1988 Fatal File

Figure 2.3a Pedestrian crashes by time of day

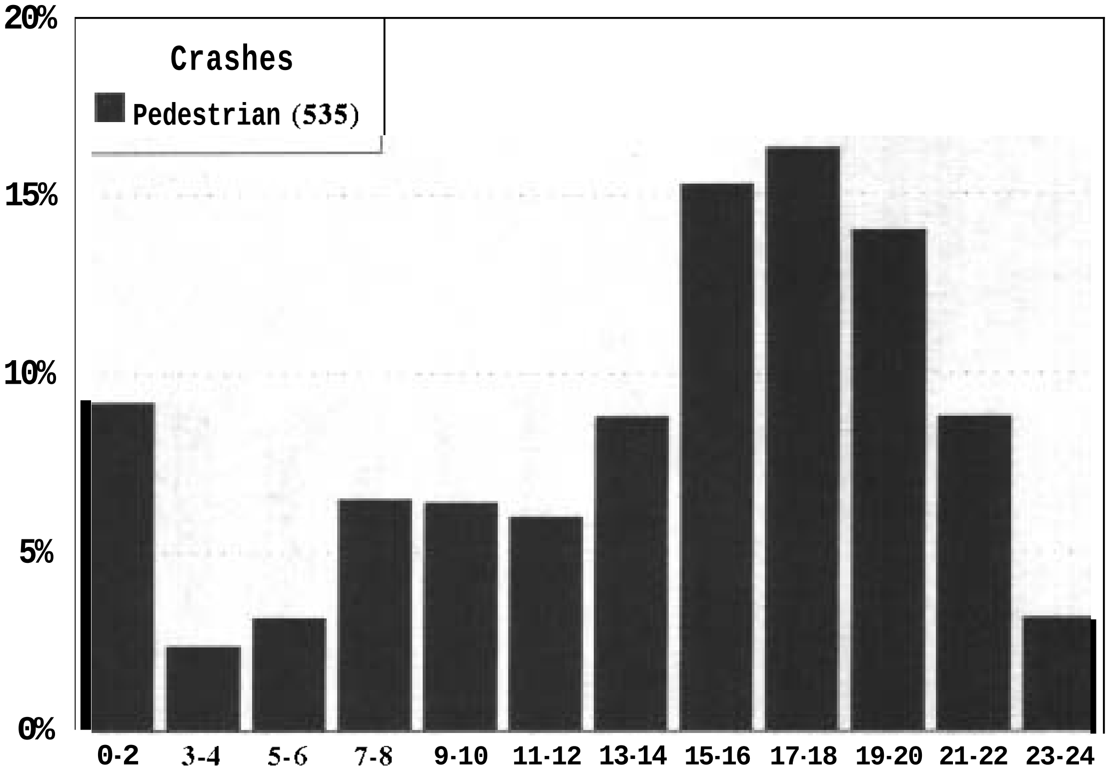
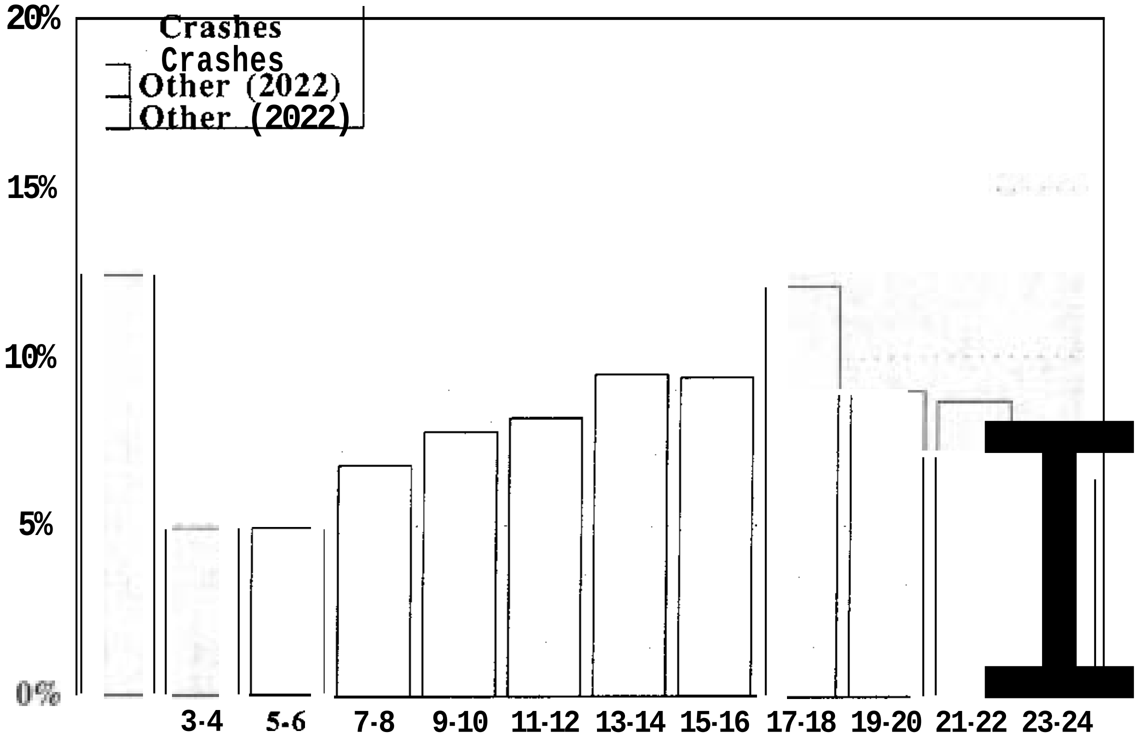



Figure 2.3b Other fatal crashes by time of day




Source FORS 1988 Fatal file

Figure 2.4a Pedestrian and other fatal crashes by hour for weekdays and weekends in urban areas

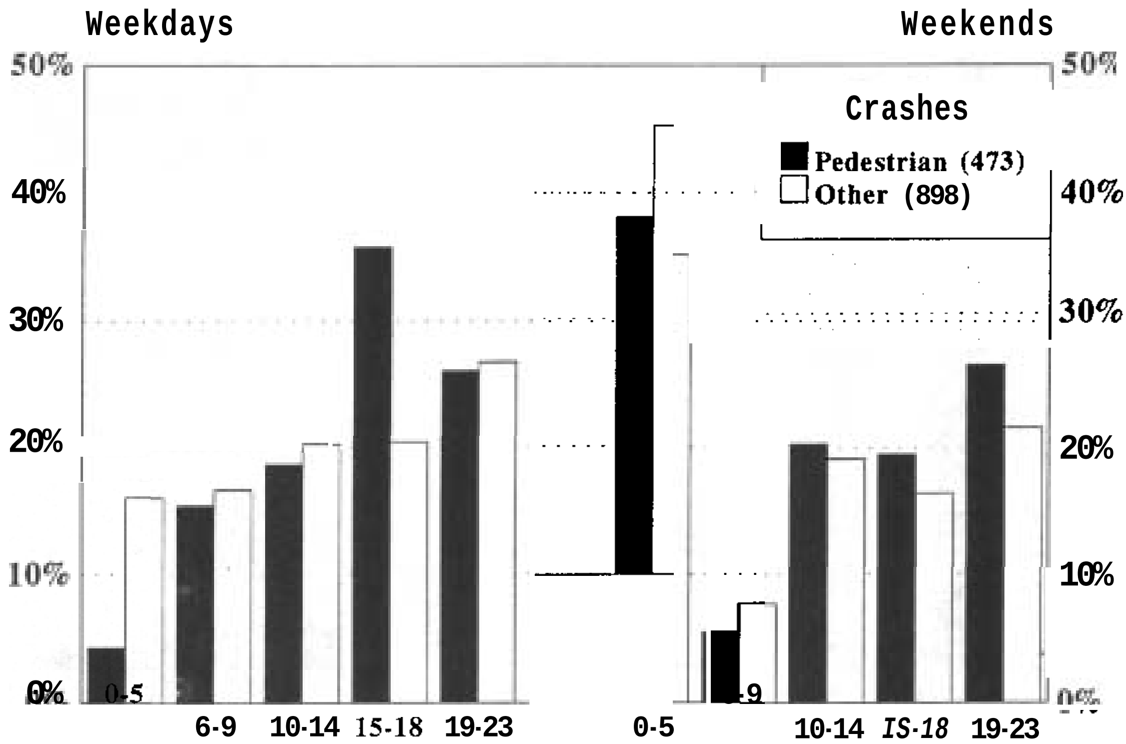
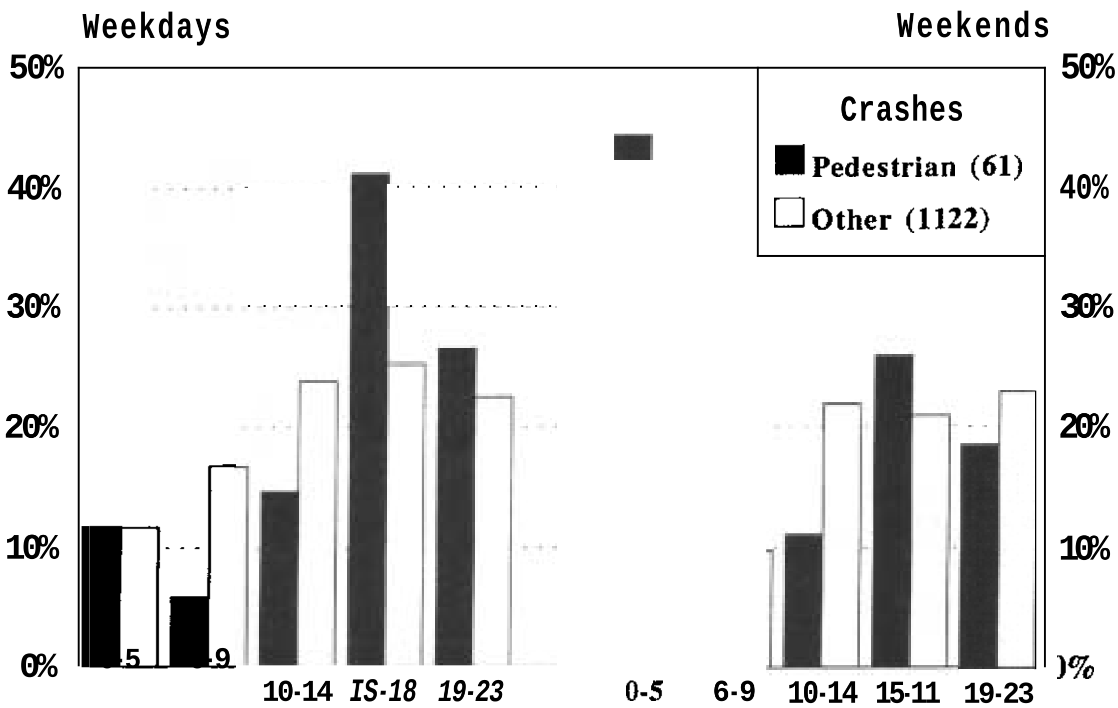



Figure 2.4b Pedestrian and other fatal crashes by hour for weekdays and weekends in rural areas

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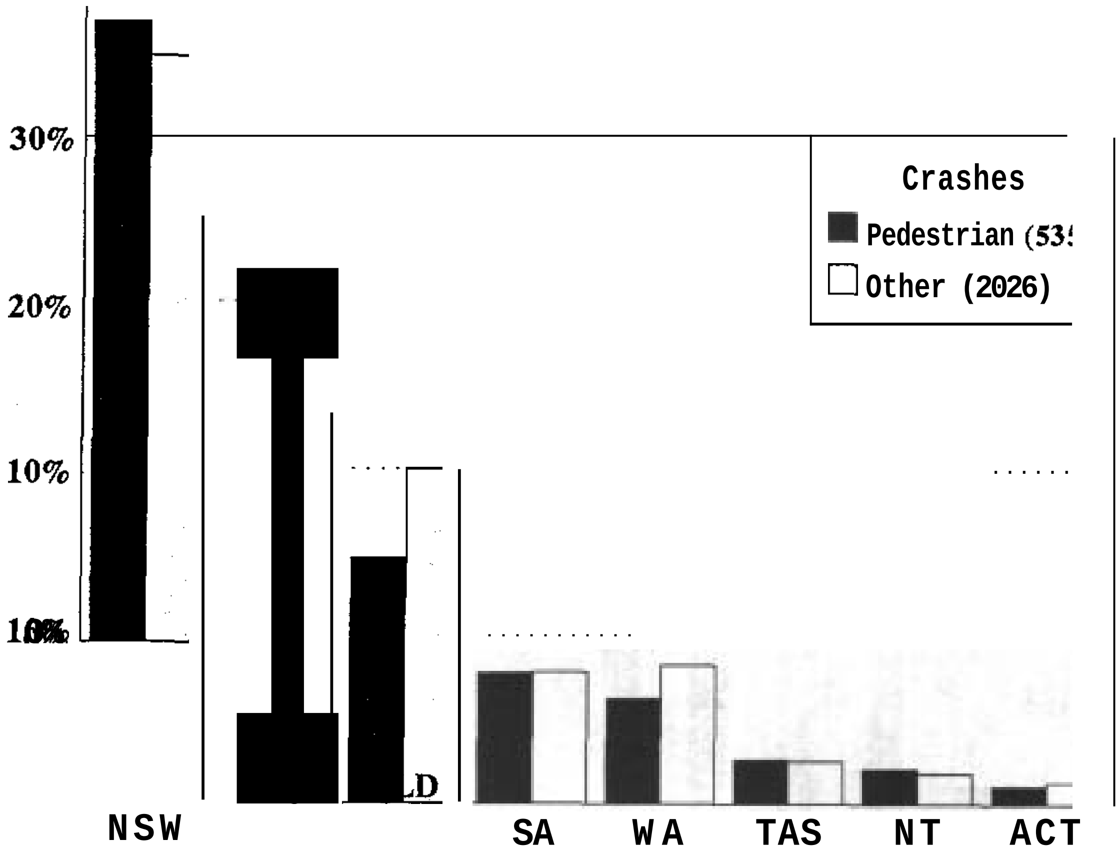



Source: FORS 1988 Fatal file

## Location

There were some deviations in the pedestrian crash frequency by State as compared with other fatal crashes (Figure 2.5). Proportionally more occurred in Victoria (29% vs 23%) and fewer in Queensland (15% vs 20%).

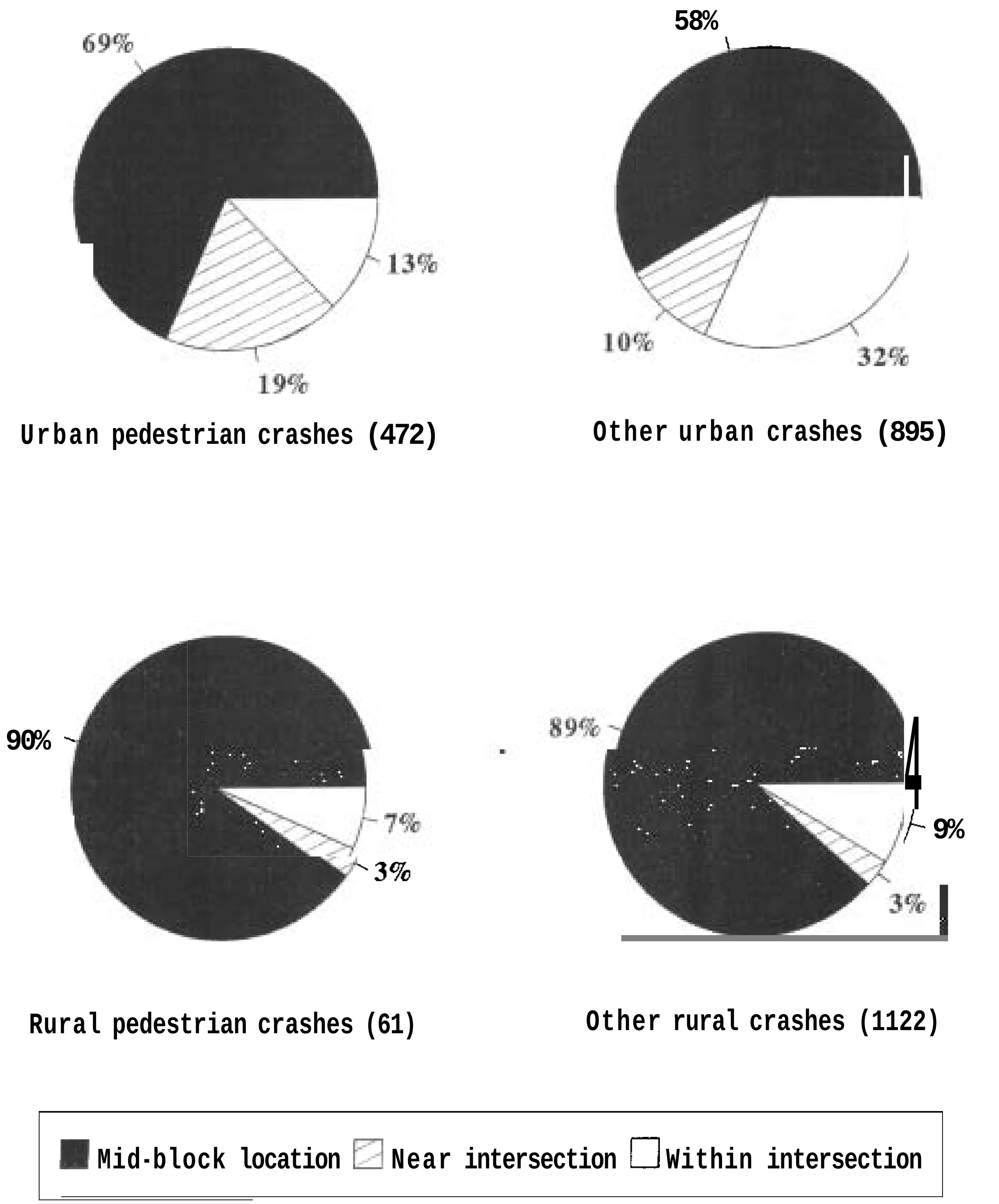
It was thought that this could be linked with the seasonal variation reported earlier. Further crosstabulation by month (grouped Summer/Winter) revealed no significant deviation from the distribution of other fatal crashes in the warmer months, whereas Victoria, South Australia, and Tasmania had disproportionately more in the Winter months as opposed to the northern States (Qld and NT) which had fewer than expected. *NSW* did not deviate significantly from other fatal crashes. The excesses occurring in the southern States in Winter were not, however, associated with adverse weather conditions or shortened daylight hours, as the excesses occurred both during the day and night and in good and bad weather.

Pedestrian crashes predominately occurred in urban areas with 89% in cities and towns (>200 inhabitants) compared with only 44% of other crashes.

Urban/rural status explained some of the variation between the States. Crosstabulation by State within urban and rural regions also revealed a higher than expected percentage of pedestrian crashes in the Northern territory rural regions (7; 11% pedestrian crashes vs 3% other fatal crashes.).

As with other crash types, approximately three quarters of all pedestrian crashes occurred in mid-block locations (71%). However, proportionally more occurred near (i.e., within 10m of) intersections (17% vs 6%). The pedestrian crash location breakdown is significantly different from other fatal crashes in urban, but not rural areas (Figure 2.6).

Figure 2.6 Location of urban & rural pedestrian & other fatal crashes with respect to intersections




Source: FORS 1988 Fatal file

Of the mid-block collisions, 32% of pedestrian crashes occurred on divided roads (dual carriageways) compared with only 11% of other fatal crashes.

Table 2.1 shows that most (94%) of the mid-block pedestrian crashes occurred where there were no marked crossings, whereas 31% of pedestrian crashes within intersections occurred at intersections controlled by traffic lights where there were 'Walk' and 'Don't walk' signals.

Table 2.1 Number and percentage of pedestrian crashes occurring at mid-block, near (<10 m) or within intersections with or without marked crossings and with or without crossings controlled by lights. Location or traffic control information was missing for 9 pedestrian crashes and thus not shown in the table.

| | Location | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Road markings and signals | Mid-block | | Near intersection | | Within intersection | | Total | |
| | n | % | n | % | n | % | n | % |
| No marked pedestrian crossing | 355 | 94% | 61 | 70% | [1]41 | 66% | 457 | 87% |
| Presence of pedestrian signals | | | | | | | | |
| No 'Walk/Don't walk' lights | 10 | 3% | 8 | 9% | 2 | 3% | 20 | 4% |
| 'Walk/Don't walk' lights | 12 | 3% | 18 | 21% | 19 | 31% | 49 | 9% |
| Total pedestrian crashes | 377 | 100% | 87 | 100% | 62 | 100% | 526 | 100% |

[1] 4 of these intersections controlled by traffic lights, but no pedestrian signals or marked crossings

A higher than expected number of pedestrian crashes occurred in bus/transit (4) or tram (7) lanes (11 or 2% vs 0.4%). The seven killed in tram lanes were hit by other motor vehicles, not trams, and of the four in bus lanes, two were hit by buses.

The majority (91%) of pedestrian crashes occurred on straight stretches of road (for both urban and rural areas).

## Road and driving conditions

No disproportionate number of pedestrian accidents occurred in adverse weather conditions with 87% of pedestrian crashes and 85% of other fatal crashes occurring in fine/dry conditions.

Of night time crashes, proportionally more pedestrian crashes than other fatal crashes in both urban (23% vs 15%) and rural (56% vs 38%) areas occurred in areas with no street lighting.

Of the 134 pedestrians killed at night in locations without street lights, 48 (36%) were noted as wearing dark clothing. The corresponding figures for locations with street lights operating were 17 (27%) of 62.

## Vehicle characteristics

Only 14 (3%) pedestrian crashes involved more than one vehicle. In 78% of pedestrian crashes, a passenger car hit the pedestrian and no other vehicles were involved.

The most typical fatal pedestrian crashes involved passenger vehicles. The remainder involved trucks, buses, motorcycles, vehicles of unknown type, bicycles and other combinations of vehicles (Table 2.2).

Table 2.2 Pedestrian crashes subdivided by type of vehicle involved.

| | Pedestrian crashes | |
|---|---|---|
| Vehicle mix | n | % |
| Passenger vehicle(s) | 436 | 81.5% |
| Truck | 54 | 10.1% |
| Bus | 16 | 3.0% |
| Motorcycle | 13 | 2.4% |
| Unknown type | 13 | 2.4% |
| Bicycle | 1 | 0.2% |
| Other combination | 2 | 0.4% |
| Total pedestrian crashes | 535 | 100% |

Almost all the vehicles which collided with pedestrians at night had their lights on. The incidence of vehicles with no lights at night was, in fact, lower than for all other fatal crashes (2% vs 8%).

A lower incidence of interstate vehicles and interstate drivers and shorter distances travelled from commencement of the journey for vehicles involved in the pedestrian crashes, were, on further crosstabulation, seen to be a result of the predominance of crashes in urban areas. Compared with vehicles involved in other fatal crashes in urban regions, more vehicles in urban pedestrian crashes were 1-10 kilometres from home (64% vs 55%).

Most vehicles were considered to be within the speed limits (89%) prior to pedestrian crashes, in contrast to other fatal accidents (72%).

Fewer vehicles in pedestrian crashes were tested for defects (30% vs 36%). Of the 164 vehicles tested, 47 (29%) had defects; a figure similar to other crashes. Only 3 of these were considered contributory to the crash. Problems with brakes (12% vs 6%) and lights (6% vs 3%) were more frequent. Also, of the three vehicles with windscreen defects of all vehicles tested in 1988, two were involved with pedestrian crashes. Despite the small numbers (effectively 1% vs 0%), this is statistically significant: p(exact test)=0.045. One of these 'defects' was a dirty windscreen.

A higher than expected proportion of vehicles in pedestrian accidents originated from work (43% vs 30%) and/or were on their way home (42% vs 36%), and lower roportions were coming from (32% vs 41%) or going to (16% vs 23%) recreational activities compared with other fatal crashes. This is consistent with most pedestrian crashes occurring in the afternoon and evening.

## Crash description

The DCA was usually fatal (507; 95%) and occurred on the carriageway (519; 97%). These are higher proportions than for other fatal accidents (80% and 58%, respectively). Only 15 (3%) pedestrian crashes involved prior events and 27 (5%) had subsequent events; lower proportions than other fatal accidents (17% and 22%, respectively).

Despite the small number of pedestrian crashes with prior events, the pattern of prior events differed significantly from other fatal crashes. There were more avoidance manoeuvres (60% vs 16%) and fewer 'out of control off path' events (33% vs 75%). The remaining prior event was a collision with a parked car.

The subsequent events in pedestrian crashes differed from subsequent events in other fatal crashes in than they mostly involved pedestrians. This is, in general, a consequence of the definition.

Table 2.3 gives a breakdown of the major types of pedestrian crashes. Most (76%) of the crashes involved the pedestrian crossing the road. By definition, both the 'near side' and 'emerging' type crashes involve the pedestrian stepping out and crossing the road and being hit by a vehicle from the right, whereas in the 'far side' crashes, the pedestrian is hit from the left. However, it was possible to identify that in 50 of the 171 'far side' crashes (9% of all the pedestrian crashes), the pedestrian stepped from a median strip, so, to a certain extent these crashes resemble the 'near side' crashes.

Table 2.3 Major DCA types for 535 pedestrian crashes.

| DCA | n | % |
|---|---|---|
| Near side (hit by vehicle from right) | 193 | 36% |
| Far side (hit by vehicle from left) | [1] 171 | 32% |
| Playing, working, lying, standing on carriageway | [2] 52 | 10% |
| Emerging from behind a parked vehicle (hit by vehicle from right) | 44 | 8% |
| Walking with traffic | 30 | 6% |
| Other (includes pedestrian movement unspecified) | 13 | 2% |
| Pedestrian struck on footpath or median-strip | 9 | 2% |
| Cross traffic/turning vehicle[3] | 7 | 1% |
| Walking against/facing traffic | 6 | 1% |
| Pedestrian boarding or alighting vehicle | 6 | 1% |
| Vehicle out of control and/or into object[3] | 4 | 1% |
| Total pedestrian crashes | 535 | 100% |

[1] In 50 of ths far side crashes, the pedestrian stepped off a median strip.
[2] 37 lying/sitting/standing, 5 playing , 3 walking, 2 working, 5 unknown.
[3] Pedestrian killed in Subsequent event *(off* carriageway).

The fatal point of impact for pedestrian crashes was more often the front left (24% vs 3%) or the front right (16% vs 4%) of the vehicle compared with vehicles involved in other fatal accidents. Front centre impacts were approximately the same (45% vs 49%). Only 10% of vehicles hitting pedestrians, collided with them side-on. This was more common in other types of crashes (25%). (Table 2.4).

Table 2.4 Number and percentage of vehicles hitting pedestrians and vehicles colliding with other vehicles or objects with fatal impact points on the front, sides, rear and other parts of the vehicle.

| | Impact with | | | |
|---|---|---|---|---|
| | Pedestrian | | Other vehicle or object | |
| Point of fatal impact | n | % | n | % |
| Front of vehicle | 427 | 85% | 1696 | 56% |
| Front centre | 226 | 45% | 1493 | 49% |
| Front left | 120 | 24% | 92 | 3% |
| Front right | 81 | 16% | 111 | 4% |
| Side of vehicle | 49 | 10% | 758 | 25% |
| Left side | 30 | 6% | 362 | 12% |
| Right side | 19 | 4% | 396 | 13% |
| Rear of vehicle | 9 | 2% | 124 | 4% |
| Roof, undercarriage | 20 | 4% | 42 | 1% |
| Overturn | 0 | 0% | 415 | 14% |
| Total vehicles | [1]505 | (100%) | 3035 | (100%) |

[1] Point of fatal impact was missing for 37 impacts where pedestrians were killed.

The damage, if any, was generally minor with only 18% of vehicles sustaining damage requiring towing after pedestrian crashes as opposed to 87% in other fatal crashes.

## Contributory factors

For 358 (69%) of the pedestrian crashes, the pedestrian was deemed responsible for the initial event and in a further 33 (6%) crashes both the pedestrian and the driver of the motor vehicle were considered at fault.

Table 2.5 shows the number and percentage of crashes of each type with at least one of the various types of factors.

Pedestrian factors were considered contributory in 79%. These are tabulated separately by DCA type (Table 2.6). Other factors in decreasing frequency were unintentional failure to see the other unit (13%). bad visibility (9%) and alcohol and/or drug use by the driver (7%) and speed (5%).

Table 2.5 Number and percentage of pedestrian and other fatal crashes attributed to various factors. Significantly high percentages are highlighted.

| Factor | Pedestrian crash | | Other crash | |
|---|---|---|---|---|
| | n | % | n | % |
| Pedestrian factor | 417 | 79% | 0 | 0% |
| Pedestrian error | (341) | (65%) | (0) | (0%) |
| Alcohol/drugs | (146) | (28%) | (0) | (0%) |
| Failure to observe other unit | 71 | 13% | 225 | 12% |
| Visibility | 46 | 9% | 127 | 7% |
| Driver error | 42 | 8% | 557 | **29%** |
| Alcohol/drug use by driver | 35 | 7% | 624 | **33%** |
| Speed | 27 | 5% | 501 | **26%** |
| Surface conditions | 6 | 1% | 125 | 7% |
| Vehicle defects | 5 | 1% | 81 | **4%** |
| Fatigue | 4 | 1% | 167 | **9%** |
| Crashes for which at least one major factor noted | 526 | | 1891 | |

The percentages do not sum to 100% since up to 3 major factors can be recorded for each crash. The 'n' in the table is the number of crashes with at least one of the specific major factors recorded for the crash. The percentage is calculated with the denominator as the number of crashes with some information on major factors.

The frequency of alcohol/drug use by pedestrians, though high (28%), was similar to that of drivers involved in other fatal crashes (33%). A similar statement could be made for unintentional failure to observe the pedestrian or other vehicle (13% vs 12%) and for visibility (9% vs 7%). Conversely, speed, fatigue, driver errors, vehicle defects, surface conditions were less frequent major factors than in other fatal crashes.

'Unintentional failure to see the other unit' was considered to be a factor in 13% of pedestrian crashes. Further subdivision showed that this factor to be more common among pedestrian crashes in which both parties were at fault (42%) or the driver was at fault (23%) than among those where the pedestrian was at fault (7%).

Further examination of major factors was made within urban and rural groups. The incidence of pedestrian drug and alcohol use was higher in rural areas as opposed to urban regions (44% vs 26%).

The pedestrian factors are tabulated by DCA type in Table 2.6. Alcohol and drugs were prominent in DCAs in which the pedestrian was either playing, working, lying, standing, or walking with or against the line of traffic on the carriageway.

By definition, 'stepping from behind an obstruction' obviously is a common factor in the 'pedestrian emerging' DCAs, but it also appears in the 'far side' crashes.

The proportion of misjudgment factors is highest for the 'far side' crashes, and figures prominently in both the 'near side' and pedestrian 'emerging' crashes.

Table 2.6 Number and percentage of pedestrian crashes attributed to at least one various pedestrian factors within DCA types. Significantly high percentages are highlighted. Percentages do not sum to 100% since more than one factor might be noted for one crash.

| | Emerge | | Near side | | Far side | | On c'way playing walking | | Other | | Total | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Factor | n | % | n | % | n | % | n | % | n | % | n | % |
| Alcohol /drugs ......... | 6 | 14% | 42 | 22% | 47 | 28% | 48 | 56% | 3 | 8% | 146 | 28% |
| Slow ........... | 3 | 7% | 21 | 11% | 18 | 11% | 4 | 5% | 2 | 5% | 48 | 9% |
| From behind vehicle ........ | 26 | 59% | 8 | 4% | 22 | 13% | *0* | *0%* | *0* | *0%* | 56 | 11% |
| Skylarking.. ... | 0 | 0% | 2 | 1% | 1 | 1% | 6 | 7% | *0* | *0%* | 9 | 2% |
| Misjudgment. .. | 24 | 55% | 111 | 59% | 118 | 69% | 16 | 19% | 4 | 11% | 273 | 52% |
| Against traffic control ........ | 3 | 7% | 16 | 8% | 11 | 6% | 5 | 6% | 1 | 3% | 36 | 7% |
| Jaywalk ........ | 1 | 2% | 3 | 2% | 5 | 3% | *0* | *0%* | *0* | *0%* | 9 | 2% |
| Any pedestrian factor ........... | 44 | | 189 | | 170 | | 85 | | 38 | | 526 | |

A total of 44 pedestrian crashes (8%) were hit and run crashes.

## Persons involved

### Pedestrians

A total of 575 pedestrians were involved in these accidents. Of these, 542 (94%) were killed or died within 30 days, 21 were hospitalised with non-fatal injuries and the remaining 12 required medical attention.

The other road users involved in these accidents included 538 drivers, 345 passengers and 15 motorcyclists. Of these, a motorcyclist and pillion passenger died, and the proportions injured (medical treatment/hospitalisation) were 5%, 5% and 53% in these three groups, respectively. Compared with other fatal crashes, the risk for injury or death for motor vehicle occupants in these pedestrian accidents was low.

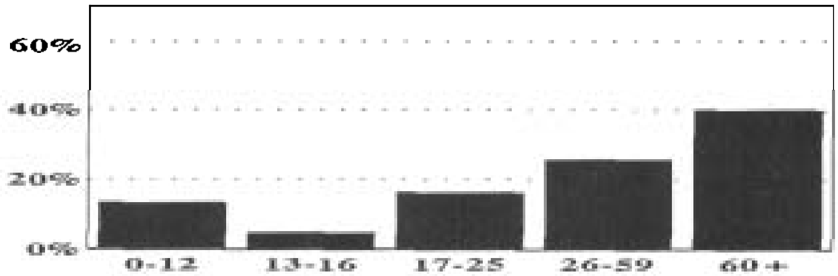
### Pedestrian fatalities

Two thirds of the 542 pedestrians killed were male (361; 67%). This is a smaller percentage compared with fatalities in other crashes (72%).

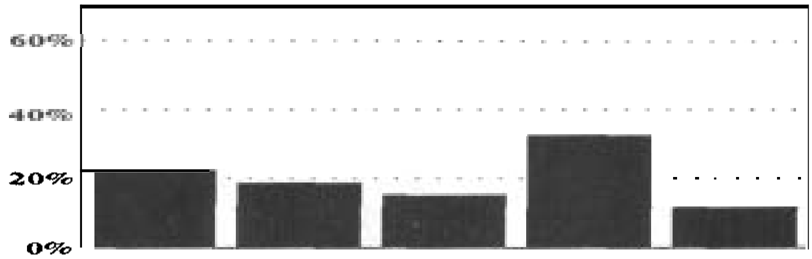
Children and aged persons were over represented in the pedestrian fatalities (Figure 2.7). Three times as many children under 13 years (13%) and persons 60 years or older (40%) were killed in pedestrian crashes compared with other road fatalities.

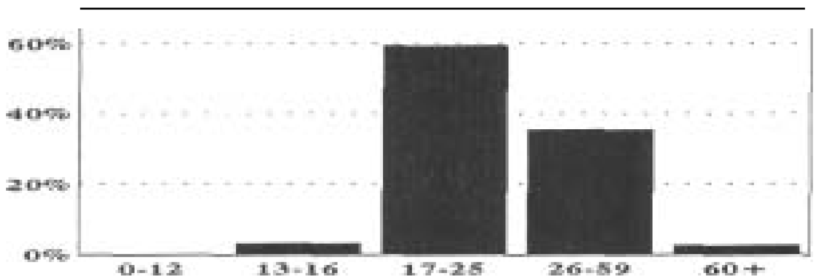
The extremes in the age distribution appeared more pronounced for women with 18% vs 11%, girls vs boys 12 years or younger; and 47% vs 38% for women vs men 60 or over. However, in comparison with the age distribution of other road fatalities the largest proportional excesses were for the young girls and older men. Figure 2.8 displays age groups for male and female pedestrian and other fatalities.

Thirty-six (7%) of the pedestrians killed were noted as being physically handicapped, and of these, 29 were aged 60 or over. The handicap was noted as sensory for 30 pedestrian fatalities.

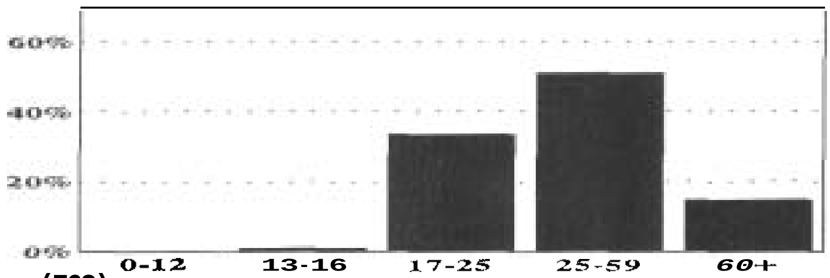



Cyclists (86)

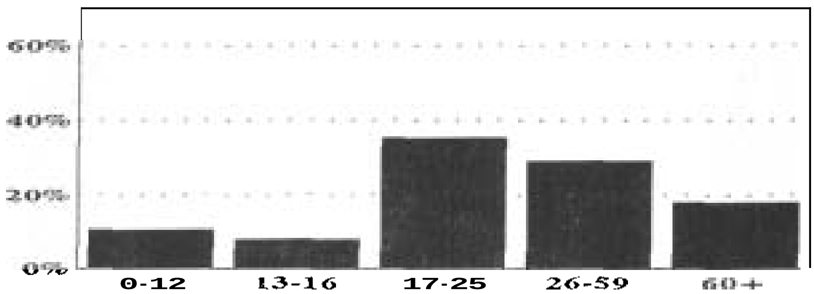



Drivers (1147)



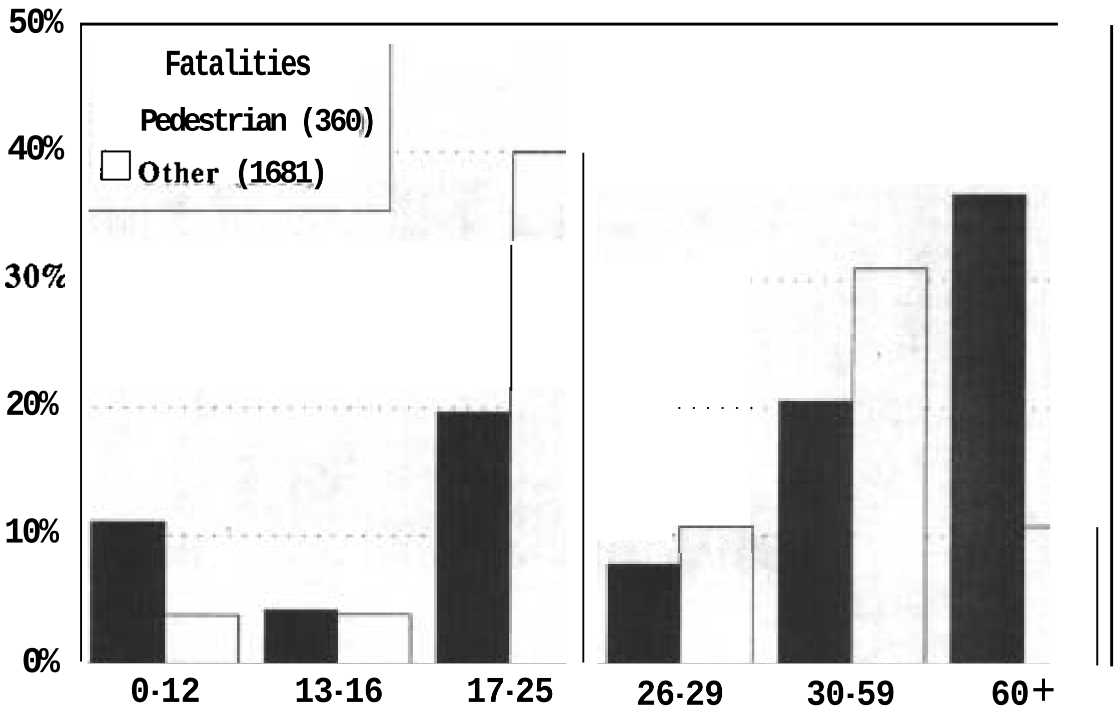

Passengers (763)



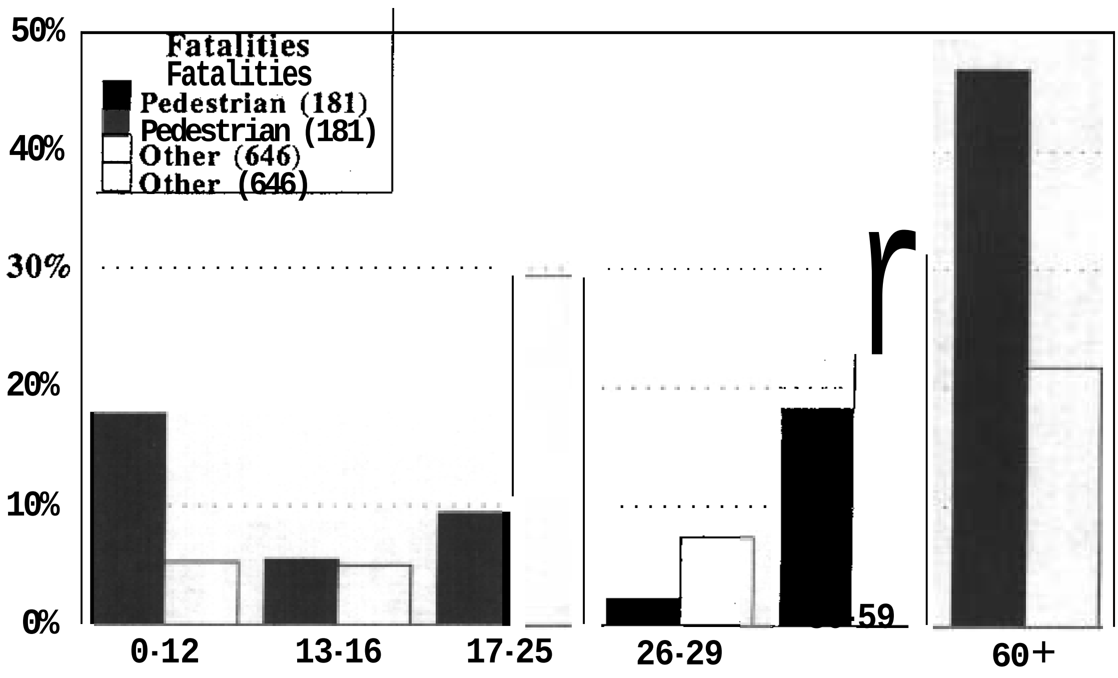

**Source: FORS *1988* Fatal file**

Figure 2.8 Male and female pedestrian and other road fatalities by age group

## Males




## *Females*




Source: FORS 1988 Fatal file

## Employment status

Information on employment status was available for 82% of the road accident victims in the fatal file. Due to the larger numbers of children and older persons, only 27% of the pedestrian fatalities were active in the work force, compared to 60% of other road fatalities.

The distribution of different occupations for different categories of road user fatalities are given in Table 2.7. For reference, the corresponding figures for the Australian working population in 1986 are also shown. Though not shown in this Table, analyses were conducted disaggregated further by sex and age (15-24, 25-59, 60+) due to the differences between these groups (Appendix Table A1). Considering only active members of the work force, there were fewer professional and white collar workers and more blue collar workers among road fatalities than in the population in general. These differences were mainly observed for men, though the proportion of female professionals killed was also lower. These differences were observed in all age groups.

Within each of the various road user categories, the major distinctions relative to the general population were similar. However, comparing between these groups, there tended to be proportionally more plant operators and labourers among the pedestrian fatalities, more tradespersons among the motorcycle accident victims and more professionals among the motor vehicle occupants. These differences were observed for all age groups and, generally, for males rather than females.

Table 2.7 Percentage of fatalities in different occupations for each road user category. ABS data for the Australian population in 1986 are also shown. Note that these figures exclude persons not in the work force such as students, unemployed and retired persons, and persons at home.

| | Road user fatality groups | | | | | Australian work force[1] |
|---|---|---|---|---|---|---|
| Employment category | Pedestrian | Cyclist | MC + pillion | Motor vehicle occupant | Total | |
| Manager/ professional | 7% | 10% | 4% | 18% | 15% | 30% |
| Trades | 23% | 10% | 41% | 19% | 23% | 15% |
| Clerical/sales/ service | 14% | 24% | 11% | 21% | 18% | 30%[2] |
| Plant op/labourer | 49% | 45% | 38% | 36% | 38% | 23% |
| Other employed | 6% | 10% | 5% | 7% | 6% | 3% |
| Total employed | 124 (100%) | 29 (100%) | 203 (100%) | 895 (100%) | 1251 (100%) | 6513547 (100%) |
| % in work force[3] | 27% | 40% | 77% | 58% | 53% | |

[1] Source ABS ASCO 1986
[2] The significant difference for clerical workers is due to the smaller percentage of females killed in road crashes. See Appendix Table A1
[3] The percentage of fatalities with information on employment status who were in the work force.

## Blood alcohol content

Blood alcohol content (BAC) was tested in 350 (65%) of the pedestrians killed, a lower proportion compared with 79% of other operator fatalities (drivers, MC riders, cyclists). However, the percentage of pedestrians over the age of 16 who were tested (80%) was higher than the corresponding percentage of operator fatalities (73%).

Of those pedestrians tested, 45% could be determined non-zero and 42% over 0.05 g/100ml. The proportion over the limit was not significantly higher than driver or motorcyclist fatalities (Table 2.8). However, when analysed taking age into account, significantly more pedestrians were found to have elevated values within each of the age groups (17-25, 26-59 and 60+) (Table 2.8).

Table 2.8 Number and percentage of pedestrian and other road user fatalities with blood alcohol content (BAC) tested and over 0.05 gm/100ml. Figures are also given broken down by age. Significantly high percentages relative to other road user groups (across a row) are highlighted.

| | Pedestrian fatalities | | Bicyclist fatalities | | MC rider[1] fatalities | | Driver fatalities | |
|---|---|---|---|---|---|---|---|---|
| **Fatalities** | n | % | n | % | n | % | n | % |
| Total | 542 | | 86 | | 295 | | 1147 | |
| Total tested | 350 | 65% | 54 | 63% | 242 | 82% | 912 | 80% |
| BAC>0.05 gm/100ml | 143 | | 7 | | 98 | | 334 | |
| BAC>0.05, % of those tested | | 42%[2] | | 13%[2] | | 41%[2] | | 37%[2] |
| BAC>0.05, % of total | | 26%[3] | | 8%[3] | | 33%[3] | | 29%[3] |
| BAC >0.05 by age | | | | | | | | |
| c17 years | 4 | 17%[2] | 0 | 0%[2] | 2 | 40%[2] | 2 | 29%[2] |
| 17-25 years | 51 | 73%[2] | 2 | 22%[2] | 55 | 39%[2] | 140 | 45%[2] |
| 26-59 years | 59 | 59%[2] | 5 | 25%[2] | 41 | 47%[2] | 178 | 39%[2] |
| 60+ years | 29 | 19%[2] | 0 | 0%[2] | 0 | 0%[2] | 14 | 11%[2] |

[1] MC riders excluding pillion passengers
[2] Percentage of those tested with accurate results (1% of those tested had inaccurate results).
[3] Percentage of total (tested plus not tested)

The non-zero BAC values were, in general, higher for pedestrians than for operator (driver, cyclist and motorcyclist) fatalities (median 0.19 vs 0.17 gm/100ml). In fact, the percentage of pedestrian fatalities with BAC>0.15 was significantly higher than drivers/rider fatalities (30% vs 24%). This was also reflected in that alcohol use was noted as a significant factor for 28% of the pedestrian fatalities compared with only 23% of the other fatalities.

The pedestrian fatalities with non-zero BAC were older than other operator fatalities with alcohol in their blood (median age 29 vs 27 years).

## Drug use

Thirty-five (6%) of the pedestrian fatalities were tested for drugs, a lower proportion than other fatalities (10%). Of these 35, 15 were tested for cannabis, 14 for opiates, 6 for cocaine, 4 for anti-convulsives, anti-anxiety drugs and sedatives, and 2 for other drugs. For 13 (37% of 35; or 2% overall) pedestrian fatalities, at least one drug test was positive; a similar fraction to other fatalities. These include 4 instances of opiate use, 4 anti-convulsive, 3 cannabis and 2 anti-anxiety. Drug use was noted as a significant factor for 10 of these persons (2% of pedestrians killed).

### Drivers/riders

Of the 551 persons in control of vehicles involved in pedestrian crashes, one (a motorcyclist) died. Men predominated, 81%, as for other crashes.

In comparison with other 'drivers' involved in other fatal crashes, they were younger (median age 28 vs 30). Just over half were under 30 (54%), compared with 46% in the same age group for other crashes. This was observed for both men and women.

A total of 378 (72%) of the drivers involved in pedestrian crashes were tested for blood alcohol; a similar proportion as for other drivers. However, a lower fraction tested were over the 0.05 limit: 11% vs 29%. Only one was tested for drugs (with a negative result).

## Medical details

The timing of death is tabulated below (Table 2.9) for different road user categories. Half of the pedestrians died in hospital and similar proportions died instantaneously and at the scene before medical help arrived (19% each). This was similar to bicycle fatalities. A higher proportion of instantaneous deaths occurred for motorcyclists (32%) and motor vehicle occupants (28%). Further subdivision showed that these patterns characterised urban fatalities. In rural areas, approximately one third of the fatalities were instantaneous and about 38% occurred before medical attention for all road user groups. Thus, although Table 2.9 shows significant differences in the timing of death for different road users, these differences are primarily due to the fact that pedestrian and bicyclist crashes tend to occur in urban areas.

Table 2.9 Timing of death for different road user categories. Significantly high percentages within columns are highlighted.

| Road user fatality group | Instantaneous | | Before med. attention | | During med. attention[1] | | In/after hospital | | Total 100% |
|---|---|---|---|---|---|---|---|---|---|
| | n | % | n | % | n | % | n | % | n |
| Pedestrian | 103 | 19% | 101 | 19% | 48 | 9% | 280 | 53% | 532 |
| Bicyclist | 9 | 10% | 20 | 23% | 12 | 14% | 45 | 52% | 86 |
| Motorcyclist | 91 | 29% | 05 | 27% | 32 | 10% | 107 | 34% | 315 |
| Vehicle Occupant | 588 | 32% | 598 | 32% | 196 | 11% | 453 | 25% | 1832 |
| Total fatalities | 791 | 28% | 801 | 29% | 288 | 10% | 885 | 32% | [2]2765 |

[1] includes in transit to hospital
[2] excludes 103 with *time* to death unknown and 5 road user category unknown and 2 riders of animals

The location of injuries (sufficiently serious to be coded on the Abbreviated Injury scale (AIS, 1985 version) as serious, severe, critical or maximum) for pedestrians is compared with other road user fatality groups in Table 2.10. For pedestrian fatalities, head injuries were most common (78%), followed by chest (60%), lower extremities (39%), abdomen/pelvis (25%) and spine(14%). Head injuries were more common among pedestrians, bicyclists and motor cyclists compared with motor vehicle occupants. There were fewer chest and abdomen/pelvic injuries for pedestrians than for the other road user groups. The incidence of lower extremity injuries, on the other hand, was high (39%) compared with motor vehicle occupants (27%) and bicyclists (21%).

Table 2.10 Number and percentage of persons killed sustaining at least one serious injury (AIS Abbreviated Injury Score 3-6) in different body regions. Different road users are tabulated separately. Because a person may sustain one or more serious injuries in one or more body region, percentages do not *sum* to 100%.

| | Road user fatality group | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Pedestrian | | Bicyclist | | MC rider or pillion | | Motor vehicle occupant | |
| Fatalities with at least one serious injury to the: | n | % | n | % | n | % | n | % |
| Head | 424 | 78% | 69 | 80% | 224 | 75% | 1295 | 68% |
| Face | 8 | 1% | 1 | 1% | 8 | 2% | 59 | 3% |
| Neck | 5 | 1% | 2 | 2% | 7 | 2% | 30 | 2% |
| Chest | 323 | 60% | 54 | 63% | 223 | 69% | 1267 | 66% |
| Abdomen/pelvis | 135 | 25% | 23 | 27% | 103 | 32% | 600 | 31% |
| Spine | 75 | 14% | 7 | 8% | 44 | 14% | 208 | 11% |
| Upper extremity | 31 | 6% | 2 | 2% | 33 | 10% | 140 | 7% |
| Lower extremity | 209 | 39% | 18 | 21% | 106 | 33% | 515 | 27% |
| Total fatalities | 542 | | 86 | | 324 | | 1916 | |

Table 2.11 Coroner's assessment of final cause of death for different road user groups.

| | Road user category | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Pedestrian | | Bicyclist | | MC rider or pillion | | Motor vehicle occupant | |
| Cause of death: body region | n | % | n | % | n | % | n | % |
| Head | 233 | 43% | 40 | 47% | 122 | 38% | 690 | 36% |
| Chest | 37 | 7% | 4 | 5% | 39 | 12% | 241 | 13% |
| Abdomen/pelvis | 6 | 1% | 2 | 2% | 7 | 2% | 44 | 2% |
| Spine | 26 | 5% | 2 | 2% | 10 | 3% | 91 | 5% |
| Lower extremity | 28 | 5% | 3 | 3% | 15 | 5% | 75 | 4% |
| Other | 0 | 0% | 0 | 0% | 3 | 1% | 42 | 2% |
| Multiple | 179 | 33% | 30 | 35% | 123 | 38% | 601 | 31% |
| Indirect/non-crash | 33 | 6% | 5 | 6% | 5 | 2% | 132 | 7% |
| Total fatalities | 542 | 100% | 86 | 100% | 324 | 100% | 1916 | 100% |

The higher incidence of head injuries was also reflected in the final cause of death (43%). The incidence of death due to multiple injuries was similar in all groups (33%) (Table 2.11).

Of the pedestrian fatalities with serious head injuries, 51% of these persons sustained serious skull fractures. This percentage was similar to motor vehicle occupant fatalities (52%) and less than cyclist (64%) and motorcyclist (66%) fatalities with head injuries (Table 2.12). The distribution of location of the fractures was similar, in general, for all road user groups. Two thirds of the fractures coded as serious or severe were fractures at the base of the skull (Table 2.12). However, the AIS coding of base and vault fractures is such that some of the vault fractures have an AIS severity coding of moderate(2). These are also shown in Table 2.12. On including these, some differences become apparent between the road user groups. Cyclists and motorcyclists had the highest percentage of base fractures. Pedestrians had proportionally the most moderate vault fractures and motor vehicle occupants had proportionally the most serious/severe vault fractures.

Table 2.12 Number and percentage of skull fractures coded as moderate, serious or severe sustained by pedestrian and other road user fatalities. Significantly high percentages across rows are highlighted.

| | Pedestrian fatalities | | Bicyclist fatalities | | MC rider[4] fatalities | | Motor vehicle occupant fat. | |
|---|---|---|---|---|---|---|---|---|
| | n | % | n | % | n | % | n | % |
| **Skull fractures** | | | | | | | | |
| Base (serious+severe)[1] | 175 | 47% | 39 | 57% | 123 | 57% | 522 | 51% |
| Vault (moderate)[2] | 109 | 29% | 15 | 22% | 39 | 18% | 226 | 22% |
| Vault (serious+severe)[3] | 87 | 23% | 15 | 22% | 53 | 25% | 276 | 27% |
| Total skull fractures | 371 | 100% | 69 | 100% | 215 | 100% | 1024 | 100% |
| **Skull fractures (excluding moderate)** | | | | | | | | |
| Base (serious+severe)[1] | 175 | 67% | 39 | 72% | 123 | 70% | 522 | 65% |
| vault (serious+severe)[3] | 87 | 33% | 15 | 28% | 53 | 30% | 276 | 35% |
| Total skull fractures | 262 | 100% | 54 | 100% | 176 | 100% | 798 | 100% |

| | | AIS code (1985) |
|---|---|---|
| 1 | Base NFS (Not further specified) | 20701.3 (serious) |
| | Base with or Without CSF leak | 20702.3 (serious) |
| | *Base* complex (open, dura torn with tissue loss) | 20703.4 *(severe)* |
| 2 | Vault NFS (Not further specified) | 20704.2 (moderate) |
| | Vault closed/undisplaced/diastatic/linear/simple | 20705.2 (moderate) |
| 3 | Vault comminuted/compound/depressed/displaced | 20706.3 (serious) |
| | Vault complex (open, dura torn with tissue loss) | 20707.4 [severe) |
| | vault massively depressed (large areas of skull depressed, 2cm) | 20708.4 (severe) |

[4] MC riders includes pillion passengers

## Subgroups

Table 2.13 attempts to characterise the main types of pedestrian crashes, subdivided by crash pattern (DCA). The major differences are highlighted in the tables and summarised in the following text. For further information on these subgroups, see Table 2.6.

The four main groups were named, emerging, near side, far side and on carriageway. The emerging group included crashes where the pedestrian came from in front of a stationary or parked vehicle and was hit from the right. In near side crashes, the pedestrian proceeded from the kerb, median or side of the road and was also hit by a vehicle from the right whereas in *far* side crashes, the pedestrian was hit from the left. Crashes on the carriageway include those where a pedestrian was playing, working, lying, standing or walking with or against the traffic on the carriageway.

The collisions with pedestrians emerging comprised 8% of pedestrian crashes. They usually occurred in urban low speed zones in the afternoon, with the pedestrian at fault. Half the pedestrians killed were school age (<17) and one quarter were more than 60 years old. Seventeen of the children were under 10 years of age (39%).

The near side pedestrian crashes, in comparison with emerging crashes, were more frequent (36%), occurred later in the afternoon and evening, and in low and even some high speed (9%) urban areas. The driver was at fault for one in three of these crashes. The pedestrians killed were older with half being at least 60 years of age.

The far side pedestrian crashes (32%) were similar in almost all respects to the near side crashes. Slightly more occurred mid-block.

The on carriageway pedestrian crashes (16%) were quite distinct from the other groups. They occurred in general at night, often in rural high speed zones and alcohol often played a role. The median age of the pedestrians killed in such crashes was 25, younger than all but the 'emerging' group.

The remainder of the pedestrian crashes (7%) included cross traffic crashes, the pedestrians on the footpath or median, and/or the vehicle was out of control. In most of these, the driver was at fault. The median age of pedestrians killed was similar to the near and far side crashes (57 years).

Table 2.13 Characteristics of the major DCA groups of fatal pedestrian accidents.

| | Emerging | | Near side | | Far side | | On C'way | | Other | | Total | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | n | % | n | % | n | % | n | % | n | % | n | % |
| No. of crashes | 44 | 8% | 193 | 36% | 171 | 32% | 88 | 16% | 39 | 7% | 535 | 100% |
| Weekend | 11 | 25% | 37 | 19% | 54 | 32% | 37 | 42% | 16 | 41% | 155 | 29% |
| Night [1] | 6 | 14% | 79 | 41% | 86 | 51% | 64 | 73% | 12 | 31% | 247 | 46% |
| Urban low speed | 42 | 95% | 170 | 89% | 148 | 87% | 46 | 52% | 31 | 79% | 437 | 82% |
| Rural high speed | 1 | 2% | 5 | 3% | 12 | 7% | 31 | 35% | 6 | 15% | 55 | 10% |
| Mid-block | 33 | 75% | 127 | 66% | 119 | 70% | 76 | 86% | 24 | 63% | 379 | 71% |
| Near intersection | 7 | 16% | 43 | 22% | 30 | 18% | 6 | 7% | 5 | 13% | 91 | 17% |
| Pedestrian's fault | 40 | 93% | 137 | 74% | 120 | 75% | 54 | 65% | 7 | 18% | 358 | 70% |
| BAC pedestrian>.05 | 5 | 25% | 41 | 33% | 43 | 38% | 47 | 76% | 4 | 19% | 140 | 41% |
| BAC driver >.05 | 1 | 4% | 9 | 7% | 14 | 11% | 13 | 25% | 4 | 15% | 41 | 11% |
| Pedestrian ≤16y | 22 | 50% | 29 | 15% | 26 | 15% | 10 | 11% | 9 | 23% | 96 | 18% |
| Pedestrian 60+ y | 11 | 25% | 93 | 48% | 85 | 50% | 11 | 13% | 16 | 41% | 216 | 40% |
| Median age ped. | 17 | | 57 | | 60 | | 25 | | 53 | | 46 | |
| commonest period | 2-6pm | | 4-8pm | | 4-8pm | | 0-4am | | 4-8pm | | 4-8pm | |

[1] Night excluding dawn and dusk.

## Summary

Fatal pedestrian crashes were the largest group of crashes covered in this report, comprising one fifth of all fatal crashes in Australia in 1988.

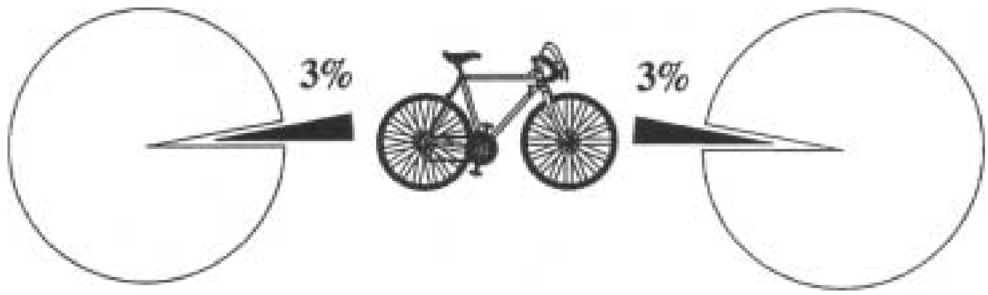
These crashes generally occurred in the afternoons and evenings on weekdays and at night on weekends. A disproportionate number occurred in Winter, but this could not be specifically related to light or weather conditions. Most pedestrians were killed in urban areas, away from intersections and while crossing the road where there were no marked crossings. Most crashes involved a single passenger vehicle. A majority of the pedestrians were considered at fault (69%). The pedestrians killed included children who did not look before crossing, young alcohol affected adults and the largest group (40%) comprised older persons who generally made misjudgments.

Nineteen percent died instantly and just over half died in hospital. Pedestrians, like cyclists, had a high incidence of death due to head injuries. Lower extremity injuries were more common than other road user fatality groups.

The drivers of vehicles involved in these crashes tended to be younger and in many cases did not see the pedestrian. However, they were less likely to be speeding or driving under the influence of alcohol than drivers involved in other fatal crashes.

# Chapter 3: Fatal bicycle crashes

**Crashes** **Fatalities**




**Timing**

- Bicycle crashes peaked after school on weekdays (32% of crashes between 3 & 6 pm)
- There was a morning peak on weekends (22% of crashes between 9 and 12 noon)

**Location**

- Most fatal bicycle crashes (81%) occurred in urban areas.
- Compared with other fatal crashes, an unexpectedly high percentage of bicycle crashes occurred in mid-sized towns (1 000-50 000 inhabitants).

- A high percentage (46%) occurred within or near intersections.

**Crash type**

- 44% of fatal bicycle crashes were rear end collisions. In 24% of crashes, a vehicle ran into a bike, and in 20% the bike ran into a vehicle.

**Contributory factors**

- The cyclist was deemed solely at fault in 67% of fatal bicycle crashes.

- 67% of bicycles in night time fatal crashes had no lights.
- In 50% of the crashes at night, the driver did not see the cyclist.

- There was low alcohol and drug involvement among both the cyclists and drivers involved in these crashes.

**Cyclists**

- 86% of cyclists killed were male.

- 22% of the cyclists killed were children (aged 4-12 years).
- 19% of the cyclists killed were school aged teenagers (aged 13-16 years).

- 3% of cyclists killed wore helmets.

- 47% of cyclists killed died of head injuries, 33% died of multiple injuries.
- 52% of cyclist6 killed died in hospital.

## Definition

A bicycle crash was defined as any crash in which at least one bicyclist was killed or died within 30 days as a result of injuries sustained. A bicyclist may be a bicycle or tricycle rider or a pillion passenger.

## Frequency

There were 85 such crashes in 1988 (with 86 cyclists killed). This represents 3% of all fatal crashes and 3% of road fatalities in Australia that year. Of persons involved in these accidents, the only fatalities were the 86 cyclists. There were no bicycle pillion riders involved in these accidents. Two of the motor vehicle drivers and one passenger involved in these crashes were injured.

These crashes involved 86 bicycles and 79 other vehicles, totalling 4% of vehicles involved in fatal accidents.

Note that one additional crash in the fatality file involved a bicyclist. This was, however, included in the pedestrian chapter as it involved a bicycle and a pedestrian. The pedestrian died and the bicyclist sustained non-fatal injuries.

## Contrast groups

In this chapter, unless stated otherwise, fatal bicycle crashes were compared with all other fatal crashes. Non-stationary vehicles in bicycle accidents were compared with non-stationary vehicles in other fatal accidents. Bicycle fatalities were compared with other fatalities and drivers of non-stationary vehicles involved in bicycle accidents were compared with drivers of non-stationary motor vehicles in other fatal accidents.

## Timing

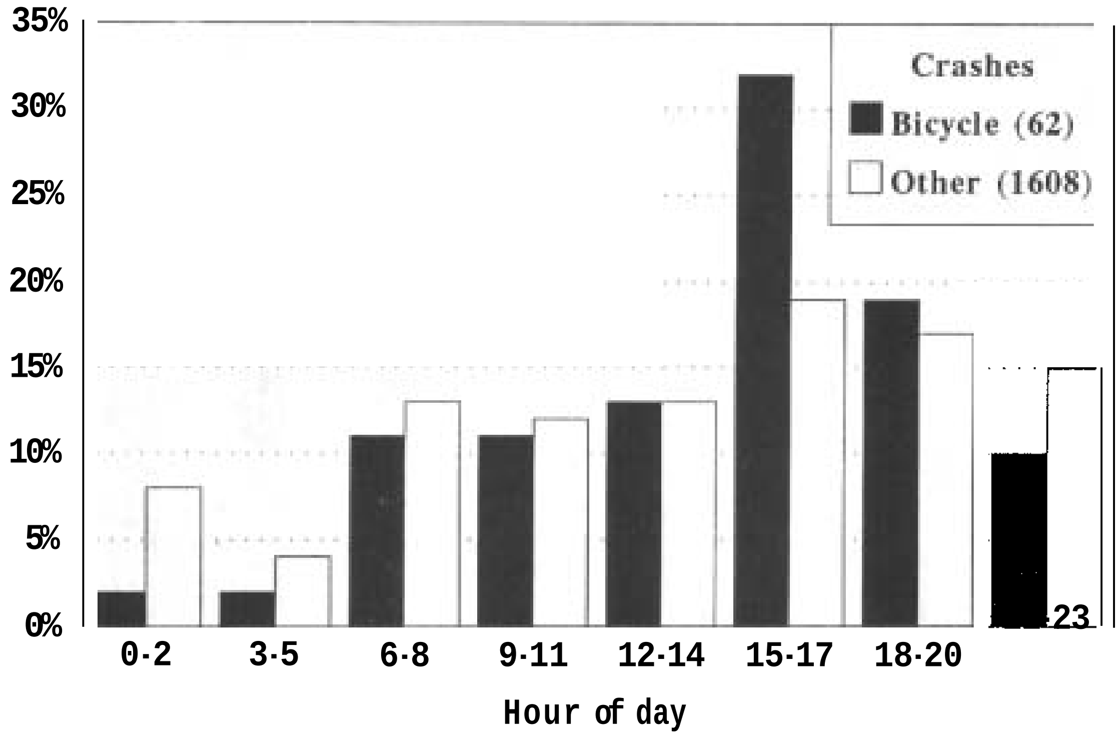
No particular month or season was worse than any other. Also, the pattern of bicycle crashes during the week followed that of all other crashes, peaking on Friday and Saturday.

Slightly, but significantly, more bicycle crashes occurred during the day (67%) as compared with all other fatal crashes, which, in general, had equal numbers during the day and night.

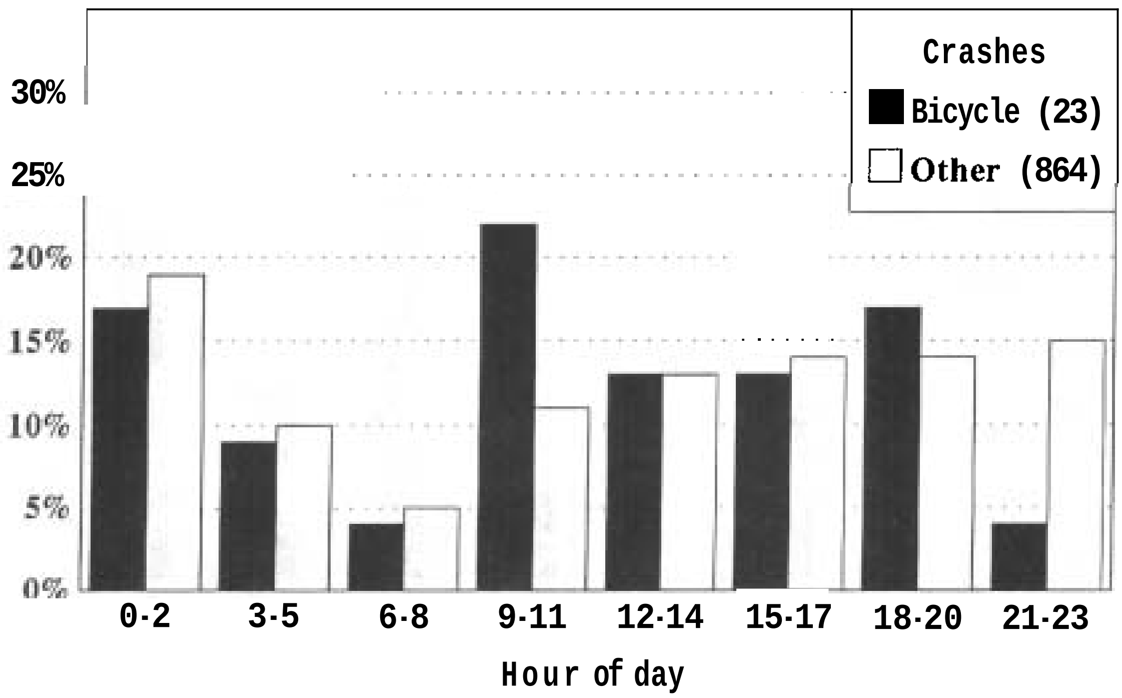
Proportionally more bicycle accidents occurred between 3 and 6 in the afternoon (27% vs 17%). This was essentially due to a peak during that period on weekdays (32% vs 19%) which was not evident at all on the weekends, for which the excess occurred in the morning (9-12) (22% vs 11%). See Figure 3.1. Subdivision by age of cyclist showed that the peak for school age children (<17 years) occurred after school on weekdays and slightly earlier during the day on weekends. For adults, a morning and afternoon peak occurred on weekdays and a morning and night peak occurred on weekends. See Figure 3.2.

Figure 3.1 Bicycle and other crashes on weekdays and weekends in 3 hour periods

Weekdays



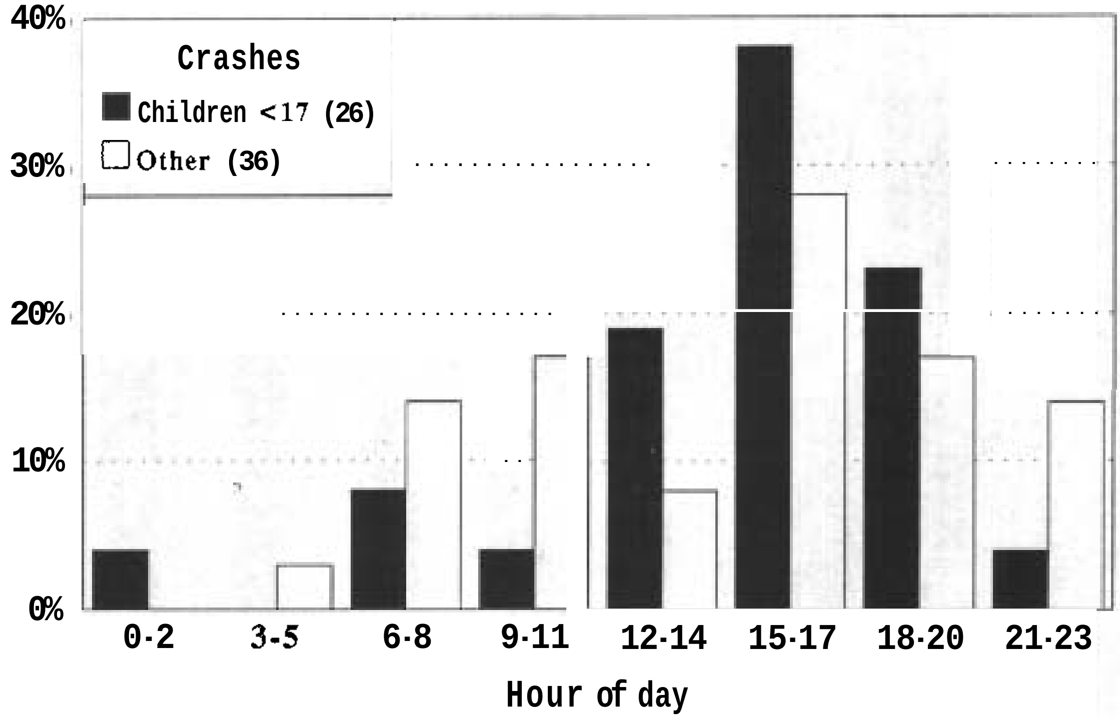

Weekends



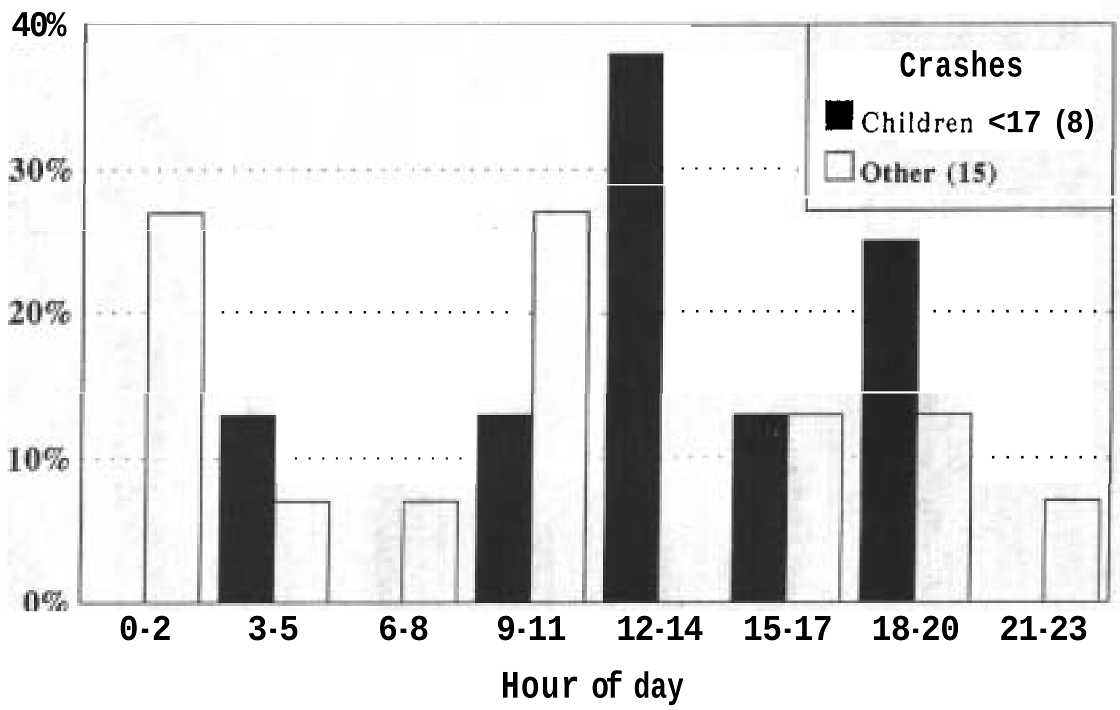

Source: ***FORS*** 1988 Fatal file

Figure 3.2 Bicycle crashes involving school age (<17) and other, older cyclists on weekdays and weekends in 3 hour periods

Weekdays




Weekends




Source: FORS 1988 Fatal file

## Location

The distribution by State followed that all fatal crashes.

Bicycle crashes predominantly occurred in urban areas with 81% in cities and towns (>200 inhabitants) compared with 53% of other crashes. The highest relative frequency was in medium sized towns (population 1000-50000) with 24 fatalities (28% vs 9%).

In 68% of bicycle crashes, the adjacent land use category was residential (or part residential). A total of 31% of bicycle crashes occurred in areas where the speed limit was at least 80 km/h. Sixty-eight percent of bicycle crashes occurred in urban low speed zones compared to 46% of other crashes.

Almost half (46%) of all fatal bicycle crashes occurred within or near (within 10m of) intersections, compared with only one quarter for all other fatal crashes. This tendency was observed for urban crashes (50% of urban bicycle crashes occurring within or near intersections versus 38% of other fatal urban crashes occurring within intersections) (Figure 3.3), but was more pronounced for rural crashes (5: 31% of rural bicycle crashes associated with intersections vs 11% of other rural crashes)

No particular type of intersection was identified as being high risk.

Of the mid-block collisions, a proportionally more bicycle crashes than other crashes occurred on divided roads (27% vs 15%).

Most (91%) bicycle crashes occurred on straight as opposed to curved roads; compared with only 66% for all other fatal crashes.

## Road and driving conditions

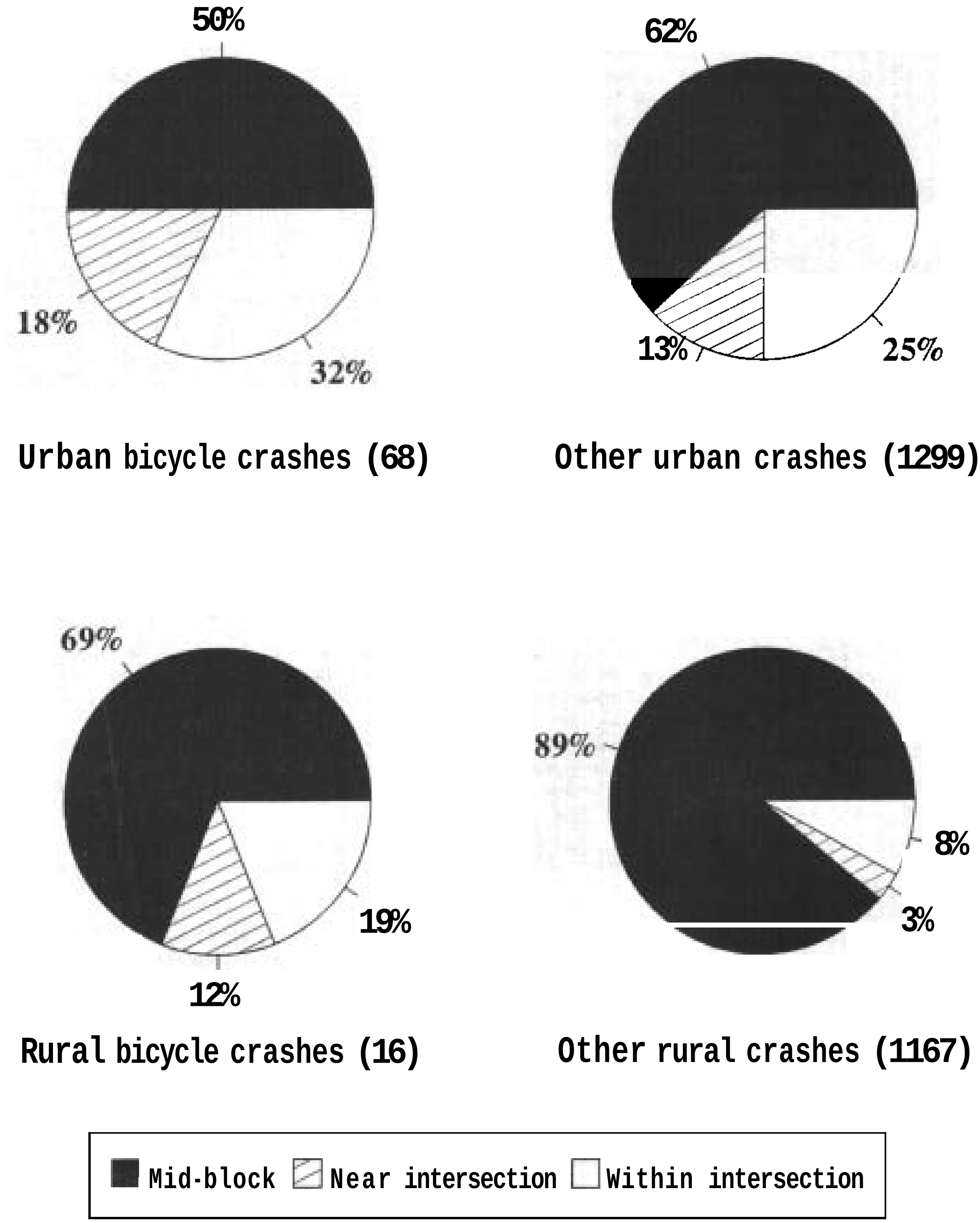
No disproportionate number of bicycle accidents occurred in adverse weather conditions. For example, there were only six bicycle fatalities during rain. Reflecting their usually urban location, almost all occurred on sealed roads.

Of crashes occurring at night, the proportions of bicycle and other crashes occurring in dark conditions of limited visibility (i.e., no street lights) were similar (72% vs 75%). Even within urban and within rural areas the percentages were effectively the same.

## Vehicle characteristics

Seven crashes involved only the bicyclist and two crashes involved the cyclist running into stationary vehiclee. However, the most typical fatal bicycle crash involved a bicycle and a moving motor vehicle (92%). Only one such crash involved 2 vehicles. Of the 77 motor vehicles in these crashes, most were cars (59), with, additionally, 15 trucks, 2 buses and, in one hit and run crash, the type of vehicle was unknown. Only 4 of these vehicles sustained major damage.

Figure 3.3 Location of urban & rural bicycle & other fatal crashes with respect to intersections




Source: FORS 1988 Fatal file

## Crash description

Only 3 bicycle crashes had prior events (4%). compared with 14% of other crashes. The DCA was usually fatal (92%), a higher proportion than in other fatal accidents (82%). In 10 accidents, a subsequent event was identified (12%), not significantly lower than other crashes. In 8 of these subsequent events, the bicycle was out of control and/or hit an object. The other 2 subsequent events were the cyclist lying on the carriageway.

In order to identify particular patterns for accidents involving bicycles and other moving vehicles, the frequencies of the major DCA types were compared with other multiple vehicle crashes. Figure 3.4 shows the relative proportions of bicycle-motor vehicle and motor vehicle-motor vehicle crashes in the following major DCA categories (adjacent, opposing, same directions, manoeuvring, overtaking, other).

Several major differences emerge: bicycle crashes were rarely 'head on', unlike other multiple vehicle crashes. They tended instead to occur with both vehicles travelling in the same direction or manoeuvring. In approximately 20% of both bicycle crashes and multiple vehicle crashes, the vehicles approached each other from adjacent directions (e.g. intersections, entering or leaving the carriageway).

Table 3.1 identifies the major bicycle crash types using the DCA and additional information on the placement and movement of the vehicles involved.

Table 3.1 Bicycle crashes grouped by road crash pattern.

| Crash pattern | n | % |
|---|---|---|
| Bike struck *from behind* | 20 | 24% |
| Bike hits other vehicle same direction | 17 | 20% |
| Cross traffic accident at or near intersection | 20 | 24% |
| Bicycle entering carriageway from driveway/footpath/median | 13 | 15% |
| Bicycle out of control | 8 | 9% |
| Bike into car door or parked vehicle | 2 | 2% |
| Head *on* crash | 2 | 2% |
| Unknown | 3 | 4% |
| Total bicycle crashes | a5 | 100% |

Rear end collisions comprised 44%. Of these, there were almost as many involving the bike running into the other vehicle, as with a motor vehicle running into a bicycle. The most common bike manoeuvre resulting in the bike hitting a vehicle travelling in the same directions was a lane change from the left to the right lane (5 cases).

Fifteen of the 20 cross traffic collisions occurred within intersections. The other five occurred within 10 metres of intersections. One quarter to one third of the other types of fatal bicycle crashes occurred at or near intersections (Table 3.6)

Table 3.2 gives the distribution of the point of primary impact (i.e. that most likely to have caused the fatality) for bicycles and other vehicles involved in bicycle crashes. Bicycles had proportionally more rear impacts. The number of full frontal impacts was about one third for both, but vehicles had proportionally more front angled impacts on the right and especially the left. For the sides of the vehicles, bicycles were more often hit on the right side, and the other vehicles more often hit on the left side, suggesting the bicycle was more often on the left hand side of the other vehicle.

Table 3.2 Place of impact on the bicycle and motor vehicle for vehicles involved in fatal bicycle crashes.

| | Impact | | | |
|---|---|---|---|---|
| | On bicycle | | On other vehicle | |
| Point of impact | n | % | n | % |
| Front of vehicle | 24 | 35% | 48 | 65% |
| Front centre | 24 | 35% | 26 | 35% |
| Front left | 0 | 0% | 14 | 19% |
| Front right | 0 | 0% | 8 | 11% |
| Side of vehicle | 22 | 32% | 22 | 30% |
| Left side | 6 | 9% | 19 | 26% |
| Right side | 16 | 24% | 3 | 4% |
| Rear of vehicle | 22 | 32% | 2 | 3% |
| Undercarriage | 0 | 0% | 2 | 3% |
| Total vehicles | [1]68 | (100%) | [2]74 | (100%) |

[1] Excluding 9 bicycles which *did* not hit another vehicle
3 bicycles with no information on pint of impact
6 bicycles coded as overturn
[2] Excluding 3 vehicles With no information on pint of impact

## Contributory factors

For 6 of the crashes, it could not be determined who, if anyone, was responsible for the crash. In 67% (53) of the remaining crashes, the cyclists were assessed as being responsible for the initial events. In a further 4 crashes (5%), both the cyclist and driver where deemed at fault.

A total of 8 (9%) were hit and run crashes.

In the assessment of which factors contributed to the likelihood of the crash (Table 3.3), alcohol/drugs (drivers 7, cyclists 4, both 1), driver errors and excessive speed were less frequent in bicycle crashes than in other fatal crashes. The factor 'failure to observe the other unit' (cyclist (12). motor vehicle (14)), was more frequent for bicycle crashes.

There were 34 cyclist errors; included among these were 13 traffic rule breaches (5 at give way sign, 2 through red lights, 3 give way convention, 3 other). In nine cases, the cyclist fell from the bicycle. The most commonly reported factor was a dangerous manoeuvre by the cyclist (22); Nine of these being cross traffic crashes within intersections and 6 involved the cyclist entering traffic from a driveway or lane or footpath.

Table 3.3 Number and percentage of bicycle and other fatal crashes attributed to various factors. Significantly high percentages across rows are highlighted.

| Factor | Bicycle crash | | Other crash | |
|---|---|---|---|---|
| | n | % | n | % |
| Cyclist factor | 39 | 49% | 1[1] | 0% |
| Failure to observe other unit | 26 | 33% | 268 | 11% |
| Alcohol/drugs | 12 | 15% | 786 | 34% |
| Driver error | 8 | 10% | 594 | 25% |
| -Road rule breach | (2 | 3%) | (274 | 12%) |
| Visibility | 6 | 8% | 167 | 7% |
| Vehicle defects | 5 | 6% | 81 | 3% |
| Speed | 2 | 3% | 526 | 23% |
| Crashes for which at least one major factor noted | 79 | | 2333 | |

*The* percentages do not sum to 100% since up to 3 major factors can be recorded for each Crash. The 'n' in the table is the number of crashes with at least one of the specific major factors recorded for the crash. *The* percentage is calculated with the denominator as the number of crashes with some information on major factors.

[1] This was not included as a bicycle crash as the cyclist was not killed. It involved a collision between a cyclist and a pedestrian, both of whom were intoxicated. The pedestrian was killed.

Of the 21 bicycles involved in fatal crashes at night, two thirds (14; 67%) had no lights and, of these, 10 had no reflectors or other aids for visibility. Nine of the cyclists out at night wore dark clothing.

Table 3.4 is an attempt, despite the small numbers, to characterise the accidents grouped by the following 5 factors: (1) crashes where the cyclist made a dangerous manoeuvre or error, (2) cyclist failing to see the motor vehicle, (3) cyclist intoxicated, (4) driver intoxicated, (5) driver fails to see the cyclist. Note that these groups are not necessarily mutually exclusive since up to three major factors can be noted for any one crash.

The main point to note about the erring cyclists (the largest group) is their age distribution, with more children and aged persons: 12 (36%) up to 12 years of age and 7 (32%) over 60. These accidents tended to occur during the day in urban areas.

This group was similar to crashes in which the cyclist did not see the motor vehicle.

Bicycle crashes in which the cyclist was intoxicated occurred in urban areas, mostly at night, often on weekends, mid-block with older cyclists (median age 27). Bicycle crashes in which the driver was intoxicated were similar but also occurred in rural areas.

Of the crashes where the driver did not see the cyclist, half occurred at night and half within intersections.

Table 3.4 Charaoterisation of 79 fatal bicycle crashes grouped by major factors. Shown in the table are the number and percent of crashes which occur at night (as opposed to day, dawn or dusk), weekend (not weekday), in urban (not rural) areas, in mid-block locations (not near or in intersections) and within (not mid-block or near) intersections for each group of crashes with at least one of a particular type of factor. The median ages of the cyclists (C) and drivers (C) are also shown. For the 6 accidents not included in this table, no particular major factors were recorded.

| Factor group | Crashes | Night | | Weekend | | Urban | | Mid-block | | Within Int | | Age |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | n | n | % | n | % | n | % | n | % | n | % | Median |
| Cyclist error | 33 | 5 | 15% | 8 | 24% | 29 | 88% | 14 | 42% | 11 | 33% | 14 C |
| Didn't see motor vehicle[1] | 14 | 4 | 29% | 2 | 14% | 14 | 100% | 5 | 36% | 5 | 36% | 13 C |
| cyclist intoxicated | 7 | *6* | *86%* | 3 | 43% | 7 | 100% | 5 | 71% | 2 | 29% | 27 C |
| Driver intoxicated | 6 | 4 | *67%* | 4 | *67%* | 3 | 50% | 5 | 83% | 1 | 17% | 28 D |
| Didn't see cyclist[1] | 12 | 6 | 50% | 3 | 25% | 10 | 832 | G | 50% | 6 | 50% | 41 D |
| Total bicycle crashes | 79 | 24 | 30% | 22 | 28% | 66 | 84% | 39 | 50% | 25 | 32% | 21 C<br>33 D |

[1] This was not explicitly coded hut inferred from the major factor variables (unintentional failure to see the other unit) and whether the cyclist or driver was at fault.

## Persons involved

These accidents involved 86 cyclists, 78 drivers and 37 passengers.

## Cyclists

The cyclists were predominantly male (74; 86%) compared with other road fatalities (71%). They were younger than other road fatalities (median age 21 vs 28). As many as 35 were aged 16 or younger (41% vs 9%) and 10 were aged 60 or older (12% vs 19%). Figure 2.7 in the previous chapter shows the percentage of children and teenagers among the bicycle, pedestrian other fatality groups. There were proportionally more teenage cyclists killed than teenage pedestrians (19% vs 5%) and child cyclists killed than pedestrians under the age of 13 (22% vs 13%). The youngest cyclist killed was 4 years old.

Although there were equally many males and females in the extreme age groups, young men (17-29) appeared to be at particular risk. There were no female fatalities in these age groups.

The majority (70%) of cyclists were killed within 5km of their homes. The corresponding figure for drivers was 39%.

Information on origin and destination was available for only approximately half the cyclists and drivers involved. The missing information on purpose of trip was not found to be related to time of day, weekend, time of death, sex or age) for either cyclists, other fatalities, drivers in bicycle crashes or other drivers. Of the larger States, Victoria had the most information for all these groups.

Table 3.5 shows the percentage of cyclists and drivers of vehicles involved in bicycle crashes coming from and going home, work and recreational activities. The cyclists were more likely to be coming from or going to recreational activities than the drivers, higher proportions of whom were coming from or going to work. The origin and destination of vehicles involved in other fatal crashes were more evenly distributed between these groups (not shown in the table).

Table 3.5 Number and percentage of cyclists and drivers of motor vehicles involved in bicycle crashes according to origin and destination. Note that this information was available for only approximately half of the bicycle crashes.

| | Origin | | | | Destination | | | |
|---|---|---|---|---|---|---|---|---|
| | Bicyclists | | Drivers | | Bicyclists | | Drivers | |
| | n | % | n | % | n | % | n | % |
| Home | 14 | 30% | 10 | 22% | 23 | 53% | 20 | 45% |
| Work | 9 | 20% | 24 | 52% | 6 | 14% | 15 | 34% |
| Recreation | 19 | 41% | 8 | 17% | 13 | 30% | 5 | 11% |
| Other | 4 | 9% | 4 | 9% | 1 | 2% | 4 | 9% |
| Total vehicles | 46 | 100% | 46 | 100% | 43 | 100% | 44 | 100% |

## Blood alcohol content

A total of 54 bicyclists were tested for alcohol. Of these, only 7 (13%) showed elevated levels (>0.05), a lower fraction than other fatalities (38%), in general, and other specific road user groups (Table 2.8). Of the seven, two were aged 17 to 25 and five were aged between 26 and 59.

## Drug use

Four cyclists (5%) were tested for drugs (mainly marijuana, opiates and amphetamines), but only one showed a positive result (paracetamol). The fractions tested and tested positive were no different from other road fatalities.

## Drivers

The sex, age distribution and employment status of the drivers of the motor vehicles involved in fatal bicycle crashes were no different from that of other drivers involved in other fatal road accidents.

Fifty (68%) were tested for alcohol and only 7 of these (14%) had levels recorded above 0.05 gm/100 ml. The percentage of drivers over the limit (of those tested) tended to be lower for the drivers involved in fatal bicycle crashes compared with other drivers (14% vs 26%). This same tendency was observed when the percentages were expressed as percentages of all drivers (i.e., those tested plus not those tested (9% vs 18%)).

Of those values that were elevated, the median level was lower than for other drivers (median 0.09 vs 0.17).

None were tested for drugs.

## Medical details

Although 10% of the cyclists died instantaneously, the most striking difference with other fatalities is the high percentage (52%) who died in hospital as a result of their injuries. In this respect they resembled pedestrian fatalities (Table 2.9).

As with other road fatalities, the most common causes of death were head and multiple injuries (accounting for 47% and 35%, respectively).

Helmets were worn by only 3 of the victims. They died of multiple (2) and head (1) injuries. Two of these collided with trucks.

## Subgroups

The following table characterises the main types of bicycle crashes. The major differences are highlighted in the table. The four main groups include two types of rear end crashes, one with a vehicle running into a bike and the other with the bike running into a motor vehicle. These two groups were opposite in more than just the definition. The former usually involved adult cyclists, occurred mid-block with the driver at fault. Proportionally more of these occurred on the weekend, at night and in rural high speed zones. The latter group, on the other hand, usually occurred during the day in urban low speed zones with the cyclist, who was also young, usually at fault.

Cross traffic accidents also usually occurred in urban low speed zones with the cyclist usually at fault. These, however, occurred a little later in the day.

Cyclists killed while entering traffic were most often young children (median age 11 years) and usually considered to be at fault.

The fifth group listed in the tables includes 8 crashes where the bicycle was out of control. The median age of these cyclists was 35, somewhat higher than the other groups.

Table 3.6. Characteristics of the major types of fatal bicycle accidents. The number and percent of crashes occurring on the weekend, at night, in urban low speed or rural high speed zones, mid-block, with the cyclist at fault, with a school age cyclist (or younger) are shown within each crash type. Also shown for these groups are the median age of the cyclist and the commonest 4 hour period.

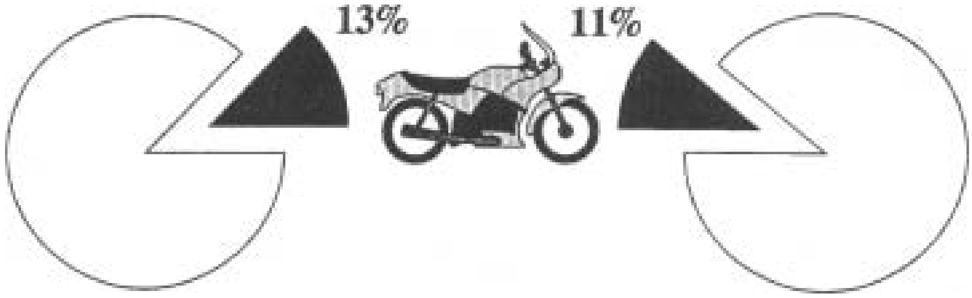
| | Vehicle into bike | | Bike into vehicle | | Cross traffic | | Entering | | Other | | Total | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | n | % | n | % | n | % | n | % | n | % | n | |
| No. of crashes | 20 | 12% | 17 | 20% | 20 | 12% | 13 | 15% | 15 | 18% | 85 | |
| Weekend | 8 | 40% | 4 | 24% | 2 | 10% | 2 | 15% | 7 | 47% | 23 | 27% |
| Night [1] | 9 | 45% | 1 | 6% | 6 | 30% | 3 | 23% | 6 | 40% | 25 | 29% |
| Urban low speed | 6 | 30% | 13 | 76% | 17 | 85% | 11 | 85% | 11 | 73% | 58 | 68% |
| Rural high speed | 10 | 50% | 1 | 6% | 2 | 10% | 0 | 0% | 2 | 13% | 15 | 18% |
| Mid-block | 16 | 80% | 10 | 63% | 0 | 0% | 9 | 69% | 10 | 67% | 45 | 54% |
| Cyclist at fault | 2 | 13% | 16 | 94% | 15 | 83% | 11 | 92% | 9 | 82% | 53 | 72% |
| School age cyclist | 3 | 15% | 9 | 53% | 9 | 45% | 11 | 85% | 2 | 13% | 34 | 41% |
| Median age cyclist | 31 | | 16 | | 18 | | 11 | | 35 | | 21 | |
| Commonest 4h period | 4-8pm | | 12-4pm | | 4-8pm | | 2-6pm | | 10-2pm | | 2-6pm | |

[1] Night excludes dawn and dusk.

## Summary

Bicycle crashes comprised a small group, only 3% of all fatal crashes with only 86 cyclist fatalities. Their occurrence varied on weekdays and weekends and occurred mostly in urban areas (81%), similar to pedestrian crashes. An after school peak was also observed. Almost half occurred within or near intersections. Forty-four percent were rear end collisions. Cyclists were often at fault (67%) and visibility played a role, both at night and during the day. Two thirds of the bicycles involved at night had no lights. There was low alcohol and drug involvement and the motor vehicles involved were rarely speeding. The type of persons killed resembled pedestrian fatalities, though there were more school aged children (22%) and proportionally more males (86%). Injuries and cause of death resembled pedestrian fatalities with 47% dying of head injuries and 52% dying in hospital. Only 3% of cyclists killed were wearing helmets.

# Chapter 4: Fatal motorcycle crashes




**Frequency**
- 13% of fatal crashes involved motorcycles (MCs)
- 10% of fatalities were motorcycle riders.
- 1% of fatalities were pillion passengers.
- 9% of vehicles in fatal crashes were motorcycles.

**Timing**
- 60% of fatal MC crashes occurred on Fridays and weekends (22% on Sundays, compared with only 15% of other fatal crashes).

**Location**
- 67% of fatal MC crashes occurred in urban areas.
- 41% of fatal MC crashes occurred on curves.

**Conditions**
- Fatal MC crashes were less likely to occur in adverse weather than other fatal crashes. (92% of fatal MC crashes occurred in fine/dry conditions).

**Vehicles**
- Roughly 25% of the MCs involved had an engine capacity of 800cc or more.
- MCs were newer than other vehicles in fatal crashes (median 5 vs 8 years).
- 17% of motorcycles in daytime fatal crashes had their lights on.

**Crash description**
- 26% of all fatal MC crashes involved vehicles from opposing directions.
- In 25% of all fatal MC crashes, MCs left the road, out of control, on curves.
- 87% of the impacts occurred at the front of the MC.

**Contributory factors**
- In 72% of MC crashes, the MC rider was solely at fault, and in an additional 6%, partially responsible for the crash.
- In 54% of MC crashes with other types of vehicles, the MC rider was solely at fault, and an additional 10%, partially responsible.
- 40% of the motorcyclists in fatal crashes had blood alcohol levels (BAC)>0.05 compared with 24% of drivers in other fatal crashes. The corresponding percentages for 0.15 gm/100 ml were 25% and 14%.
- 45% of motorcyclists over 25 years were over 0.05 vs 20% of drivers of same age
- 32% of MCs in fatal crashes were speeding (vs 10% of other vehicles).

**Persons**
- 98% of motorcyclists in fatal crashes were male.
- 60% of motorcyclists in fatal crashes were aged 17-25.
- 14% of motorcyclists in fatal crashes had learners licences.
- 9% of motorcyclists in fatal crashes had no valid licence.
- 20% of motorcyclists in fatal crashes were carrying pillion passengers.
- 46% of pillion passengers in fatal crashes died.
- 29% of motorcyclists killed were killed instantaneously.
- 38% of motorcyclists(+pillions) killed, died of head injuries, 38% died of multiple injuries.

**Helmets**
- Approximately 80% of motorcyclists and pillion passengers killed wore helmets.
- 52% of fatalities not wearing helmets died of head injuries.

## Definition

A motorcycle crash was defined as any crash involving at least one motorcycle, trail bike or moped.

## Frequency

A total of 322 such crashes occurred in 1988, 13% of all fatal crashes. Of the resultant 338 fatalities, 295 were motorcyclists and 29 were pillion passengers. Together they represent 11% (10% and 1%) of all road fatalities.

A total of 524 vehicles were involved in these crashes. Of these, 330 were motorcycles, representing 9% of all vehicles involved in fatal collisions.

## Terms

The term motorcyclist was used for the person in control of the motorcycle, trail bike or moped. It is explicitly stated in the instances where both motorcyclists and their pillion passengers were treated as one road user group. The term driver/rider refers to persons in control of motor vehicles or motorcycles.

The abbreviation MC is used for motorcycle (or trail bike or moped).

## Contrast groups

Motorcycle crashes were compared with all other fatal crashes, unless otherwise stated. Motorcycles were compared with other non-stationary vehicles in all fatal crashes, and motorcyclists were compared with drivers of other non-stationary motor vehicles in all fatal crashes. Motorcyclists and pillion passengers who died were compared with other road fatality groups (namely, pedestrians, bicyclists and motor vehicle occupants).

## Timing

There were no significant seasonal variations distinct from other fatal crashes.

Motorcycle crashes were more likely to occur on Sundays than other crashes (22% vs 15%) and fewer earlier in the week (Figure 4.1).

Approximately half of all motorcycle accidents (48%), as for other fatal crashes (51%), occurred during the day. The only significant deviation from the pattern of other fatal crashes with respect to hour and day of the week was that fewer MC crashes occurred during the day on weekdays (47% vs 57%) (Figure 4.2).

Figure 4.1 Motorcycle and other fatal crashes by day of week

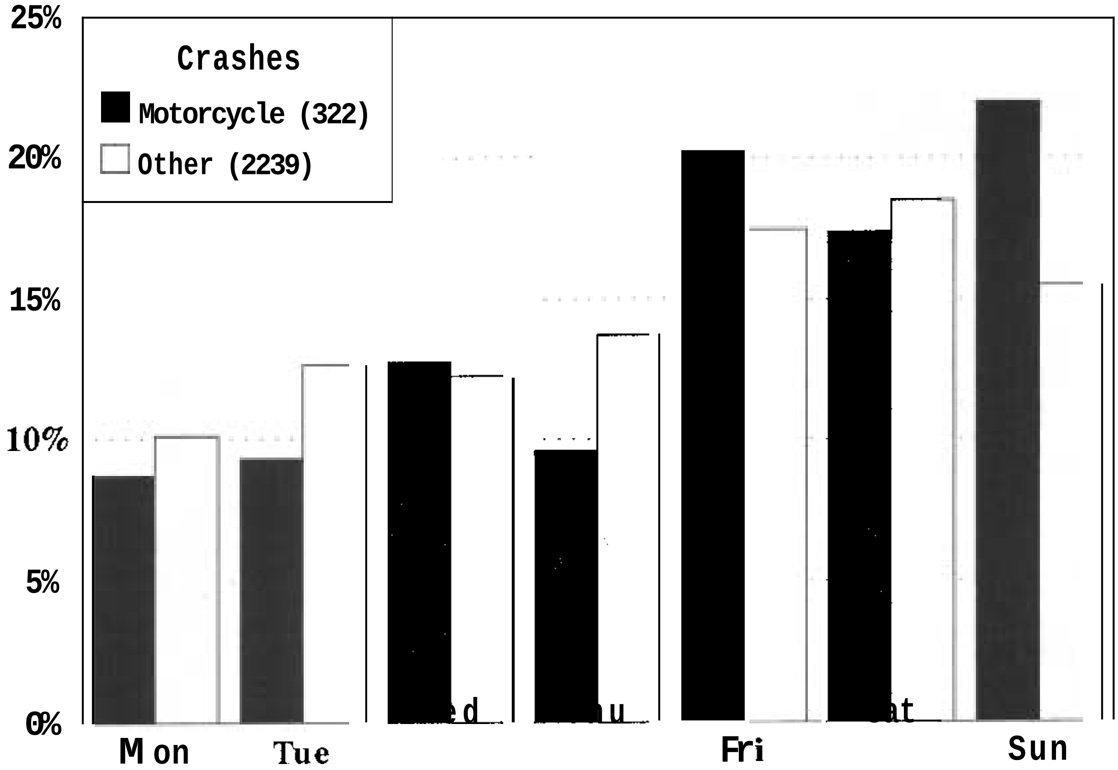
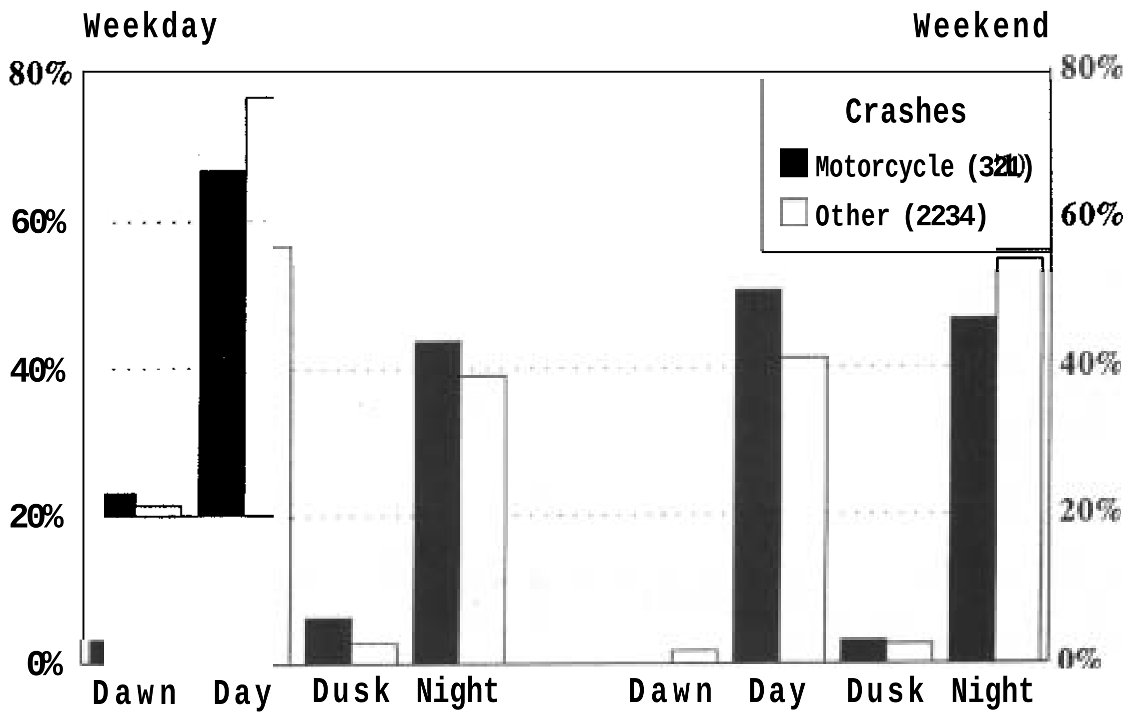



Figure 4.2 Motorcycle and other fatal crashes by time of day on weekdays and weekends




Source: FORS 1988 Fatal file

## Location

Compared with other fatal crashes, fewer motorcycle crashes occurred in Victoria (19% vs 25%), and proportionally more in the ACT (3% vs 1%). See Figure 4.3.

Approximately two thirds of the motorcycle crashes occurred in urban areas; a higher proportion than other fatal crashes (67% vs 52%). Only 27% of MC crashes occurred in rural high speed areas, compared with 45% of other crashes (Figure 4.4).

Figure 4.5 illustrates the breakdown of MC and other fatal crashes in urban and rural regions of each State. There were proportionally more MC crashes than other fatal crashes in urban regions of South Australia, Western Australia and the ACT, and rural regions of Tasmania and fewer in urban Victoria.

Figure 4.6 shows the distribution of MC and other crashes with respect to intersections in urban and rural areas. The percentage of MC crashes occurring within urban intersections was higher than expected (32% vs 24%). The location of MC crashes with respect to intersections in rural areas was similar to other crashes (83% mid-block).

Of the intersection crashes, T intersections were worse for MCs than other configurations (63% vs 50%).

MC crashes were more likely to occur on curves than other crashes (41% vs 32%). This difference was more pronounced in urban locations (36% vs 20%) than rural locations (50% vs 45%).

## Road and driving conditions

Only 8% of MC crashes occurred in adverse weather conditions (compared with 16% of other crashes).

## Vehicle characteristics

Eight of the 322 motorcycle crashes involved 2 motorcycles, so a total of 330 motorcycles were involved in the MC crashes. There were 311 (94%) motorcycles, 17 (5%) trail bikes and 2 (1%) mopeds.

Information on engine capacity was available for 66% of the motorcycles. Thirty-eight percent were up to 250cc, 37% 300-750cc and 25% 800-1500cc.

Information on whether lights were on or not at the time of the crash was available for 91% of the motorcycles. Sixteen (17%) of the MCs involved in daytime crashes, 93 (89%) of the MCs in night time crashes and 9 (53%) of the MCs in crashes occurring at dawn or dusk, were known to have had their lights on.

The motorcycles were newer than other vehicles involved in fatal crashes (median year of manufacture 1983 vs 1980).

A higher proportion of MCs were tested for defects (42% vs 34%). However, the fault rate was not significantly different from that of other for other vehicles (24%). A similar proportion of the other vehicles involved in MC crashes were faulted (25%). Only 6 of the 11 MC defects were considered to play a contributory role in the crash.

The distribution of defects was similar to other vehicles (tyres 18 (13%), brakes 8 (6%), lights 6 (4%)).

More MCs had major or extensive damage (87% vs 76%) than vehicles in other crashes.

Figure 4.3 Motorcycle and other fatal crashes by State

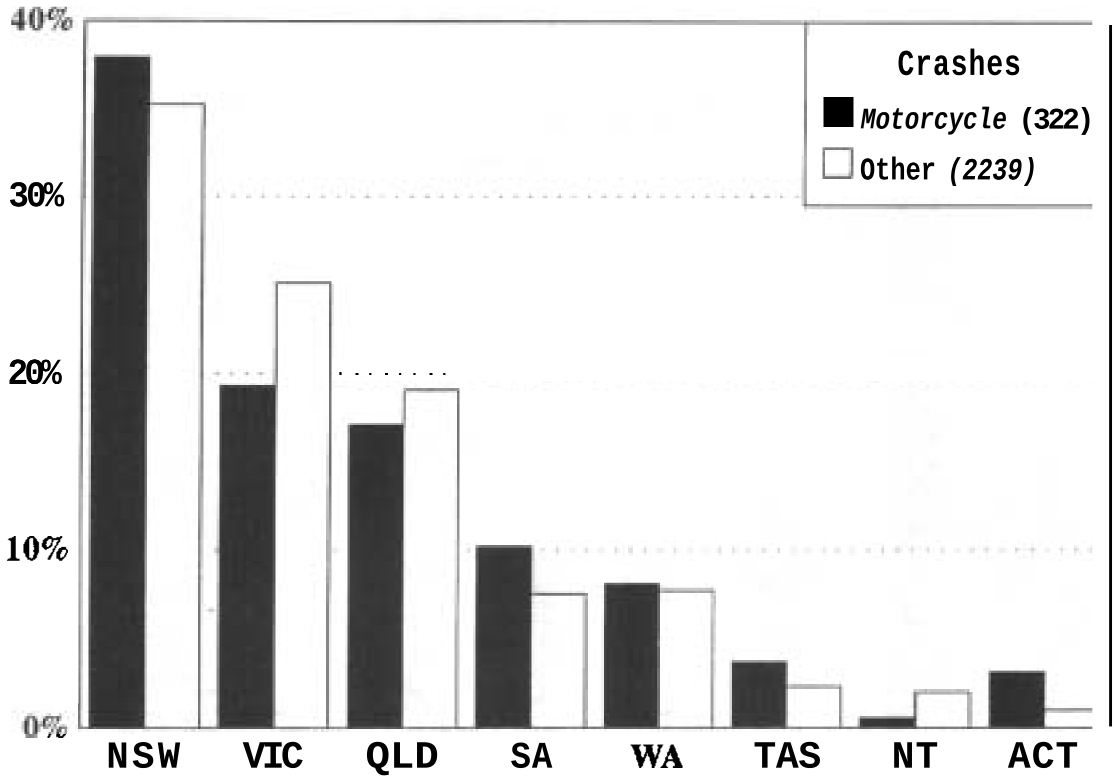
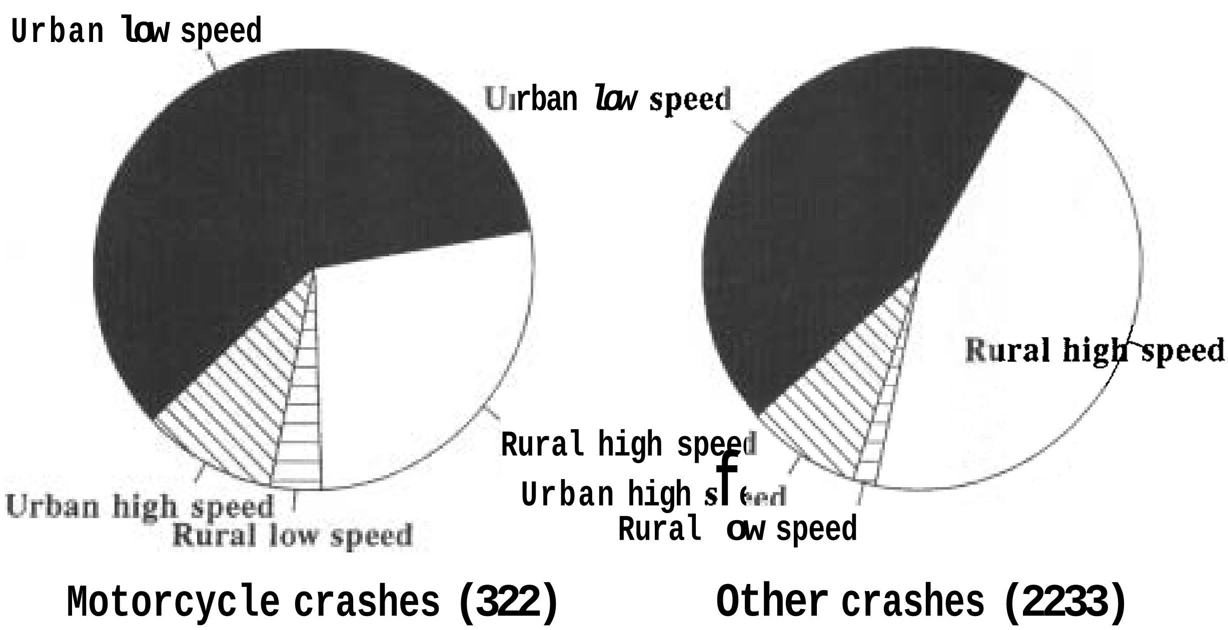



Figure 4.4 Motorcycle and other fatal crashes in urban & rural, low (<80 kmph) & high speed zones




Source: FORS 1988 Fatal file

Figure 4.5a Motorcycle and other fatal crashes by State in urban regions

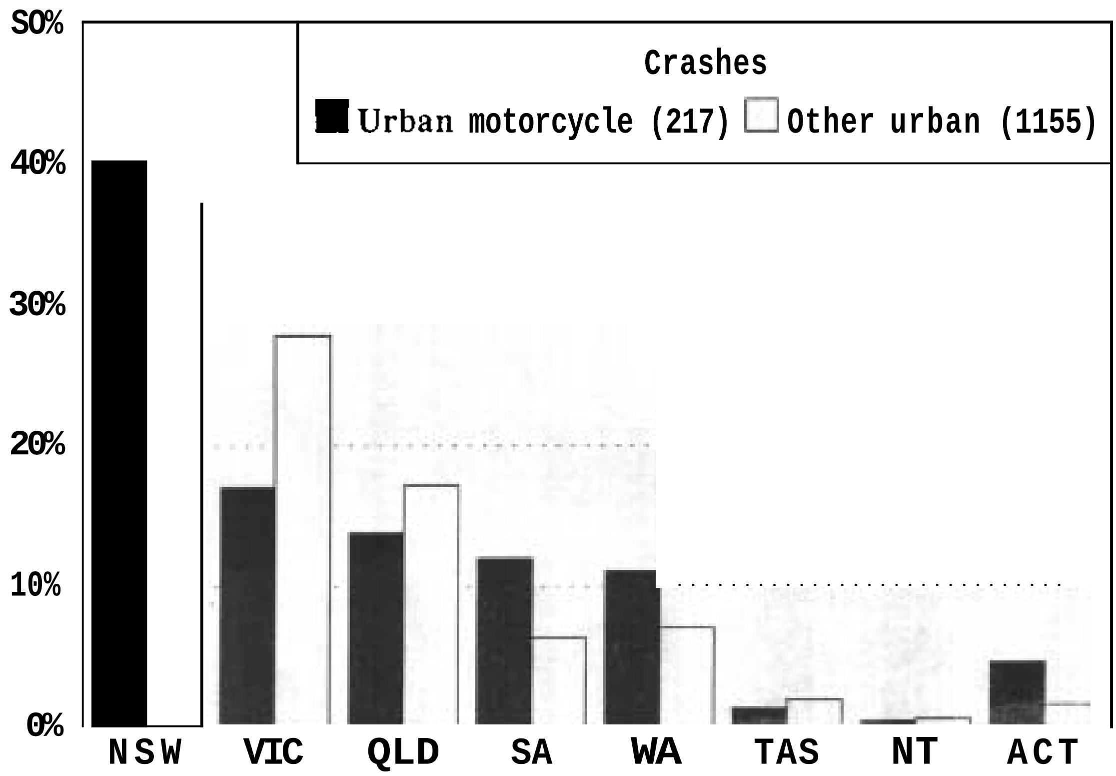
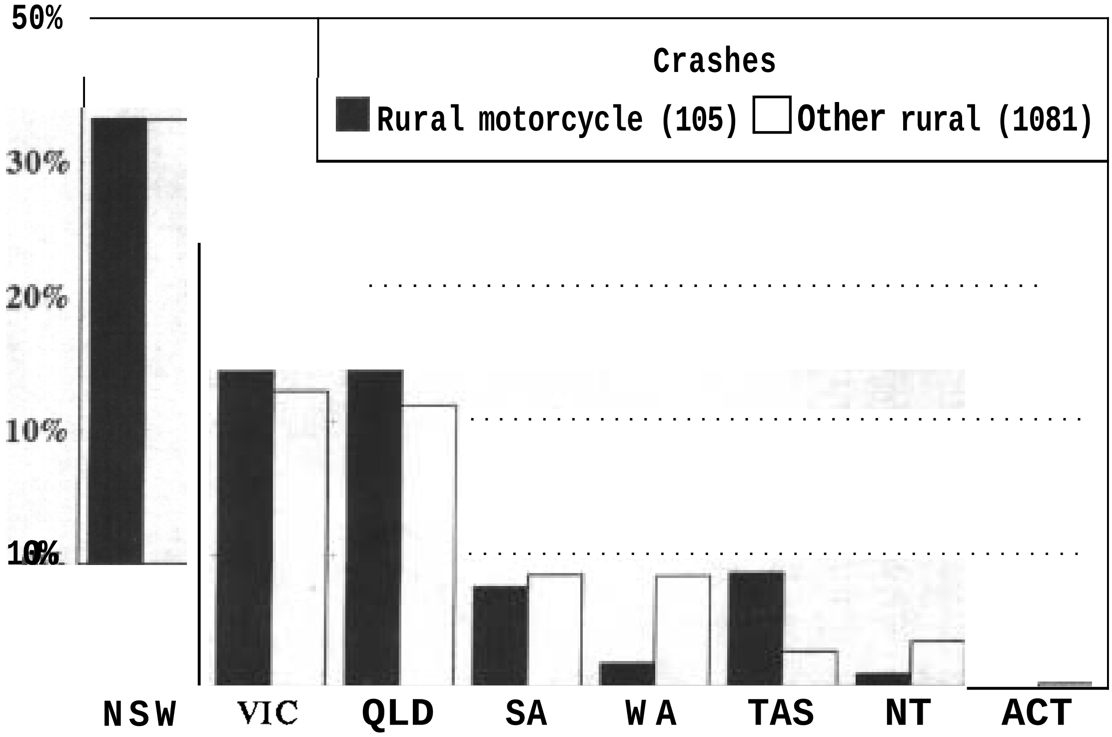
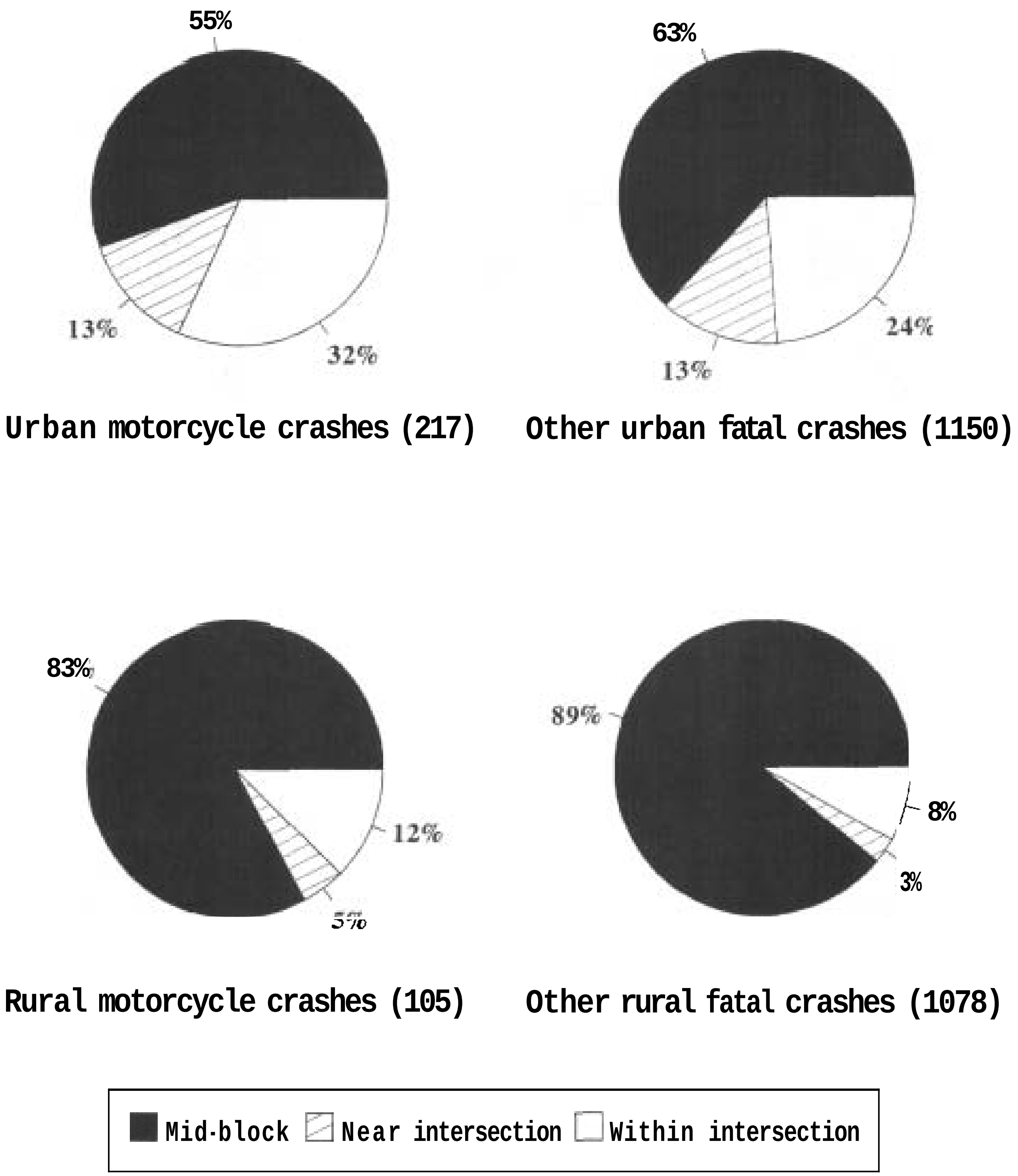



Figure 4.5b Motorcycle and other fatal crashes by State in rural regions



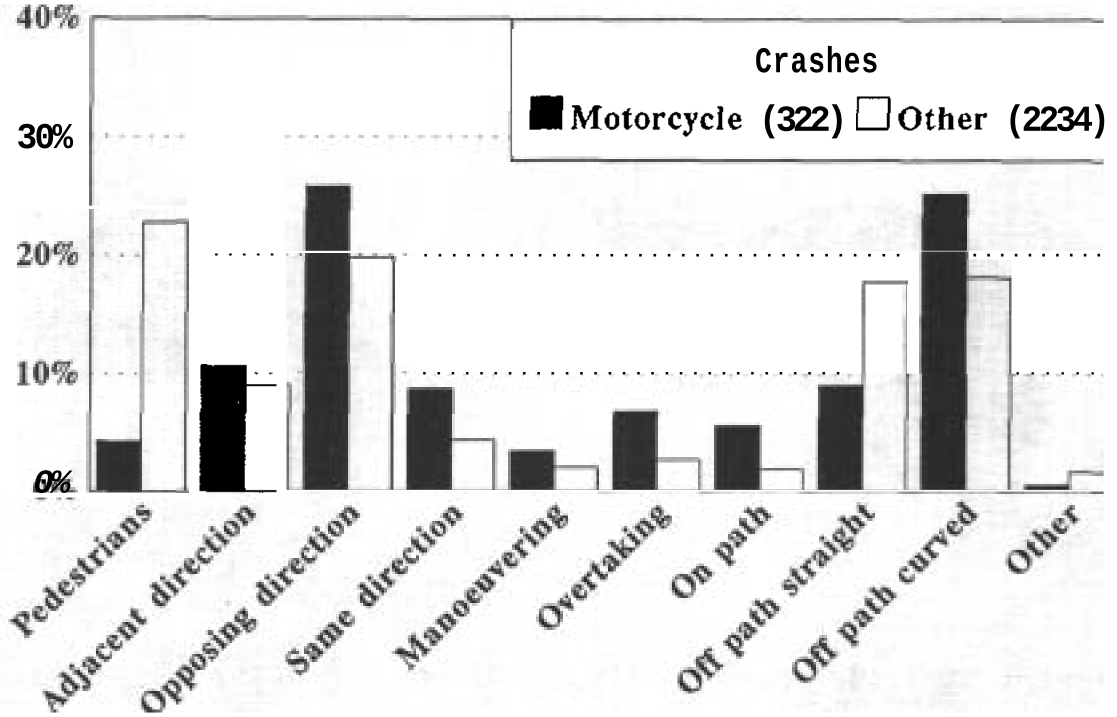

Source: Fors 1988 Fatal file

Figure 4.6 Location of urban & rural motorcycle & other fatal crashes with respect to intersections




Source: FORS 1988 Fatal file

**Figure 4.7 Motorcycle and other fatal crashes by major crash classification (DCA)**




Source: FORS 1988 Fatal file

## Crash description

A total of 127 (39%) of the MC crashes were single vehicle crashes (i.e. involving only the motorcyclist and no pedestrians); the same proportion as other fatal crashes.

There were fewer prior (10% vs 14%), but more subsequent events (28% vs 17%) and the DCA was less often fatal (76% vs 84%). As many as 24% of the MCs were involved in subsequent events (vs 12% for other vehicles).

Figure 4.7 shows the percentage of MC and other crashes of the major crash classifications (DCA). The major differences in the DCA were fewer pedestrian (4% vs 23%) and off path crashes on straight roads (9% vs 17%), and crashes with vehicles from opposing directions (26% vs 20%), off path on curved roads (25% vs 18%), rear end (9% vs 4%), overtaking (7% vs 3%) and on path (6% vs 2%) crashes.

In single vehicle crashes, MCs were more likely to lose control on curves (79% vs 52%) than on straight roads. For all vehicles which lost control on curves, the majority occurred on right bends. However, motorcyclists differed from other drivers in this situation in that almost all them left the carriageway to the left (96% vs 62%) (Table 4.1).

Table 4.1 Number and percentage of MC and other fatal crashes where the vehicle runs of the road to the left or right.

| | Motorcycle crashes | | Other fatal crashes | |
|---|---|---|---|---|
| | n | % | n | % |
| Out of control on left bend | 28 | (100%) | 167 | (100%) |
| Off left | 24 | 86% | 114 | 68% |
| Off right | 4 | 14% | 53 | 32% |
| Out of control on right bend | 49 | (100%) | 222 | (100%) |
| Off left | 47 | 96% | 137 | 62% |
| Off right | 2 | 4% | 85 | 38% |
| Out of control on straight road | 20 | (100%) | 358 | (100%) |
| Off left | 14 | 70% | 195 | 54% |
| Off right | 6 | 30% | 163 | 46% |
| Total out of control crashes | 97 | | 747 | |

Among the prior events, there were proportionally more classed as out of control, but remaining on the carriageway, on both straight (13; 41% vs 8%) and curved (6; 19% vs 8%) roads. The pattern of MC subsequent events resembled other crashes with 36 (40%) 'off path' on straight roads and 34 (38%) on curved roads.

The point of primary impact was more often centre front of the MC (83% vs 52%), and less often the sides (11% vs 27%) or rear (2% vs 5%) (Table 4.2).

Table 4.2 Place of impact on motorcycles and other vehicles involved in other fatal crashes.

| | Motorcycle | | Other vehicle | |
|---|---|---|---|---|
| Point of impact | n | % | n | % |
| Front of vehicle | 254 | 87% | 1869 | 66% |
| Front centre | 244 | 83% | 1475 | 52% |
| Front left | 7 | 2% | 205 | 7% |
| Front right | 3 | 1% | 189 | 7% |
| Side of vehicle | 33 | 11% | 774 | 27% |
| Left side | 17 | 6% | 375 | 13% |
| Right side | 16 | 5% | 399 | 14% |
| Rear of vehicle | 5 | 2% | 128 | 5% |
| Other | 1 | 0% | 61 | 2% |
| Total vehicles | 293 | (100%) | 2832 | (100%) |

## Contributory factors

In 7 (2%) of the MC crashes, fault could not be determined. This percentage was not significantly higher than for other fatal crashes. For 78% of the other motorcycle crashes, motorcyclists were considered to be at least partially at fault (72% solely at fault and 6% partially at fault). These percentages include crashes involving only motorcycles. In terms of crashes between MCs and other types of vehicles (<=9 seats), motorcyclists were deemed solely responsible for 54% and jointly responsible for a further 10% (Table 4.3). The corresponding figures for passenger vehicles involved in fatal crashes were similar. In fatal collisions between cars and other types of vehicles, the car driver was considered solely responsible for 58% and jointly responsible for 5%.

Table 4.3 Number and percentage of crashes involving MCs and crashes involving passenger vehicles (<=9 seats) in which the motorcyclist, car driver, other road user, both or no one was considered to be responsible (based on evidence from the coroner or police accident report).

| | Road user responsible for MC crash | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MC crash vehicle mix | Motorcyclist | | Other road user | | Both | | No one | | Total |
| | n | % | n | % | n | % | n | % | 100% |
| MC(s) only[1] | 130 | 98% | – | – | – | – | 2 | 2% | 132 |
| MC + pedestrian | 4 | 33% | 7 | 58% | 1 | 8% | 0 | 0% | 12 |
| MC + other vehicle[2] | 93 | 54% | 58 | 34% | 17 | 10% | 3 | 2% | 171 |
| Total MC crashes | 227 | 72% | 65 | 21% | 18 | 6% | 5 | 2% | 315[5] |

| | Road user responsible for passenger vehicle crash | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Vehicle mix for crashes involving passenger vehicles (<=9 seats) | Car driver | | Other road user | | Both | | No one | | Total |
| | n | % | n | % | n | % | n | % | 100% |
| Cars only[3] | 1145 | 95% | – | – | 23 | 2% | 32 | 3% | 1200 |
| Car + pedestrian | 101 | 23% | 292 | 68% | 27 | 6% | 10 | 2% | 430 |
| Car + other vehicle[4] | 275 | 58% | 161 | 34% | 23 | 5% | 14 | 3% | 473 |
| Total passenger vehicle crashes | 1521 | 72% | 453 | 22% | 73 | 3% | 56 | 3% | 2103 |

1 includes 4 MC-MC crashes
2 'other vehicle' includes bicycles, cars, buses and *trucks*
3 includes car-car Crashes
4 *'other* vehicle' includes bicycles, buses, motorcycles and trucks
5 Responsibility missing for 7 MC crashes

Table 4.4 shows the percentage of crashes in which at least one of the factors of various types was noted for MC and other fatal crashes. For 10 MC crashes, no factors were noted. MC crashes were characterised by alcohol, speeding, dangerous driving and failure to see the other unit. Pedestrian factors and fatigue were less frequent than in other crashes.

Table 4.4 Number and percentage of MC and other fatal crashes attributed to various factors. Significantly high percentages across rows are highlighted.

| Factor | MC crash n | MC crash % | Other crash n | Other crash % |
|---|---|---|---|---|
| Alcohol/drug use by driver and/or rider | 121 | 39% | 540 | 26% |
| Speed | 115 | 37% | 413 | 20% |
| Driver/rider error | 100 | 32% | 502 | 24% |
| - Road rule breach | (38 | 12%) | (238 | 11%) |
| - Dangerous driving | (25 | 8%) | (91 | 4%) |
| Failure to observe other unit | 57 | 18% | 237 | 11% |
| Visibility | 17 | 5% | 156 | 7% |
| Surface conditions | 13 | 4% | 118 | 6% |
| Vehicle defects | 11 | 4% | 75 | 4% |
| Pedestrian factor | 10 | 3% | 407 | 19% |
| Fatigue | 4 | 1% | 167 | 8% |
| Crashes for which at least one factor noted | 312 | | 2100 | |

The percentages do not sum to 100% since up to 3 major factors can be recorded for each crash. The 'n' in the table is the number of crashes with at least one of the specific major factors recorded for the crash. The percentage is calculated with the denominator as the number of crashes with some information on major factors.

Table 4.5 lists the incidence of speeding, alcohol/drugs, driver/rider errors and unintentional failure to observe the other unit for MC crashes subdivided by the unit considered responsible for the crash. In MC crashes in which the motorcyclist was considered solely responsible, speed and alcohol were frequent, whereas if the other driver was responsible, driver errors (particularly road rule breaches) and failure to observe the other unit predominated. These latter factors were also more frequent even in the smaller group of crashes where both were considered partly responsible.

Table 4.5 Number and percentage of MC crashes attributed to various factors tabulated by unit considered responsible for the MC crash. Significantly high percentages across rows are highlighted.

| Factor | Unit considered responsible for MC crash: Motorcyclist n | % | Other vehicle/ pedestrian n | % | Both n | % |
|---|---|---|---|---|---|---|
| Alcohol/drug use by driver/rider | 105 | 48% | 12 | 19% | 4 | 22% |
| Speed | 97 | 44% | 4 | 6% | 10 | 56% |
| Driver/rider error | 64 | 29% | 28 | 44% | 6 | 33% |
| - Road rule breaches | (14 | 6%) | (19 | 30%) | (5 | 28%) |
| - Dangerous driving | (19 | 9%) | (6 | 10%) | (0 | 0%) |
| Failure to observe other unit | 21 | 10% | 25 | 40% | 9 | 50% |
| Crashes for which at least one factor noted | 220 | | 63 | | 18 | |

The percentages do not sum to 100% since up to 3 major factors can be recorded for each crash. The 'n' in the table is the number of crashes with at least one of the specific major factors recorded for the crash. The percentage is calculated with the denominator as the number of crashes with some information on major factors.

The proportions of motorcyclists considered to be possibly (22%), or definitely speeding (32%), were both high compared with other vehicles (10% and 11%, respectively). These differences were observed in both urban and rural areas and in low and high speed zones.

## Blood alcohol levels (BAC)

The proportion of motorcyclists tested for alcohol was significantly higher than for other drivers (265; 83% vs 72%). However, the proportions were the same among the fatalities (84% MC fatalities tested vs 81% driver fatalities tested).

Of those tested, and with accurate results, proportionally more motorcyclist BACs were non-zero, more were over the 0.05 limit and more were over 0.15gm/100 ml compared with other drivers (Table 4.6). However, the median non-zero BAC and the median elevated BAC (over 0.05) of the motorcyclists and the drivers were the same (median non-zero BAC: 0.15; median BAC>0.05: 0.17).

Table 4.6 Number and percentage of motorcyclists, pillion passengers, and drivers of motor vehicles involved in fatal crashes and tested for alcohol with zero blood alcohol content (BAC), non-zero and up to 0.05, and over 0.05 gm/100 ml. The number and percentage with BAC>0.15 gm/100 ml are shown in brackets.

| | MC rider | | MC Pillion | | Driver | |
|---|---|---|---|---|---|---|
| BAC, gm/100 ml | n | % | n | % | n | % |
| 0.00 | 134 | 51% | 11 | 44% | 1581 | 72% |
| 0.01-0.05 | 22 | 8% | 1 | 4% | 84 | 4% |
| >0.05 | 105 | 40% | 13 | 52% | 532 | 24% |
| (>0.15) | (64 | 25%) | (6 | 24%) | (297 | 14%) |
| Total with accurate BAC data | 261 | 100% | 25 | 100% | 2197 | 100% |
| Total | 330 | | 63 | | 3228 | |

Forty percent of the pillion passengers were tested for alcohol, and 52% were over 0.05.

Of the younger motorcyclists and drivers (up to 25 years of age) involved in fatal crashes, the proportions with BACs over 0.05 were not significantly different (37% motorcyclists vs 32% drivers). However, for those over 25, there was a higher proportion of motorcyclists over the limit (45% vs 20%). See also Table 2.8 which gives the corresponding figures for fatalities only. This table also shows the higher proportion of alcohol affected motorcycle riders over 25 years of age compared with driver fatalities over 25 (47% vs 39%).

Blood alcohol values for the motorcyclists were available in 98 (95%) of the 103 crashes where the motorcyclist was considered to be solely at fault and alcohol and/or drugs were considered to play a role. Of these, the BAC was greater than 0.05 for 88 (85%) and zero for only one. The motorcyclist who had zero BAC, tested positive for drugs.

## Drugs

The proportion of motorcyclists tested for drugs was significantly higher than drivers of other motor vehicles (47; 14% vs 4%), but, of these, the proportion with positive tests was not significantly higher (24; 51% vs 34%, p=0.07).

The drug most often tested for was marijuana (36; 11% motorcyclists vs 3% other drivers). Half of the motorcyclists tested, had positive results (18), compared with only 24% positive for drivers of motor vehicles who were tested. Of those 18 motorcyclists, drugs were considered a contributory factor in 2 cases, and alcohol and drugs were considered contributory in 8.

Of other drugs that were tested for, 3 cases tested positive for opiates, 2 with amphetamines and one with anti-convulsive drugs.

## Persons involved

### Motorcyclists

The 330 motorcyclists involved in MC crashes were compared with 3228 drivers of other non-stationary motor vehicles.

The motorcyclists were younger (median age 24 vs 31 years). The proportion of motorcyclists in the age group 17-25 was 60% vs 34% of drivers of other motor vehicles.

Based on the information available (43%), motorcyclists had fewer years of experience than other drivers (median 3 vs 10 years). Thirty-eight percent of motorcyclists with this data had less than one year's experience (compared with 14% other drivers).

Higher proportions of motorcyclists had learners' licences (35; 14% vs 1%) or were disqualified from having a licence due to a traffic offence (10; 4% vs 1%). A total of 23 (9%) had no valid licence, compared with 2% for drivers of other vehicles.

Only 5 motorcyclists were female (2% vs 19% other drivers).

A higher proportion of motorcycle riders than drivers in other fatal accidents were unemployed (10% vs 5%). Of those males actively employed, there was a high percentage of male motorcyclists employed as tradesmen (42% vs 23% of male motor vehicle occupants and 23% of male work force, in general). See also Table 2.7 and Appendix Tables.

A higher proportion of motorcyclists were within 50 km of their homes compared with other drivers (90% vs 73%). They were also mostly within 50 km of the place of commencement (95% vs 80%). Such differences were observed in urban and rural areas.

Though based on limited information (48% of vehicles), there were proportionally more MCs going to (52% MC vs 20% other) and coming from (60% vs 36%) recreational activities.

The MC drivers who died were younger than other driver fatalities (median age 33 vs 28). The age distribution of the MC drivers who died was similar to that of the other MC drivers.

## Pillion passengers

There were 63 pillion passengers, but no side car passengers involved in these crashes. Thus, 20% of the MCs involved in fatal crashes were carrying pillions.

The pillion passengers were younger than the motorcyclists (median age 20 vs 24 years). Proportionally more were female (24% vs 2%).

## Fatalities

Of the 330 motorcyclists involved fatal crashes, 295 (89%) died. This is higher than the corresponding figure for drivers of other motor vehicles involved in fatal crashes (36%). Of the 63 motorcycle pillion passengers in fatal crashes, 29 (46%) died.

## Medical details: Fatalities

The timing, pattern of serious injury and cause of death did not differ significantly between motorcyclists and pillion passengers. They are compared below with motor vehicle occupant fatalities.

There were no significant differences between motorcyclists and pillion passengers, and motor vehicle occupant fatalities in terms of timing of death within urban and rural regions. The proportion of motorcyclists and pillion passengers dying instantaneously in urban and in rural areas were 24% and 38%, respectively. See Table 2.9 in pedestrian chapter.

The causes of death were also similar between motorcyclist and motor vehicle occupant fatalities: multiple injuries 38% MC vs 31% vehicle occupant, head 38% vs 36%. chest 12% vs 13%). There were, however, more head and lower extremity serious injuries among motorcyclist and pillion passenger fatalities (head: 75% vs 68%; lower extremity 33% vs 27%). See Tables 2.10 and 2.11 in the chapter on pedestrian crashes.

## Helmets

It could be determined for only 269 (68%) motorcyclists and pillion passengers whether or not a helmet was definitely being worn at the time of the crash. For an additional 66 (17%), a helmet was found beside the rider. It is likely that these came off during the crash, but they may not have been worn, or were taken off afterwards.

Of these 269, 78% were thus definitely wearing helmets; 81% motorcyclists, 67% pillion passengers. This difference is not significant.

If those cases where the helmet 'came off' are included as wearing helmets and not unknown, the percentage becomes 83%.

If similar calculations are made for MC fatalities only, the use of helmets by those killed was 79% (or 84% of the 'helmet came off' group are included).

A higher proportion of those not wearing helmets died due to head injuries (52% vs 34%). Those wearing helmets were more likely to die of injuries to the thorax (16% vs 0%).

## Summary

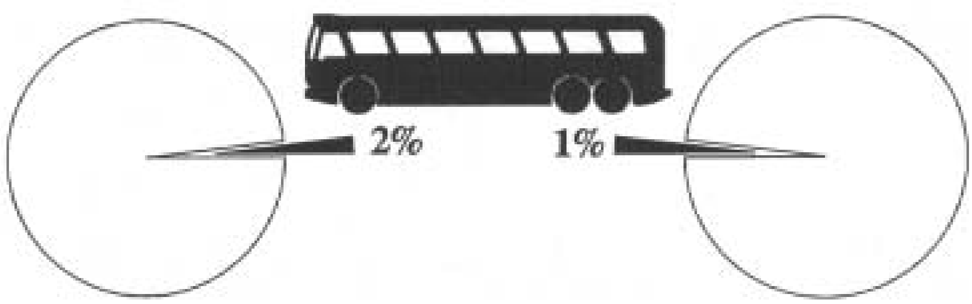
Thirteen percent of fatal crashes involved motorcycles with 295 motorcycle riders and 29 pillion passengers killed. These represent 10% and 1% of road fatalities, respectively. Motorcyclists were the third most vulnerable road user group after pedestrians and cyclists, with 89% of those involved in fatal crashes being killed.

Most motorcycle crashes occurred on Fridays and weekends (especially Sundays). These crashes also generally occurred in urban areas in fine conditions. Typical MC crashes involved the motorcyclist losing control (especially on curves) or colliding head-on with another motor vehicle. The motorcyclists were considered solely responsible for just over half the fatal crashes with other vehicles. Speeding and alcohol were common contributory factors with 40% of motorcyclists involved in fatal crashes over 0.05 gm/100 ml blood alcohol (compared with 24% of other drivers) and 32% speeding compared with only 10% of other vehicles involved in fatal crashes. The other persons involved in these crashes often failed to observe the motorcycle.

Approximately 80% of motorcyclists were wearing helmets. Almost all were male and 60% were aged 17-25.

Almost one third were killed instantly (29%). The most common causes of death being head (38%), multiple (38%) and chest injuries (12%); no different from motor vehicle occupant fatalities.

# Chapter 5: Fatal bus crashes




**Vehicles**

- Only 1% of vehicles involved in fatal crashes were buses.
- Of the buses involved, 47% were urban route buses, 36% were inter/intrastate coaches, 15% were large vans and 2% were of unspecified type.

**Timing**

- Most fatal bus crashes (72%) occurred during the day.
- In rural areas there were more bus crashes at night (36%) than in urban areas (11% at night).

**Location**

- 53% of fatal bus crashes occurred in urban regions.
- 52% of urban bus crashes occurred at mid-block (not intersection) locations
- 92% of rural bus crashes occurred at mid-block (not intersection) locations

**Crash description**

- Pedestrians were hit in 32% of fatal bus crashes.
- 26% of all fatal bus crashes were head-on crashes.

**Contributory factors**

- The bus drivers were considered solely responsible for 34% of all fatal bus crashes and only 11% of bus crashes involving multiple vehicles. These figures were lower than for cyclists, motorcyclists and passenger vehicle drivers.

- Only 11% of bus drivers involved in fatal crashes were speeding compared with 26% of other drivers involved in fatal crashes.

- Fatigue or alcohol or drug use by the bus driver <u>rarely</u> contributed to these crashes.

**Drivers**

- Bus drivers were older than other drivers (median age 40 years vs 30 years).

**Fatalities**

- 69% of bus crash victims were external to the buses (i.e. pedestrians or in other vehicles).

- 13% of bus drivers (7) were killed and 11% (64) were hospitalised with non-fatal injuries
- 3% of bus passengers (13) were killed and 27% (118) were hospitalised with non-fatal injuries
- 31% of bus passenger fatalities (4) sustained serious spinal injuries

## Definition

A bus crash was defined as any crash involving at least one bus. Any motor vehicle with over 9 seats was defined as a bus.

## Frequency

There were 53 such crashes with 64 fatalities in 1988. This represents 2% of all fatal crashes and 2% of road fatalities in Australia that year. The fatalities included 7 bus drivers and 13 bus passengers and 18 pedestrians. Bus occupants thus accounted for 1% of road fatalities. The number of people requiring hospitalisation for non-fatal injuries sustained in these accidents was 132 or 9% of all hospitalisations after fatal crashes.

Fifty-three buses and 30 other vehicles were involved in these accidents (totally, 2% of vehicles in all fatal crashes). Buses alone accounted for 1% of vehicles in fatal crashes.

## Contrast groups

Bus crashes were compared with all other fatal crashes, unless otherwise stated. In terms of the vehicle characteristics, buses were compared with non-stationary vehicles in other fatal crashes.

Bus drivers were compared with drivers of other non-stationary vehicles in other fatal crashes. Bus driver fatalities and bus passenger fatalities were compared with other driver and other passenger fatalities in other fatal crashes.

## Timing

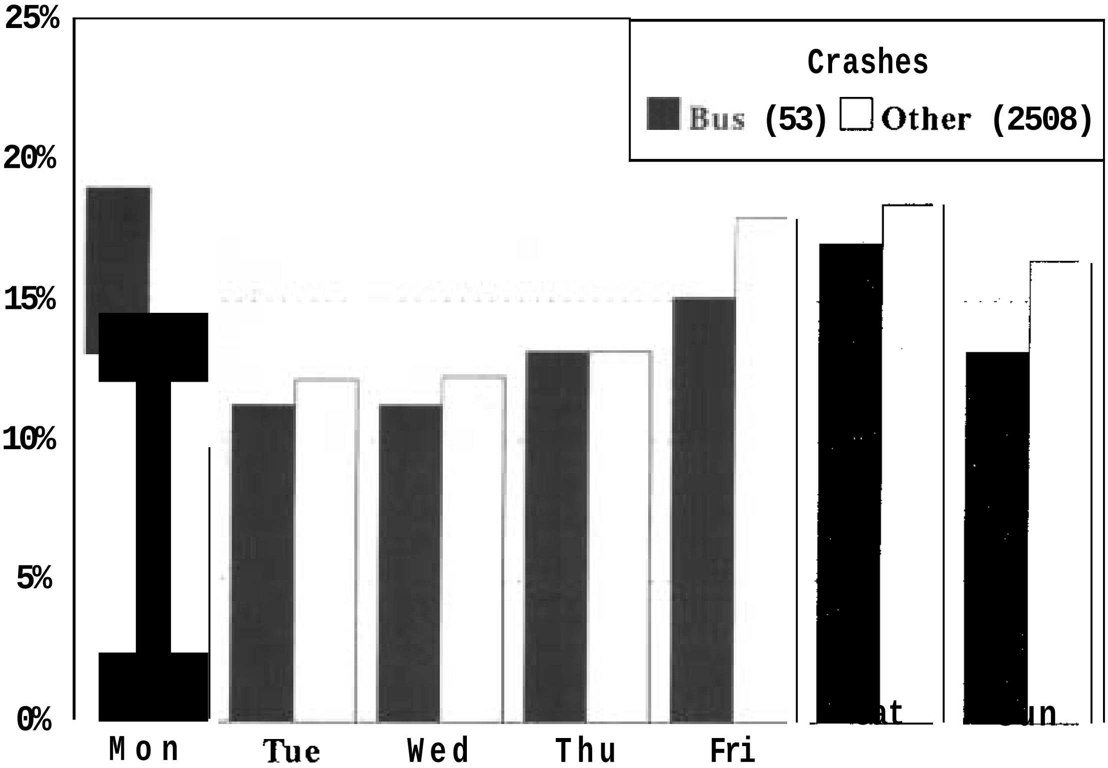
Only one bus crash occurred in January (2% vs 8% other fatal crashes) and 10 (19% vs 8%) occurred in December. In general, bus crashes showed no distinct seasonal variation and were consistent with other fatal crashes.

Figure 5.1 shows the proportion of bus and other fatal crashes occurring on each day of the week. As with other fatal crashes, bus crashes often occurred on a Saturday (17%). However, there were proportionally more bus crashes than other fatal crashes on Mondays (10; 19% vs 10%).

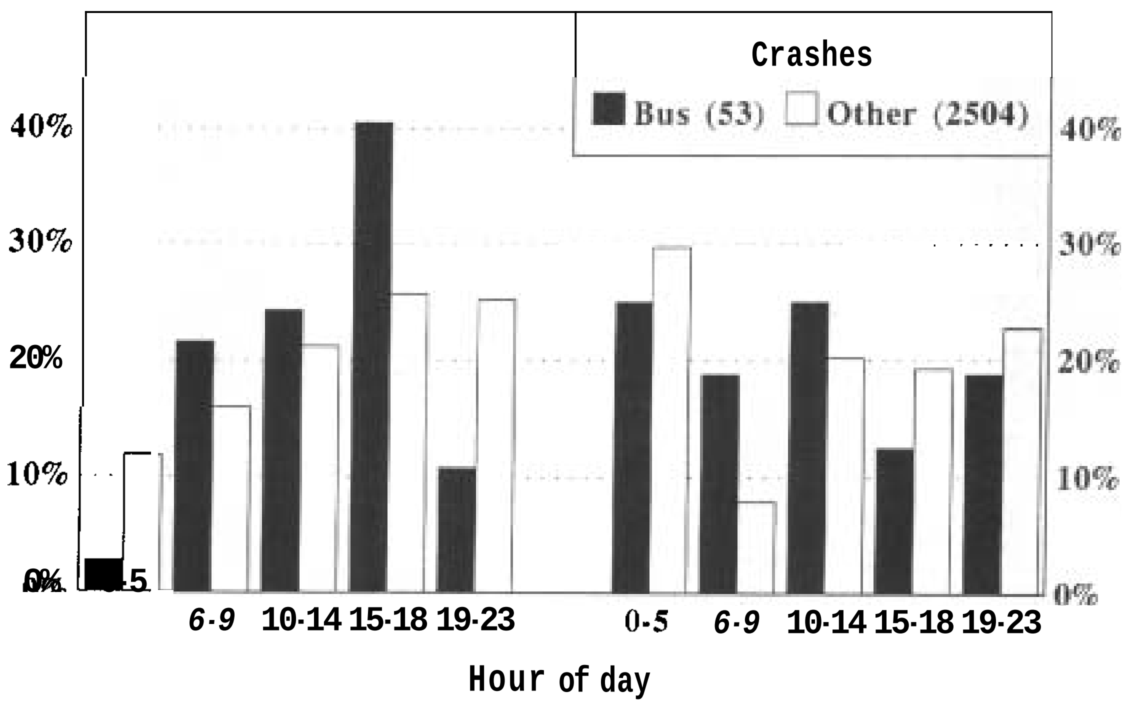
Proportionally more bus crashes occurred during the day (72% vs 53%). A morning peak round 10am was observed. The afternoon/evening peak observed for fatal accidents was earlier and more pronounced for bus crashes. The most common hour for a bus crash was 4 in the afternoon (15%). The morning peak but not the afternoon one occurred on the weekends. See Figure 5.2.

The morning and afternoon peaks occurred in both rural and urban areas. However, additionally, more rural bus crashes occurred during the night (9; 36% during the period 8pm-6am) compared with only 3 (11%) in urban areas in the same time period.

Figure 5.1 Bus and other fatal crashes by day of week




Figur 5.2 Bu and other fatal crashes by hour on weekdays and weekends




Source: FORS 1988 Fatal file

## Location

There were some deviations from the distribution of other fatal crashes by State (Figure 5.3). Proportionally more occurred in NSW (51% vs 35%) and fewer in Victoria (15% vs 25%) and Western Australia (2% vs 8%). These differences were observed in general for both urban and rural areas.

As observed for other fatal crashes, bus crashes were equally likely in urban and rural areas with 53% occurring in cities and towns (>200 inhabitants) compared with 54% of other crashes.

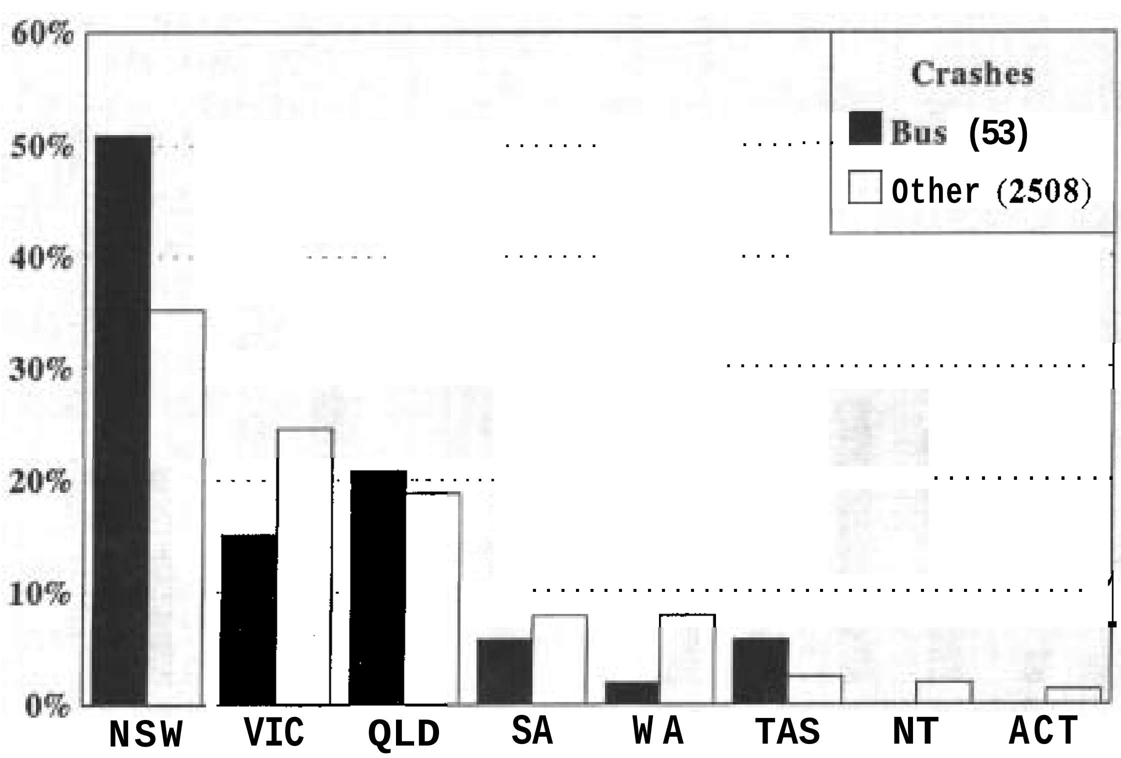
Twenty-three of the bus crashes (43%) occurred in rural high speed (>=80 km/h) zones, 3 in urban high speed zones (6%) and 27 (51%) in urban low speed zones. These proportions did not differ significantly from other fatal crashes.

The breakdown of bus crashes by location with respect to intersections did not differ significantly from other fatal crashes in either urban or rural settings. As with other crash types, mid-block locations accounted for just over one half of all urban bus crashes (52%) and almost all (92%) rural bus crashes.

A total of 23 (44%) of all bus crashes occurred on rural National or State Highways compared with only 27% for other fatal crashes. There were also proportionally more bus crashes on major arterial roads in metropolitan regions (13; 25% vs 19%).

More bus crashes than expected occurred at or near a controlled intersection or crossing (27% vs 16%).

Figure 5.3 Bus and other fatal crashes by State




Source: *FORS* 1988 Fatal file

## Crash conditions

No disproportionate number of bus accidents occurred in adverse weather conditions.

## Vehicle characteristics

There were 10 light and 43 heavy buses involved in these crashes (Table 5.1). The majority of the larger buses were on urban routes. There were 4 school buses, 14 on scheduled services and 5 tourist buses. About half the buses were urban and 36% were interstate or intrastate buses.

Table 5.1 Type and size of buses involved in fatal bus crashes.

| Vehicle type | Weight (g.v.m.) <=5 tonnes | Weight (g.v.m.) >5 tonnes | Total n | Total % |
|---|---|---|---|---|
| Passenger van | 7 | 0 | 7 | 13% |
| 4 wheel drive | 1 | 0 | 1 | 2% |
| Urban route bus | 1 | 24 | 25 | 47% |
| Intrastate coach | 1 | 9 | 10 | 19% |
| Interstate coach | 0 | 9 | 9 | 17% |
| Unknown | 0 | 1 | 1 | 2% |
| Total vehicles | 10 | 43 | 53 | 100% |

Table 5.2 Location of crash with respect to urban/rural and speed zoning by bus type. Low speed is <80 km/h.

| Bus type | Urban low speed n | Urban low speed % | Urban high speed n | Urban high speed % | Rural high speed n | Rural high speed % | Total n (100%) |
|---|---|---|---|---|---|---|---|
| Light bus/van | 2 | 25% | 0 | 0% | 6 | 75% | 8 |
| Urban bus | 21 | 84% | 1 | 4% | 3 | 12% | 25 |
| Inter/intrastate[1] | 4 | 20% | 2 | 10% | 14 | 70% | 20 |
| Total crashes | 27 | 51% | 3 | 6% | 23 | 43% | 53 |

[1] Includes one large bus of unknown type.

Table 5.2 shows the location of the crashes by bus type. It can be seen that 16% of urban buses were in high speed zones, and 20% of the inter/intrastate buses were in low speed zones. The 3 buses in rural high speed zones coded as 'urban' (as opposed to 'long distance') included one school bus and one other large bus on scheduled services, and one being driven home from work.

The mix of other moving vehicles involved in these bus crashes is summarised in Table 5.3. Half the crashes involved no other vehicles, 25 one other and two involved three vehicles. The types of persons who were killed are also shown in the table. Six (11%) crashes resulted in multiple fatalities. These included: one head-on crash with an articulated truck, 4 bus passengers killed; one head-on crash with a car, all 4 car occupants killed; a crash with a train, 3 bus passengers killed: a bus out of control, bus driver and one passenger killed; one far side pedestrian crash, 2 pedestrians killed; one intersection crash with a car: 2 car passengers killed.

Table 5.3 *Bus* crashes by mix of road users and vehicles involved and fatalitv type. The numbers in parentheses are the fatalities and the other numbers are-the number of crashes.

| Other vehicle | Total | Fatality type: Bus driver | Bus passenger | Bus driver & passenger | Other person |
|---|---|---|---|---|---|
| None (bus only) | 9(10) | 4 (4) | 4 (4) | 1 (2) | 0 |
| None (pedestrian) | 17(18) | 0 | 0 | 0 | 17(18) |
| Bicycle | 2 (2) | 0 | 0 | 0 | 2 (2) |
| Motorcycle | 4 (4) | 0 | 0 | 0 | 4 (4) |
| Passenger vehicle <=9 seats | 15(19) | 0 | 1 (1) | 0 | 14(18) |
| Truck | [1]5 (8) | 2 (2) | 1 (4) | 0 | 2 (2) |
| Train | 1 (3) | 0 | 1 (3) | 0 | 0 |
| Total crashes (fatalities) | 53(64) | 6 (6) | 7(12) | 1 (2) | 39(44) |

[1] 2 of these crashes also involved Other vehicles.

Buses were less likely to sustain damage than vehicles in other fatal accidents. Sixteen (31% vs 3%) buses were undamaged and only 9 (17% vs 39%) were written off.

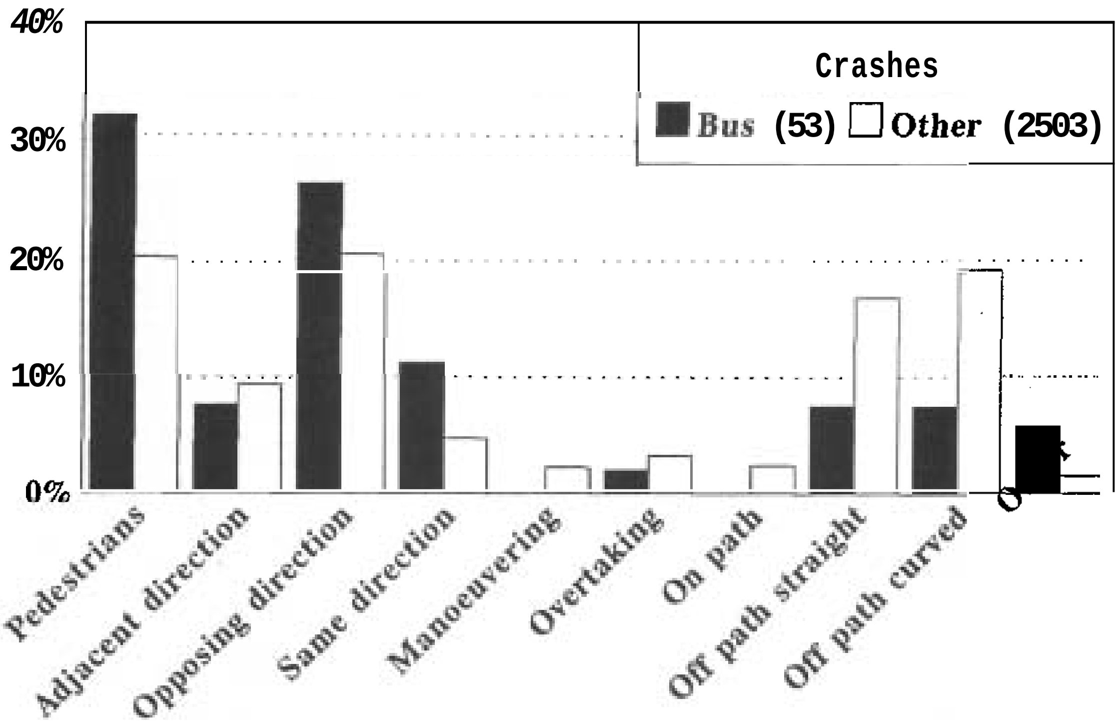
A similar proportion of buses (28%) as vehicles in other accidents (35%) were tested for defects. Of the 15 that were tested, 5 (33%) were found to have problems. This was not significantly higher overall than for other crashes (25%). The defects found included: 2 tyres, 2 lights, and one not specified. In only two cases the defects were considered contributory.

## Crash description

Three bus crashes had prior events, 7 had subsequent events and the DCA was fatal in 89% (47); no different from other fatal crashes. However, the DCA usually occurred on the carriageway (45; 85% vs 66%).

Figure 5.4 shows the major types of bus and other fatal crashes. There were proportionally more crashes involving pedestrians (17;32% vs 20%), head-on crashes (14;26% vs 20%) and crashes in which both vehicles were travelling in the same direction (6;11% vs 5%). There were fewer 'out of control' crashes (8;15% vs 36%).

**Figure 5.4 Bus and other fatal crashes by major crash classification (DCA)**




Source: *FORS* 1988 Fatal file

The fatal point of impact for the buses was distributed as for other vehicles in fatal crashes, except that there were more on the front left side (12% vs 6%). In all six of these the bus hit a pedestrian crossing the road (Table 5.4).

Table 5.4 Place of impact on the bus and other vehicles involved in other fatal crashes.

| | BUS | | Other vehicles | |
|---|---|---|---|---|
| Point of impact | n | % | n | % |
| Front of vehicle | 31 | 63% | 2070 | 60 |
| Front centre | 21 | 43% | 1678 | 48% |
| Front left | 6 | 12% | 205 | 6% |
| Front right | 4 | 8% | 187 | 5% |
| Side of vehicle | 9 | 18% | 791 | 23% |
| Left side | 4 | 8% | 383 | 11% |
| Right side | 5 | 10% | 408 | 12% |
| Rear of vehicle | 3 | 6% | 129 | 4% |
| Overturn | 4 | 8% | 411 | 12% |
| Other | 2 | 4% | 60 | 2% |
| Total vehicles | 49 | (100%) | 3461 | (100%) |

## Contributory factors

For 34% of the bus crashes, the bus driver was considered to be at fault. This percentage includes nine crashes involving only buses. Buses were considered solely or jointly responsible 23% of the other bus crashes: 7 (41%) of the 17 crashes with pedestrians and 3 (11%) of the 27 crashes with other vehicles. (Table 5.5).

Bus drivers are thus less often solely at fault in crashes between different types of motor vehicles than car (58%) or motorcycle riders (54%) (Table 4.3).

Table 5.5 Number and percentage of bus crashes in which the bus driver, other road user, both or no one was considered to be responsible (based on evidence from the coroner or police accident report).

| | Road user responsible for bus crash | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Bus driver | | Other road user | | Both | | NO one | | Total |
| Bus crash vehicle mix | | | | | | | | | |
| | n | % | n | % | n | % | n | % | 100% |
| Bus only | 9 | 100% | - | - | - | - | 0 | 0% | 9 |
| *Bus* + pedestrian | 6 | 35% | 10 | 59% | 1 | 6% | 0 | 0% | 17 |
| *Bus* + other vehicle | 3 | 11% | 22 | 82% | 0 | 0% | 2 | 7% | 27 |
| Total bus crashes | 18 | 34% | 32 | 60% | 1 | 2% | 2 | 4% | 53 |

Bus crashes and other fatal crashes can be compared in terms of the various factors contributing to the crashes in Table 5.6. There was no specific type of factor relating to the buses or bus drivers which was more frequent than in other fatal crashes. Driver related factors, speeding and alcohol/drug use were less frequent than in other fatal crashes. However, ill health on the part of the other driver was considered contributory in 4 (8%) of the bus crashes; a figure higher than in other fatal crashes (1%).

Table 5.6 Number and percentage of bus and other fatal crashes attributed to various factors. Where appropriate, the number of crashes in which the factors relate to the bus driver or drivers of the other vehicles or pedestrians involved in the crash are shown. Significantly high percentages are highlighted.

| Factor | Bus crash | | | | Other crash | |
|---|---|---|---|---|---|---|
| | Bus driver | | Other driver | | | |
| | n | % | n | % | n | % |
| Driver error | 6 | 11% | 9 | 17% | 587 | 25% |
| - Road rule breach | (3 | 6%) | (6 | 11%) | (267 | 11%) |
| - Driver illness | (2 | 4%) | (4 | 8%) | (25 | 1%) |
| Failure to observe other unit | 5 | 9% | 4 | 8% | 286 | 12% |
| Fatigue | 2 | 4% | 6 | 11% | 163 | 7% |
| Vehicle defects | 2 | 4% | 1 | 2% | 83 | 4% |
| Alcohol/drug use by driver | 1 | 2% | 4 | 8% | 657 | 28% |
| Speed | 0 | 0% | 3 | 6% | 525 | 22% |
| Pedestrian factor | | | 12 | 23% | 405 | 17% |
| Visibility | | 3 | 6% | | 170 | 7% |
| Surface conditions | | 2 | 4% | | 129 | 5% |
| Crashes with at least one factor noted | 53 | | 53 | | 2360 | |

The percentages do not sum to 100% since up to 3 major factors can be recorded for each crash. The 'n' in the table is the number Of crashes with at least one Of the specific major factors recorded for the crash. The percentage is calculated with the denominator as the number Of crashes with some information on major factors.

Ninety percent of buses were considered to be within the speed limit, a higher proportion than in other fatal crashes (74%). However, of those five buses that were over the speed limit, four were in rural areas. These four represent 17% of the bus drivers involved in fatal bus crashes in rural areas. This percentage is less than that for drivers of other vehicles involved in all fatal rural crashes (27%) (but not significantly less).

All 8 bus crashes in which fatigue played a role, and all 4 in which alcohol and drug use by a driver contributed, occurred in rural areas.

## Journey details

As with other urban crashes, over 90% of bus crashes occurred within 50 km of commencement of the trip, whereas in rural areas only about two thirds occurred in the same radius. There was no indication that bus crashes were any different from other rural crashes in this respect.

## Persons involved

The breakdown of the 64 fatalities and 132 injuries resulting in hospitalisation into road user groups is given below in Table 5.7. Pedestrians, bicyclists and motorcyclists involved in these crashes were invariably killed. A larger proportion of occupants of the other vehicles in these accidents were killed compared with the bus occupants. Only 3% of the bus passengers were killed, but 27% were hospitalised.

In 39 (74%) crashes, only persons external to the bus and/or in other vehicles were killed. These fatalities numbered 44 and comprise 69% of victims of bus crashes. In 6 of the remaining bus crashes, only the bus driver was killed, in 7 crashes only bus passengers were killed, and in one crash the bus driver and a passenger were killed.

Table 5.7 Number of fatalities and serious injuries in each road user category involved in bus crashes. The 'not hospitalised' group includes uninjured persons and those injured but not requiring hospitalisation.

| Road user | Deaths | | Injured (hospitalised) | Not hospitalised | Total |
|---|---|---|---|---|---|
| | n | % | n | n | n |
| Pedestrians | 18 | 90% | 1 | 1 | 20 |
| Bicyclists | 2 | 100% | 0 | 0 | 2 |
| Motorcyclists/pillion passengers | 4 | 100% | 0 | 0 | 4 |
| Drivers of other vehicles | 14 | 58% | 3 | 7 | 24 |
| Passengers of other vehicles | 6 | 46% | 4 | 3 | 13 |
| Bus drivers | 7 | 13% | 6 | 40 | 53 |
| Bus passengers | 13 | 3% | 118 | 311 | 442 |
| Total persons | 64 | 11% | 132 | 362 | 558 |

## Drivers

Bus drivers were, in general, older than drivers of other vehicles involved in fatal accidents (median age 40 vs 30). Two thirds were in the age group 30 to 59 years compared with 42% of drivers of other vehicles.

Five (9%) were women, but this was not significantly less than the proportion of female drivers of other vehicles involved in fatal accidents (17%).

Information on driving experience was available for 38 of the bus drivers. In general, such information was available for only half the vehicles involved in fatal crashes. The bus drivers had more years of driving experience (median 15 y) compared with drivers of other vehicles in other fatal accidents (median 10 y). Further, this difference was, in fact, only apparent in the urban bus drivers (16 y vs 8 years for drivers of other vehicles involved in fatal urban crashes).

A total of 37 (70%) were tested for blood alcohol content and only one had a value of 0.05 or more; a lower fraction than other drivers tested and positive (3% vs 26%). Only one was tested for other drugs (with a negative result).

## Fatalities: Medical details

Of the 7 bus drivers killed, 3 died due to multiple injuries, 3 with head injuries and 1 with non-crash injuries. Three bus passengers died of multiple injuries, 6 of injuries to the head, 3 with spinal injuries and one from chest injuries.

Despite the small numbers, the frequency *of* death due to spinal injuries among the bus passenger fatalities was higher than expected compared with passenger fatalities in other vehicles involved in other fatal crashes (3;23% vs 32;4%). This was also observed in the comparison *of* the serious injuries among passenger fatalities (4; 31% for bus vs 77; 10% for other passengers).

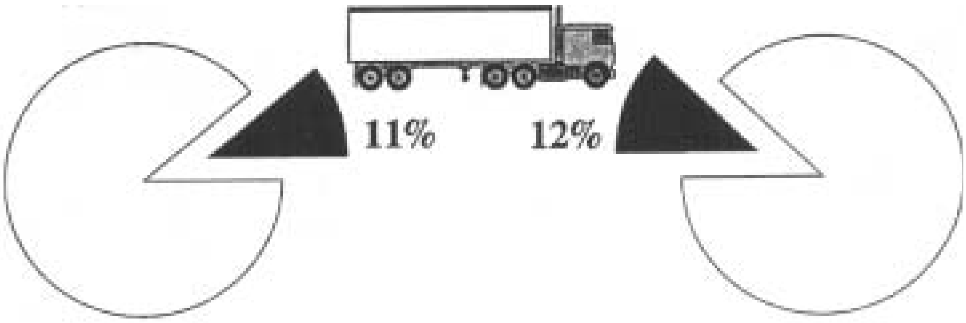
Comparison of the bus drivers with other driver fatalities failed to reveal any significant differences, partly due to the small numbers.

## summary

The 53 fatal crashes involving buses comprised the smallest crash type studied (2% of all fatal crashes) with the 20 bus occupant fatalities accounting for Only 1% of all road fatalities in 1988. The small number of crashes made characterisation difficult.

Most occurred during the day in urban regions. The majority of *bus* crash victims were actually external to the buses. One third of bus crashes involved the death of pedestrians. The other major type of crash was head-on. Bus drivers were older than other drivers and responsible for a smaller proportion of multiple vehicle crashes than other drivers. Speeding, fatigue, alcohol and drugs were rarely contributory. The incidence of serious injury (especially spinal injuries) appeared to be higher for bus passengers than for bus drivers and passengers in other vehicles involved in fatal crashes. Though only 3% of the passengers in buses involved in fatal accidents were killed, 27% were hospitalised.

# Chapter 6: Fatal articulated truck crashes




**Vehicles**
- Articulated trucks (ATs) accounted for 8% of vehicles in fatal crashes.
- Articulated trucks accounted for 61% of trucks in fatal crashes.
- Articulated trucks in fatal crashes were newer than types of vehicles in fatal crashes.

**Timing**
- Most fatal crashes involving articulated trucks (81%) occurred on weekdays.
- 62% of AT crashes occurred during the daytime; slightly more than other fatal crashes.

**Location**
- 66% of AT crashes occurred on rural roads with speed limits at least 80 km/h.
- 85% of rural AT crashes were not related to intersections.
- A higher than expected number of urban AT crashes (41%) occurred within intersections.

**Crash description**
- Many AT crashes (75%) involved at least two vehicles.
- A relatively high proportion of AT crashes (33%) were head-on (involving no turning vehicles).
- The impact point was most often the front of the truck hitting another vehicle at the side or rear.

**Contributory factors**
- 35% of AT drivers were considered solely responsible for the AT crashes and 22% were considered solely responsible for AT crashes with other types of vehicles. These percentages were low compared with cyclists, motorcyclists and passenger vehicle drivers involved in fatal crashes.
- The other drivers more often disobeyed road rules or failed to observe the AT.
- There was a low incidence of alcohol/drug use and speeding among the AT drivers involved in fatal crashes.
- Only 12% of AT drivers were speeding before fatal crashes.
- Only 3% of AT drivers were over the alcohol limit.
- Drug use and fatigue were not significantly more common factors among AT drivers than other drivers in fatal AT crashes.

**Drivers**
- Almost all AT drivers (99%) were male.
- AT drivers were older than other drivers in fatal crashes (median age 35 vs 29).
- 42% of AT drivers had travelled more than 100km before the crash.

- Only 23% articulated truck drivers wore seat belts at the time of the crash.
- 44% articulated trucks were not fitted with seat belts for the drivers.
- Just under half the AT drivers did not wear seat belts even when available.

**Fatalities**
- 79% of AT crash fatalities were external to the trucks (pedestrians, cyclists or in other vehicles).
- Only 20% of AT drivers involved in fatal crashes were killed.
- A lower proportion of AT truck driver fatalities (54%) sustained head injuries compared with other drivers killed (70%).

## Definition

An articulated truck crash was defined as any crash involving at least one moving articulated truck. An articulated truck was defined as any prime mover able to attach or detach the body from the cabin. The abbreviation AT refers to articulated trucks.

This definition excludes 6 crashes where another vehicle crashed into an articulated truck parked on the side of the road. In only one of these was the truck considered at fault, and in this case had broken down or was already involved in an accident.

## Frequency

Crashes of this type totalled 289 in 1988 and with the resulting 353 fatalities represent 11% of all fatal crashes and 12% of road fatalities in Australia that year. The fatalities included 59 truck drivers, 15 truck passengers, 149 drivers and 82 passengers of other vehicles, 16 motorcyclists, 7 bicyclists, 24 pedestrians and 1 rider of an animal. Truck occupants thus represented 3% of road fatalities.

The number of people hospitalised after these accidents was 157 or 10% of fatal crash hospitalisations for non-fatal injuries.

Articulated trucks accounted for 8% of vehicles involved in fatal accidents and 61% of all trucks involved in fatal accidents. Other vehicles involved in articulated truck crashes accounted for 6% of vehicles in fatal accidents.

## Contrast groups

In the following, AT crashes are compared with all other fatal crashes, unless otherwise stated. Articulated trucks are compared with other vehicles in other fatal accidents.

Articulated truck drivers and passengers are compared with drivers or riders and passengers of other non-stationary vehicles in other fatal crashes.

## Timing

The pattern within the year did not differ from other fatal crashes.

Proportionally more AT crashes occurred on each weekday with weekday AT crashes totalling 81% compared with 62% for other fatal crashes (Figure 6.1). Slightly, but significantly, more AT crashes occurred during the day (62% vs 52%). This was more pronounced on weekdays. Disproportionately more AT crashes occurred in the morning between 5 am and 10 am and fewer at night. This difference was evident only on weekdays. Weekend crash times followed that of other fatal crashes. Figure 6.2 illustrates the relative proportions of AT crashes and other fatal crashes by hour of day on weekdays and weekends.

Figure 6.1 Articulated truck and other fatal crashes by day of week

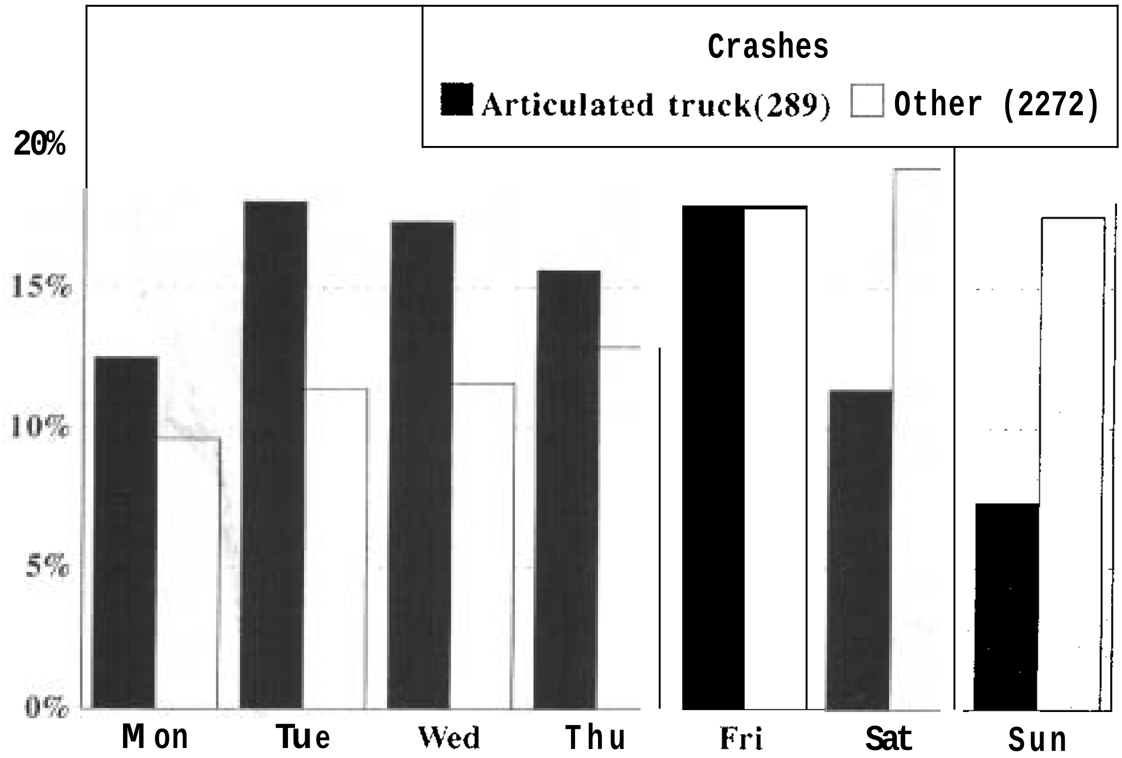
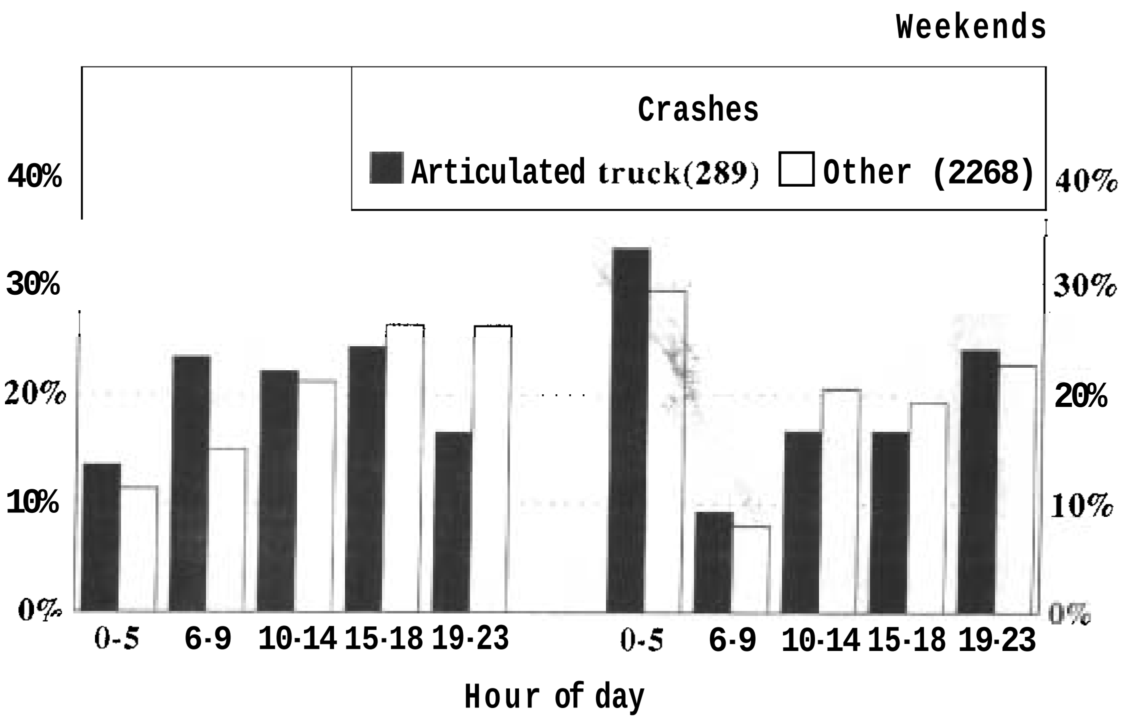



Figure 6.2 Articulated tr k and a er fatal ·ashes t hour or weekdays and weekends




Source: FORS 1988 Fatal file

## Location

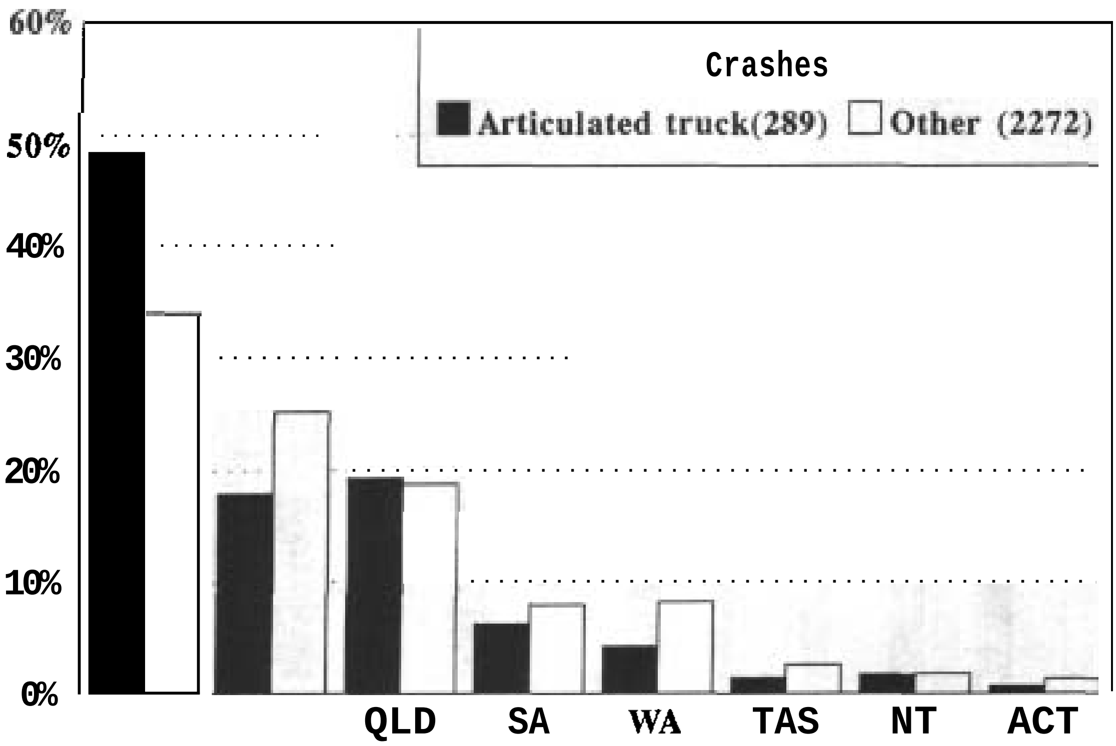
There were some differences from the distribution of other fatal crashes by State (Figure 6.3). NSW had more (48% vs 34%), and Victoria (18% vs 25%) and WA (4% vs 8%) had less than expected based on other fatal crashes.

Table 6.1 shows the location of crashes with respect to urban/rural status and speed limits. Two thirds of all fatal AT crashes occurred in rural high speed zones (>=80 km/h), compared with only 40% of other crashes. Of these 189, most, 169, occurred on highways. Almost one quarter of AT crashes occurred in urban low speed zones.

Table 6.1 Location of articulated truck crashes and other fatal crashes with respect to urban/rural status and speed zones. Low speed is <80km/h. In 4 cases, there was not enough information to determine the zone.

| | Crashes | | | |
|---|---|---|---|---|
| | AT | | Other | |
| Zone | n | % | n | % |
| Rural high speed | 189 | 66% | 911 | 40% |
| Urban high speed | 25 | 9% | 195 | 9% |
| Rural low speed | 6 | 2% | 43 | 2% |
| Urban low speed | 67 | 23% | 1121 | 49% |
| Total | 287 | 100% | 2270 | 100% |

Figure 6.3 Articulated truck and other fatal crashes by State




Source: Fors 1988 Fatal file

The location of the AT crashes with respect to intersections was similar to other fatal crashes in rural areas (85% mid-block). However, in urban regions there was a higher incidence within intersections (41% vs 24%) (Figure 6.4).

Twelve (6%) of the AT crashes occurred in breakdown (7), diverging (3) or merging (2) lanes compared with only 2% of other fatal crashes.

The percentage of AT crashes occurring on curved stretches of road was similar to other crashes within urban areas (22% vs 23%) and rural areas (47% vs 45%). A higher proportion of AT crashes occurred on roads with loose shoulders (155; 65% vs 45%). However, the difference was not significant within each of the four urban/rural speed zones and shoulder involvement was only cited for 4 articulated trucks.

## Vehicle characteristics

A total of 302 articulated trucks were involved in AT crashes and 229 other non-stationary vehicles. Of the ATs, 52 (20%) were not loaded.

The AT types included fridge (17%), table top (14%), tip truck (6%). grain (4%), tanker (3%), van (2%), no trailer (2%), B-double (2%) and fuel (1%). However, an additional 26% were classed as 'other' and, for a further 23%, there was no information on type.

The AT trucks were newer than vehicles involved in other crashes (median year of manufacture 1983 vs 1980). Fewer were tested for defects (28% vs 36%). Of the 85 that were tested, only 17 (20%) had any defects; no more than expected. These 17 included: 6 tyres, 5 lights, 4 brakes, 2 other. The only significant difference was fewer brake faults. Of those 17 faults, only 8 were considered critical.

The ATs were more often registered interstate (31% vs 8%). This was observed for trucks in both urban and rural crashes.

Fewer trucks were damaged than vehicles involved in other fatal accidents (62% with major damage vs 77%). Most (95%) of the other moving vehicles involved in AT crashes sustained serious damage. Additionally, 3 stationary vehicles which were hit by the ATs were extensively damaged.

## Crash description

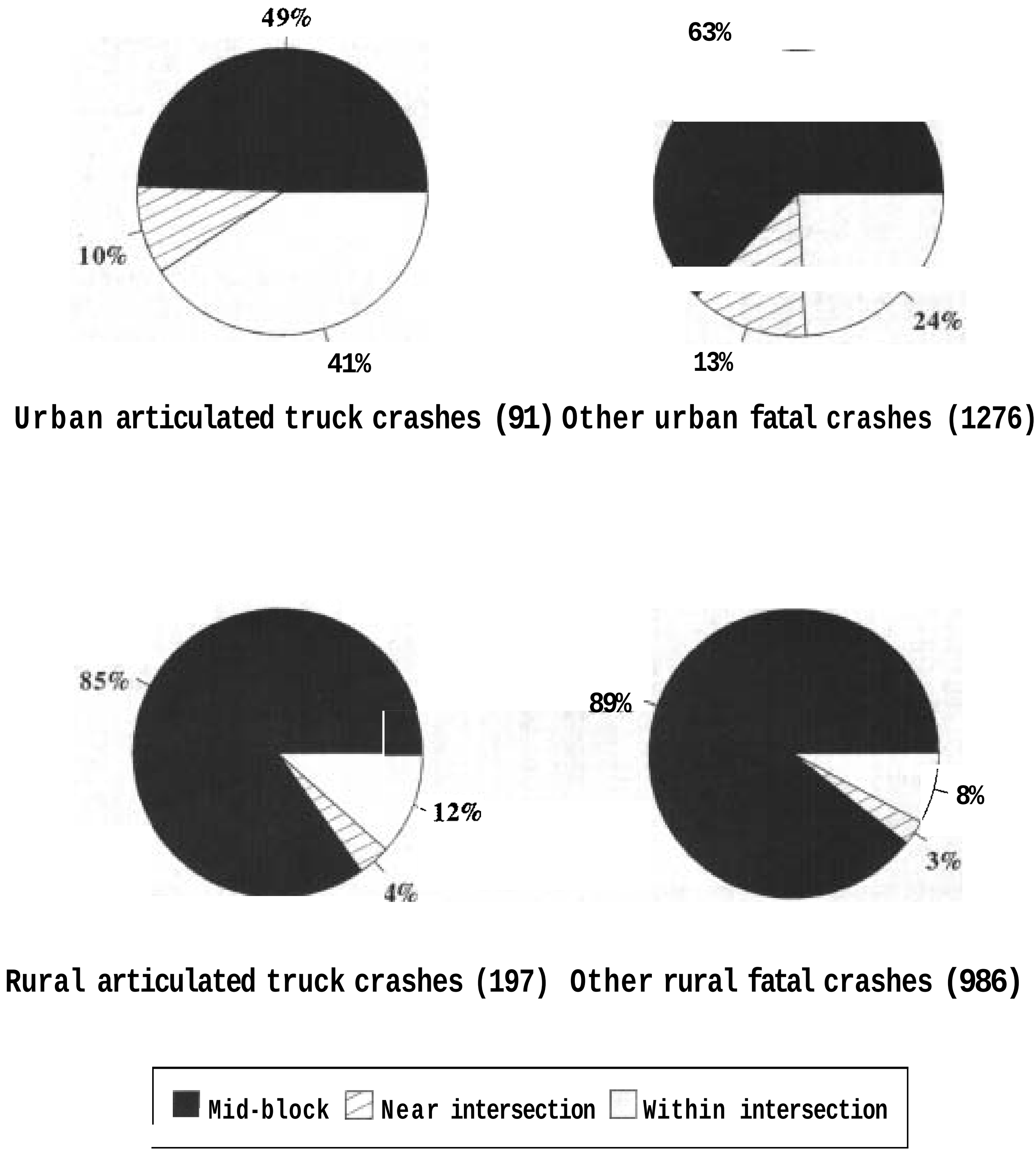
AT crashes most often involved several vehicles. Only 17% of AT crashes were single vehicle crashes compared with 42% of other crashes. (Figure 6.5).

In terms of complexity of events, AT crashes resembled other fatal crashes with 37 (13%) prior events, 230 (80%) fatal DCAs and 60 (21%) subsequent events. However, unlike fatal crashes, more prior (64% vs 42%), DCA (84% vs 64%) and subsequent events (60% vs 29%) occurred on the carriageway.

The most common DCA (95; 33% vs 15%) was a head-on collision involving no turning vehicles. Figure 6.6 shows the breakdown of major DCA groups for AT and other fatal crashes. AT crashes were more often cross traffic (16% vs 8%), opposing direction (36% vs 19%), or same direction (13% vs 4%) and less often pedestrian (8% vs 22%) or out of control crashes off the carriageway (16% vs 38%). Of the crashes with vehicles travelling in the same direction, the distinction was greatest *for* 'rear end' crashes (8% vs 2%).

Similar differences in the major crash patterns between AT crashes and other fatal crashes were observed in urban low speed and rural high speed zones. Additionally, overtaking crashes were more common with 7% of the rural high speed AT crashes involved overtaking (compared with none of the urban low speed AT crashes).

Figure 6.4 Location of urban & rural articulated truck and other fatal crashes with respect to intersections




Source: FORS 1988 Fatal file

Figure 6.5 Articulated truck and other fatal crashes by number of vehicles in the crash

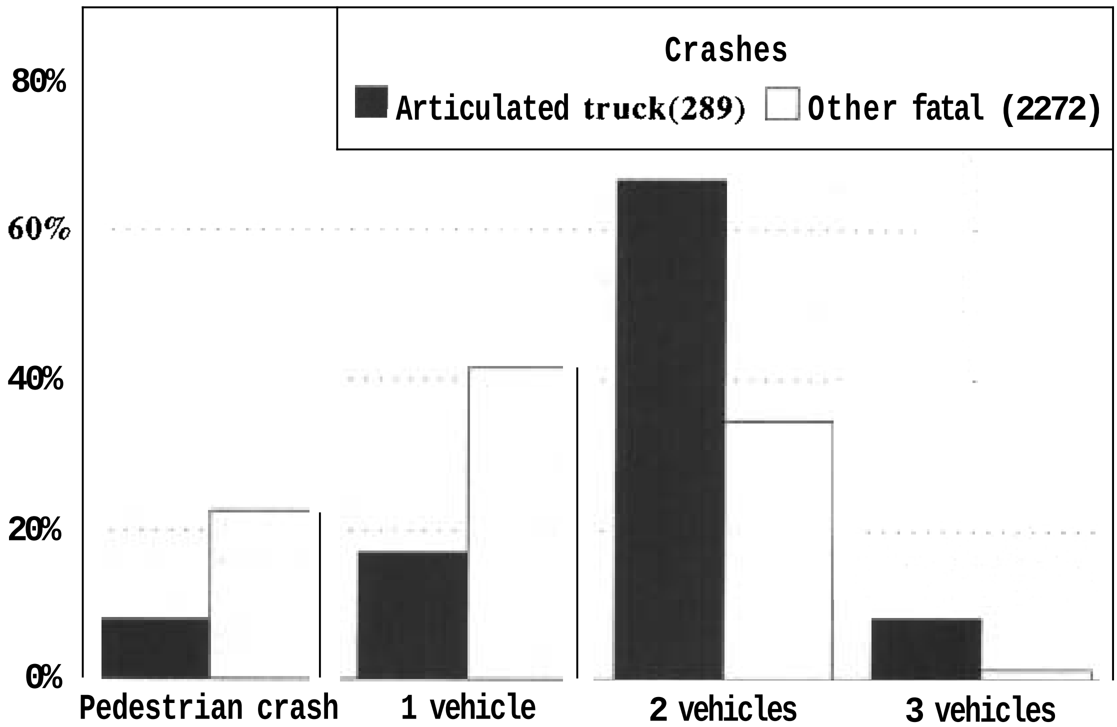
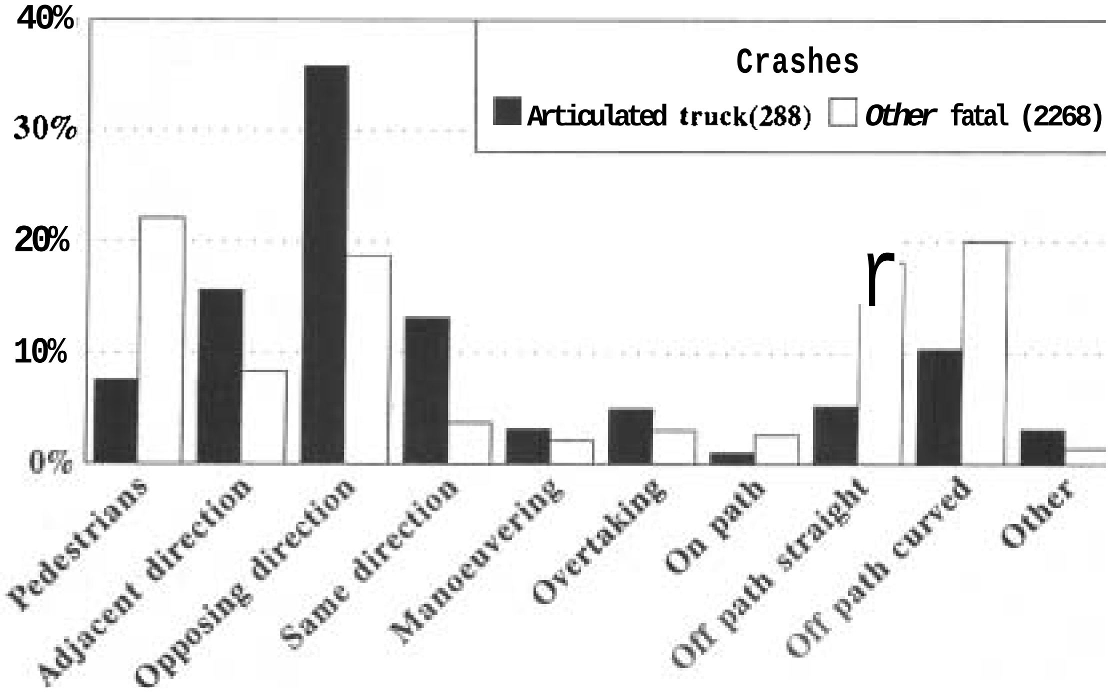



Figure 6.6 Articulated truck and other fatal crashes by major crash classification (DCA)




Source: FORS 1988 Fatal file

There were fewer prior events of the 'out of control' type (21; 57% vs 75%). but more avoidance manoeuvres (13; 35% vs 16%). The subsequent events also differed from other fatal crashes with a high number of head-on collisions (21; 35% vs 5%) and a lower incidence of off path on straight (21; 35% vs 47%) and curved (10; 17% vs 36%) roads.

The distribution of point of primary impact is shown in Table 6.2 for articulated trucks, other vehicles in articulated truck crashes and vehicles in other fatal crashes. Compared with the ATs, the other vehicles in AT crashes had fewer frontal impacts and more on the sides, especially the right hand side, and were more often hit from the rear.

Comparing vehicles in other fatal crashes with ATs, there were also fewer full frontal impacts and more at the sides. The proportions of front angular and rear impacts were similar.

Table 6.2 Place of impact on articulated trucks, other vehicles in articulated truck crashes and vehicles involved in other fatal crashes. significantly high percentages comparing ATs and other vehicles in AT crashes are highlighted.

| | Articulated truck | | Other vehicles in articulated truck crashes | | Other vehicles in other fatal crashes | |
|---|---|---|---|---|---|---|
| Point of impact | n | % | n | % | | |
| Front of vehicle | 193 | 66% | 108 | 48% | 1832 | 60% |
| Front centre | 163 | 56% | 99 | 44% | 1464 | 48% |
| Front left | 16 | 5% | 2 | 1% | 196 | 6% |
| Front right | 14 | 5% | 7 | 3% | 172 | 6% |
| Side of vehicle | 43 | 15% | 76 | 33% | 694 | 23% |
| Left side | 20 | 7% | 28 | 12% | 347 | 11% |
| Right side | 23 | 8% | 48 | 21% | 347 | 11% |
| Rear of vehicle | 10 | 3% | 27 | 12% | 130 | 4% |
| Rear centre | 7 | 2% | 21 | 9% | 94 | 3% |
| Rear left | 1 | 0% | 1 | 0% | 14 | 0% |
| Rear right | 2 | 1% | 5 | 2% | 22 | 1% |
| Overturn | 39 | 13% | 9 | 4% | 367 | 12% |
| Other | 6 | 2% | 7 | 3% | 50 | 2% |
| Total vehicles | [1]291 | (100%) | 227 | (100%) | 3073 | (100%) |

[1] Point of impact missing for 11 ATs

Information on direction of impact was available only for cars, buses and trucks not involved in pedestrian crashes. Table 6.3 illustrates this for articulated trucks, other vehicles in AT crashes and vehicles in other fatal crashes. The differences between direction of impact for ATs and other vehicles in AT crashes are similar to the point of impact differences (i.e. fewer front, more sides and rear of the other vehicle, except that left and right sides are equally different).

Table 6.3 Direction of impact for articulated trucks, other vehicles in articulated truck crashes and vehicles involved in other crashes.

| Direction of impact | Articulated truck | | Other vehicles in articulated truck crashes | | Other vehicles in other fatal crashes | |
|---|---|---|---|---|---|---|
| | n | % | n | % | | |
| **Front of vehicle** | 191 | 84% | 120 | 62% | 1334 | 73% |
| Front centre | 131 | 58% | 75 | 39% | 838 | 46% |
| Front left | 14 | 6% | 7 | 4% | 190 | 10% |
| Front right | 46 | 20% | 38 | 20% | 306 | 17% |
| **Side of vehicle** | 21 | 9% | 42 | 22% | 350 | 19% |
| Left side | 11 | 5% | 22 | 11% | 184 | 10% |
| Right side | 10 | 4% | 20 | 10% | 166 | 9% |
| **Rear of vehicle** | 15 | 7% | 26 | 13% | 131 | 7% |
| Rear centre | 6 | 3% | 18 | 9% | 52 | 3% |
| Rear left | 6 | 3% | 3 | 2% | 44 | 2% |
| Rear right | 3 | 1% | 5 | 3% | 35 | 2% |
| **Roof** | 0 | 0% | 6 | 3% | 14 | 1% |
| Total vehicles[1] | [2]227 | (100%) | 194 | (100%) | 1829 | (100%) |

[1] Excluding overturning vehicles and 2 wheeled vehicles, for which direction of impact is not coded.
[2] Direction of impact missing for 36 ATs.

## Contributory factors

The articulated truck drivers were considered solely responsible for only 100 (35%) of the crashes where information was available on who was at fault. This percentage includes 56 crashes involving only articulated trucks. Of the 23 AT crashes involving pedestrians, the AT was considered responsible for 1 (4%) and jointly responsible for 3 (13%). In terns of crashes between ATs and other vehicles, the AT drivers were deemed solely responsible for 22% and jointly responsible for 3%. AT drivers thus have a lower fault rate (22%) than car drivers (58%), motorcyclists (54%) and a rate not significantly higher than bus drivers (11%), based on fatal multiple vehicle accidents between vehicles of different types (Tables 4.3, 5.5, & 6.4)

Table 6.4 Number and percentage of articulated truck (AT) crashes in which the truck driver, other road user, both or no one was considered to be responsible (based on evidence from the coroner or police accident report).

| AT crash vehicle mix | Road user responsible for articulated truck crash: Truck driver | | Other road user | | Both | | No one | | Total |
|---|---|---|---|---|---|---|---|---|---|
| | n | % | n | % | n | % | n | % | 100% |
| AT(s) only | 53 | 95% | – | – | – | – | 3 | 5% | 56 |
| AT + pedestrian | 1 | 4% | 19 | 83% | 3 | 13% | 0 | 0% | 23 |
| AT + other vehicle | 46 | 22% | 153 | 74% | 6 | 3% | 3 | 1% | 208 |
| Total AT crashes | 100 | 35% | 172 | 60% | 9 | 3% | 6 | 2% | [1]287 |

1 In 2 AT Crashes fault information was missing or inconsistent.

Table 6.5 shows the percentage of AT and other fatal crashes in which at least one of the factors of various types was noted. The AT crashes in which the AT driver was considered solely responsible, and those for which the other driver was considered solely responsible, are also shown. Significantly high percentages are highlighted.

AT crashes were characterised by driver road rule breaches and unintentional failure to see the other unit, but less often speeding, alcohol and/or drug use and pedestrian factors compared with other fatal crashes. However, in these crashes the driver of the other vehicle was more often considered responsible. Of the 51 AT crashes involving road rule errors, when subdivided by who was deemed responsible, it was the drivers of the other vehicles who were mor; often at fault (38-other drivers vs 11 AT drivers).

Drug use in the absence of alcohol was considered contributory in only two of the AT crashes in which the AT driver was considered responsible.

Fewer ATs were considered to be over the speed limit than vehicles in other crashes (12% vs 28%). This was observed in both rural and urban areas and speed zones.

Of the 13 AT crashes in which the AT was responsible and fatigue considered to play a role, 12 occurred in rural high speed zones. Compared with other fatal crashes in rural high speed zones, the incidence of fatigued AT truck drivers was not higher (19% rural high speed AT crashes with AT at fault vs 13% other rural crashes).

Table 6.5 Number and percentage of AT and other fatal crashes attributed to various factors.

| | Articulated truck crashes | | | | | | Other fatal crashes | |
|---|---|---|---|---|---|---|---|---|
| | Vehicle responsible for crash | | | | Total | | | |
| | AT | | Other vehicle | | | | | |
| Factor | n | % | n | % | n | % | n | % |
| Driver/rider error | 17 | 20% | 51 | 35% | 14 | 28% | 528 | 25% |
| -Road rules | (11 | 13%) | (38 | 26%) | (51 | 19%) | (225 | 10%) |
| Failure to observe other unit | 8 | 9% | 33 | 23% | 50 | 19% | 244 | 11% |
| Alcohol/drugs (driver) | 12 | 14% | 29 | 20% | 41 | 15% | 621 | 29% |
| Speed | 11 | 13% | 20 | 14% | 33 | 12% | 495 | 23% |
| Fatigue | 13 | 15% | 13 | 9% | 26 | 10% | 145 | 7% |
| Pedestrian factor | | | | | 20 | 8% | 397 | 18% |
| Visibility | | | | | 17 | 6% | 156 | 7% |
| Vehicle defects | | | | | 15 | 6% | 71 | 3% |
| Surface conditions | | | | | 15 | 6% | 116 | 5% |
| Crashes for which at least one factor noted | 85 | | 146 | | 265 | | 2148 | |

The percentages *do* not sum to 100% since up to 3 major factors can be recorded for each crash. The "n" in the table is the number Of crashes with at least one of the specific major factors *recorded* for the crash. The percentage is calculated with the *denominator* as the number Of Crashes With some information on major factors.

## Persons involved

The severity of injury for the different road user groups is given below in Table 6.6. Almost all pedestrians, bicyclists and motorcyclists involved in these crashes were killed and higher proportions of drivers and passengers of the other vehicles in these accidents were killed compared with the AT occupants. Persons external to the AT trucks accounted for 79% of the AT truck crash fatalities.

Table 6.6 Number of fatalities and serious injuries in each road user category involved in articulated truck crashes. The 'not hospitalised' group includes uninjured persons and those injured but not requiring hospitalisation.

| Road user | Deaths n | Deaths %[1] | Injured (hospitalised) n | Persons not hospitalised n | Total involved n |
|---|---|---|---|---|---|
| Pedestrians | 24 | 96% | 1 | 0 | 25 |
| Bicyclists | 7 | 100% | 0 | 0 | 7 |
| Motorcyclists /pillion passengers | 16 | 94% | 1 | 0 | 17 |
| Rider (animal) | 1 | 50% | 0 | 1 | 2 |
| Drivers of other vehicles | 149 | 72% | 32 | 25 | 206 |
| Passengers of other vehicles | 82 | 35% | 89 | 64 | 235 |
| Articulated truck drivers | 59 | 20% | 18 | 224 | 301 |
| Articulated truck passengers | 15 | 19% | 16 | 46 | 17 |
| Total persons | 353 | 41% | 157 | 360 | 870 |

[1] % of those involved in the crash

## Drivers

The AT drivers were more often over 100km from home compared with other drivers (64% vs 21%) and they had more frequently travelled more than 100 km before the crash (42% vs 10%). There were more interstate drivers (31% vs 8%). Similar differences were observed in both urban and rural areas.

Of those AT drivers whose origin and destination were known (220; 76%), 98% were on work related journeys.

AT drivers were older than other drivers (median age 35 vs 29). Only 14% were aged 17-25 compared with 38% other drivers. Based on the information available (only 44% of total), the AT drivers had more driving experience than other drivers (median years of experience 15 vs 13).

Only 3 AT drivers were women (1% vs 19% of drivers of vehicles in other fatal crashes).

A lower percentage of the AT drivers were killed compared with drivers of other vehicles (20% vs 44%). The fraction of AT passengers killed was not significantly different from other passengers (19% vs 25%) (Table 6.6).

## Seat belts

Seat belts were compared between ATs and non-stationary passenger vehicles involved in fatal crashes.

Seat belt availability was recorded for 68% of AT occupants and 82% of passenger vehicle occupants. Whether they were actually worn during the crash was recorded for 91% of the AT occupants and 87% of the passenger vehicle occupants who were noted as having a seat belt available to them. Table 6.7 shows the seat belt availability and use for AT and passenger vehicle drivers and passengers.

Whereas most cars were fitted with seat belts, 56% of AT drivers had no seat belt available to them. This, coupled with the AT drivers' reluctance to wear them, even if available, led to only 23% of AT drivers actually wearing seat belts during the crash, compared with 83% of car drivers. Approximately 45% of AT drivers and 15% of car drivers did not wear seat belts even though available. These percentages could be as high as 49% and 24% if those with missing information are included.

Of the fatalities, only 7% of AT drivers who died wore seat belts, compared with 67% of car driver fatalities.

The AT passengers had an even lower rate of seat belt use (2%), which was also due to both non-availability and non-use. None of the 15 AT passengers who died were known to be wearing seat belts.

Only 3 of the 69 AT occupants who were killed were definitely wearing seat belts.

Table 6.7 Number and percentage of truck and passenger car drivers and passengers with respect to availability and use of seat belts.

| | Articulated trucks | | | | Passenger vehicles | | | |
|---|---|---|---|---|---|---|---|---|
| | Drivers | | Passengers | | Drivers | | Passengers | |
| Seat belts | n | % | n | % | n | % | n | % |
| None available | 119 | 56% | 32 | 74% | 26 | 1% | 180 | 9% |
| Available | 94 | 44% | 11 | 26% | 2214 | 99% | 1773 | 91% |
| Not worn | 39 | | 8 | | 306 | | 303 | |
| worn | 48 | 23%[1] | 1 | 2%[1] | 1674 | 83%[1] | 1198 | 71%[1] |
| Worn, if available | | 55%[2] | | 11%[2] | | | | |
| Unknown if worn | 7 | | 2 | | 234 | | 272 | |
| Total occupants | 213 | | 43 | | 2240 | | 1953 | |

[1] Overall percentage wearing seat belts
[2] Percentage wearing seat belts given that they were available and there was information on whether they were worn or not.

The proportions of AT drivers (4%) and passengers (9%) who were ejected from their vehicles, were not higher than for car occupants (7% and 11% for car drivers and passengers, respectively).

## Alcohol

The proportion of AT drivers tested for alcohol (73%) was similar to that for other drivers involved in other fatal crashes. There were fewer values greater than 0.05 (7; 3% vs 28%). The median non-zero blood alcohol reading was 0.06, compared with 0.15 for other drivers.

Six of the seven with elevated alcohol levels died. However, the proportion of AT driver fatalities tested (78%) was no higher than expected.

## Drugs

Twelve were tested (4%) for drugs with positive results for 5 (42%) drivers. Neither percentage is higher than for other drivers. The positive results included marijuana (2 cases), ephedrine (2), amphetamine (1) and phentermine (1). One driver had a positive test for marijuana and ephedrine. Ten of the twelve tested for drugs died (4 of the 5 with positive tests).

## Fatalities

Forty-six (16%) AT crashes resulted in multiple fatalities compared with 9% of other fatal crashes.

The 59 AT drivers who died were older than other driver fatalities (median age 33 vs 28). The age distribution of the AT drivers who died was similar to that of the other AT drivers.

The age and sex of the 15 AT passengers was similar to that of other passenger fatalities.

Lower proportions of AT driver fatalities were thrown out of their vehicles compared with other driver fatalities (22% vs 37%). No significant differences were found for passengers (33% vs 23%).

## Medical details

Forty percent of the AT drivers died instantaneously and another 45% died at the scene before medical attention, compared with 28% and 29%, respectively for other driver fatalities. However, 51 of the 59 AT driver fatalities occurred in rural areas and comparison with other rural driver fatalities revealed no significant differences in timing of death.

The coroner's assessment of final cause of death for the 59 AT driver fatalities was similar to that of other driver fatalities, except there were more external injuries (3; 5% vs 1%). This was also evident in the location of serious injuries for the fatalities (external: 12% vs 2%). Additionally, there was a lower incidence of head injury (54% vs 70%).

The 15 AT passenger fatalities had a pattern of injury and cause of death not significantly different from the AT driver fatalities or other passenger fatalities.

## Summary

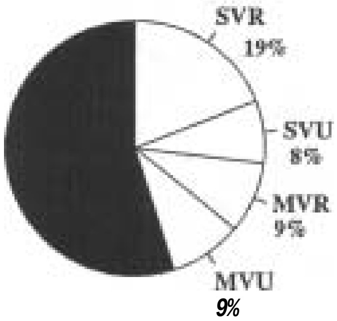
Eleven percent of fatal crashes (289) involved articulated trucks. Most occurred on weekdays (81%). Two thirds occurred on rural roads with speed limits at least 80 km per hour. A higher than expected number of the urban articulated truck crashes occurred within or near intersections (41%). The most common types of crashes involving articulated trucks were multiple vehicle crashes. Head-on, cross traffic and rear end collisions accounted for the majority. Only 22% of the drivers of these trucks were at fault in collisions with other types of vehicles. Speeding, alcohol and drug use were uncommon. The drivers of the other vehicles were more likely to make a road rule error causing these accidents.

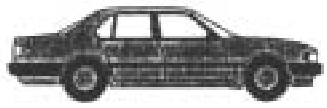
The truck drivers were almost all men and older than other drivers in fatal accidents.

Only 23% truck drivers wore seat belts (and even fewer truck passengers) due to low availability and low use even when available. However, most (79%) of the 353 resultant fatalities were persons external to the trucks.

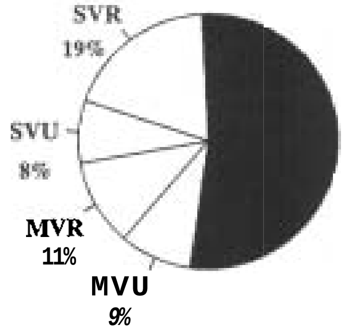
# Chapter 7: Single and multiple vehicle crashes in rural high speed and urban low speed zones

**Crashes**



**Fatalities**




This chapter describes the following four types of fatal crashes:

**SVR** Single vehicle rural high speed crashes
Fatal crashes involving a single passenger vehicle or rigid truck occurring on rural roads with speed limits at least 80 km/h.

**SVU** Single vehicle urban low speed crashes
Fatal crashes involving a single passenger vehicle or rigid truck occurring on urban roads with speed limits less than 80 km/h.

**MVR** Multiple vehicle rural high speed crashes
Fatal crashes involving at least two passenger vehicles and/or rigid trucks occurring in rural high speed zones.

**MVU** Multiple vehicle urban low speed crashes
Fatal crashes involving at least two passenger vehicles and/or rigid trucks occurring in urban low speed zones.

The features of these four types of crashes are summarised by first listing the common characteristics of the single compared with the multiple vehicle crashes, the rural versus the urban crashes, and then the individually distinguishing characteristics of each of the four crash types.

| Single vehicle crashes (SVR+SVU) | Multiple vehicle crashes (MVR+MVU) |
|---|---|
| Many occurred on weekends (44%) | Many occurred on weekdays (67%)<br>Many occurred during the day (64%) |
| Many occurred after recreational activities (59%) | Relatively large number of drivers were on work related trips (19%) |
| Most (91%) occurred mid-block<br>Most vehicles (92%) out of control<br>Most vehicles (87%) ran off the road | 36% occurred within intersections |
| 46% of crashes were alcohol related<br>Driver and passenger blood alcohol readings tend to be related | Visibility problems contributed to 12%<br>Driver errors contributed to 46% |
| Many younger drivers (47% <=25 yrs)<br>Mainly male drivers (83%)<br>High percentage (11%) unemployed | Older, more experienced drivers<br>77% male drivers |
| Relatively low (59%) seat belt *use*<br>Many (39%) head injury deaths | Relatively high (88%) seat belt use<br>Many chest injury deaths (19%) |

| Rural high speed crashes (SVR+MVR) | Urban low speed crashes (SVU+MVU) |
| --- | --- |
| | Urban crashes in Victoria much more likely to involve multiple vehicles than other States. |
| Most (91%) occurred mid-block<br>Most (96%) occurred on roads with loose shoulders | Many (42%) occurred at intersections<br>Most (92%) drivers were <50km from home |
| Drivers in rural high speed crashes were slightly older than drivers in urban low speed crashes | Drivers in urban low speed crashes were slightly younger than drivers in rural high speed crashes |
| Many (40%) died before medical assistance | Many died in hospital (38%) |

| Single vehicle rural crashes (SVR) | Single vehicle urban crashes (SVU) |
| --- | --- |
| 41% occurred on weekends<br>48% occurred at night<br>Most (87%) occurred in fine weather | 50% occurred on weekends<br>73% occurred at night |
| Only 4% occurred at intersections | 22% occurred at intersections |
| Fatal impact was overturn for 50%<br>Road shoulder involvement for 23% | 84% of vehicles hit an object |
| 49% of drivers over 0.05 alc limit<br>18% of drivers fatigued<br>22% of drivers ejected from car | 65% of drivers over 0.05 alcohol limit<br>Speed contributed to 50% of crashes<br>33% of drivers died instantly |

| Multiple vehicle rural crashes(MVR) | Multiple vehicle urban (MVU) |
| --- | --- |
| 65% of MVR occurred on weekdays<br>68% of MVR occurred during the day | 69% occurred on weekdays<br>59% occurred during the day |
| Only 19% occurred at intersections | 54% occurred within intersections |
| Many (71%) were head-on crashes | 45% of MVU crashes were head-on, 38% of crashes between vehicles from adjacent directions |
| Road surface contributed to 12%<br>Relatively high percentage of MVR crashes (27%) resulted in multiple fatalities | Road rule errors contributed to 39% |
| | A relatively high percentage of vehicles in MVU crashes had no passengers (52%) |
| Abdomen, extremity injuries common | 46% of deaths occurred in hospital |

## Introduction

### Inclusions, exclusions

This chapter deals with single and multiple vehicle accidents in rural high speed zones and urban low speed zones. These four mutually exclusive crash types are denoted SVR, SW, MVR and MVU. Excluded from these four groups are crashes dealt with in the previous chapters, i.e. crashes involving pedestrians, bicycles, motor cycles, buses and articulated trucks. This leaves passenger vehicles and rigid trucks. Passenger vehicles were involved in the majority of these crashes. There were only 15 single vehicle crashes involving rigid trucks in rural high speed zones and 8 in low speed zones. These were included in the SVR and S W groups and represent only 3% and 4% of these groups, respectively. See Table 7.1.

There were 36 multiple vehicle crashes involving rigid trucks and no pedestrians, cyclists, motorcycles, buses nor articulated trucks in rural high speed zones. These comprise 15% of the remaining *MVR* crashes. The corresponding figures for urban low speed multiple vehicle crashes were 38 or 17%. As these rigid truck crashes represented more substantial proportions of the multiple vehicle accidents to be studied in this chapter, it was checked whether these crashes differed from multiple vehicle crashes involving only passenger vehicles in terms of crash pattern and major factors. Since no obvious differences were noted, it was decided to included these for completeness.

Table 7.1 Number of fatal crashes by the number and type of non-stationary vehicles involved in rural high speed, urban low speed and other zones. High speed is at least 80 km/h; low speed <80 km/h. Note that crashes involving bicycles, motorcycles, buses and/or articulated trucks were included in the 'other' vehicle mix category.

| Vehicle mix | Rural speed | Urban low speed | Other | Total |
|---|---|---|---|---|
| **Single vehicle crashes** | | | | |
| Passenger vehicle only | 1484 | [2]211 | 64 | 759 |
| Rigid truck only | [1] 15 | | 2 | 25 |
| Pedestrian and 1 vehicle | 53 | 423 | 41 | 517 |
| Other single vehicle | 91 | 94 | 26 | 211 |
| Total single vehicle | 643 | 736 | 133 | 1512 |
| **Multiple vehicle crashes** | | | | |
| Passenger vehicles only | ''198 | [4]192 | 67 | 457 |
| Passenger vehicles and/or rigid trucks | [3] 36 | [4] 38 | 11 | 85 |
| Pedestrian and at least 2 other vehicles | 2 | 14 | 2 | 18 |
| Other multiple vehicle | 221 | 208 | 60 | 489 |
| Total multiple vehicle | 457 | 452 | 140 | 1049 |
| **Total fatal crashes** | 1100 | 1188 | 273 | 2561 |

[1] SVR single vehicle (car/rigid truck) rural high speed crashes
[2] SVU single vehicle (car/rigid truck) urban low sped crashes.
[3] MVR multiple vehicle (car/rigid truck) rural high speed crashes.
[4] MVU multiple vehicle (car/rigid truck) urban low speed crashes.

Also excluded from this chapter were the single and multiple accidents in the other types of urban/rural speed zones, i.e. rural low speed and urban high speed. There were, in total, 49 rural low speed and 220 urban high speed crashes. If one considers only those not already included in the previous chapters, i.e those involving only passenger vehicles and/or rigid trucks, these crashes represent generally small proportions; 19 (2%) single vehicle rural low speed crashes, 47 (6%) single vehicle urban high speed crashes, 8 (1%) multiple vehicle rural low speed crashes and 70 (13%) multiple vehicle urban high speed crashes. The possible exception being the last category multiple vehicle accidents in urban high speed zones.

## Definitions

A single vehicle rural (SVR) crash was thus defined as a single motor vehicle crash involving either a non-stationary passenger vehicle or rigid truck occurring in a rural high speed zone. Note that this excluded all crashes involving any pedestrians, bicycles or non-stationary motorcycles, buses or articulated trucks.

A single vehicle urban (SW) crash was defined as a single motor vehicle crash involving either a non-stationary passenger vehicle or rigid truck occurring in an urban low speed zone.

A multiple vehicle rural (MVR) crash was defined as a multiple motor vehicle crash involving at least two non-stationary passenger vehicles or rigid trucks or combinations of these occurring in a rural high speed zone.

A multiple vehicle urban (MVU) crash was defined as a multiple motor vehicle crash involving at least two non-stationary passenger vehicles or rigid trucks or combinations of these occurring in an urban low speed zone.

## Frequency

### SVR

There were 499 crashes classed as single vehicle rural (SVR). These represent 19% of all fatal crashes, 51% of single motor vehicle crashes (excluding pedestrian and bicycle crashes) and 45% of all rural high speed crashes. The 552 resultant fatalities represent 19% of all road fatalities for 1988.

### SVU

There were 219 crashes classed as single vehicle urban (SVU). These represent 8% of all fatal crashes, 22% of single motor vehicle crashes and 18% of all urban low speed crashes. The 240 resultant fatalities represent 8% of all road fatalities for 1988.

### MVR

There were 234 crashes classed as multiple vehicle rural (MVR). These represent 9% of all fatal crashes, 24% of multiple motor vehicle crashes (excluding pedestrian and bicycle crashes) and 21% of all rural high speed crashes. The 320 resultant fatalities represent 11% of all road fatalities for 1988.

### MVU

There were 230 crashes classes as multiple vehicle urban (MW).These represent 9% of all fatal crashes, 24% of all multiple motor vehicle crashes and 19% of all urban low speed crashes. The 257 resultant fatalities represent 9% of all road fatalities for 1988.

## Contrast groups

These four crash types and their corresponding vehicles, drivers and passengers and fatalities are, in general, compared with each other. Other contrast groups, where appropriate, are stated (e.g. all other fatal crashes).

## Timing

Although the proportions of crashes occurring in each month differed significantly between the 4 groups, there was no obvious seasonal pattern.

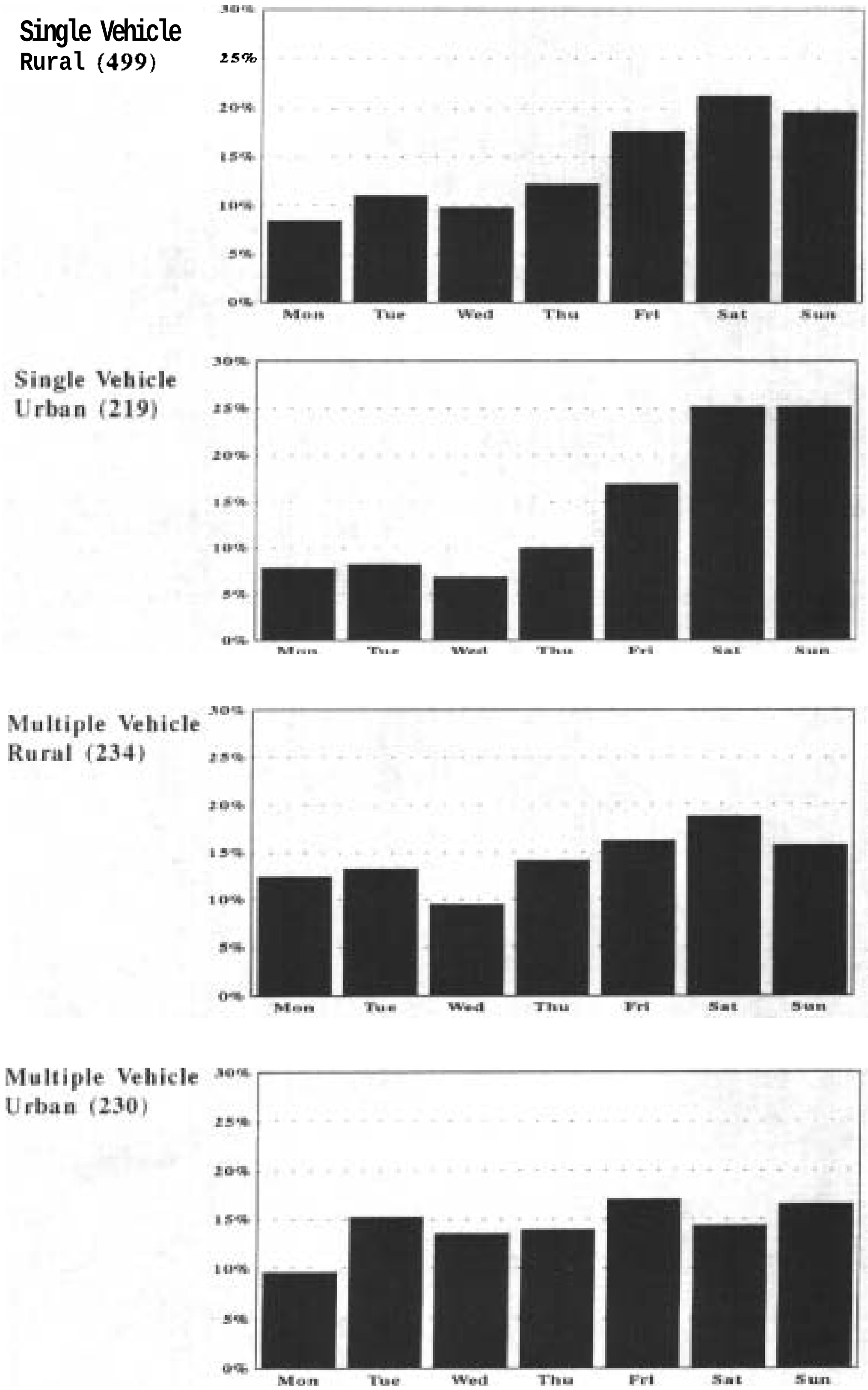
As with fatal crashes, in general, most crashes within these four groups occurred on Friday, Saturday and Sunday. SVU crashes had the highest proportion on the weekend with 50%, whereas MVU crashes had the lowest weekend figures (31%) and proportionally more earlier in the week. Single and multiple vehicle crashes in rural high speed zones did not differ from each other with respect to day of the week (Figure 7.1).

Equally many SVR crashes occurred during the day and night, whereas as many as 73% of S W crashes occurred at night. Multiple vehicle crashes in both rural high speed and urban low speed areas were more likely to occur during the day with only 26% and 35% occurring at night, respectively.

Figure 7.2 shows the breakdown of crashes in these 4 groups by hour of day. Many SVR crashes occurred from 2-6pm (21%) and then another peak from 10pm-2am (26%). SVU crashes had a single peak in the early hours of the morning (0-4 am; 37%). MVR crashes had a morning 8-12 peak (23%) and an afternoon peak 2-6pm (35%). whereas MVU crashes were less well defined, but, in general, occurred later during the day (12-4pm; 27%) and night (6-10pm; 19%).

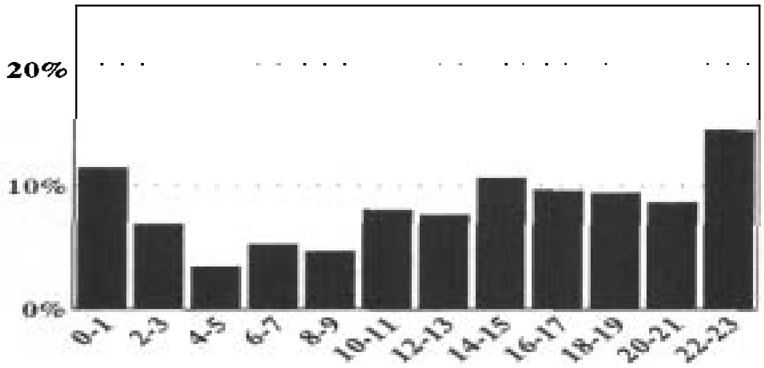
Similar patterns were observed, on both weekdays and weekends. There were, however, proportionally more crashes in the time period 0-6am on weekends compared with weekdays in all four groups.

Figure 7.1 Single/Multiple Vehicle, Urban low/Rural high speed crashes by day of week
(Fatal crashes involving passenger vehicles and/or rigid trucks only)

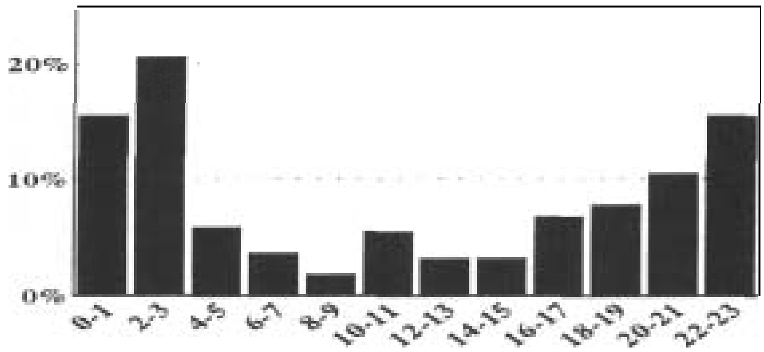



Source: FORS 1988 Fatal file

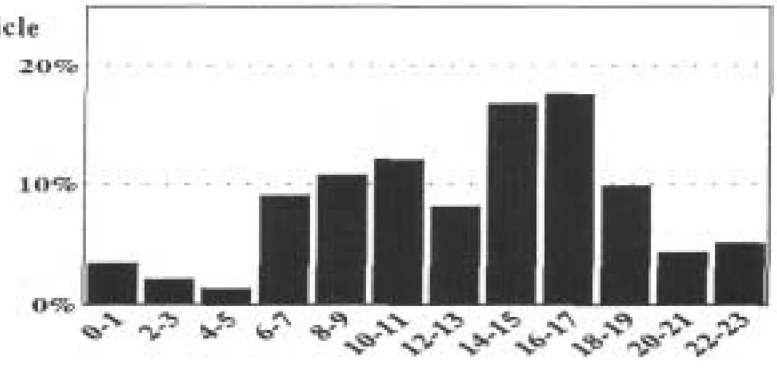
Single Vehicle
Rural (499)



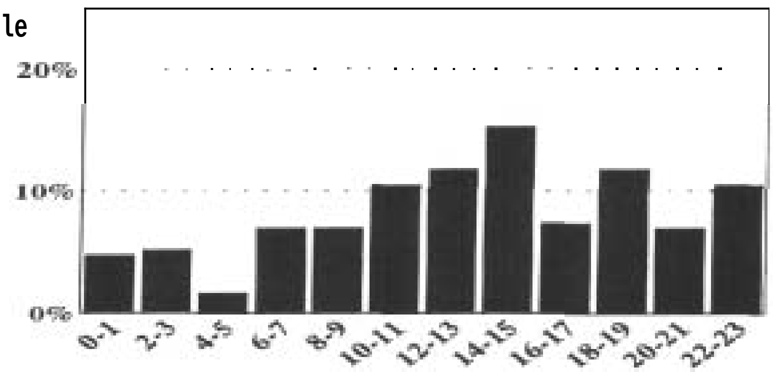

Single Vehicle
Urban (219)




Multiple Vehicle
Rural (234)




Multiple Vehicle
Urban (229)




Source: FORS 1988 Fatal file

## Location

There were some differences by State (Table 7.2). NSW had proportionally the most S W crashes (43%) and Victoria the most MVU (37%). Urban crashes in Victoria were much more likely to be multiple than single vehicle crashes relative to other States. Queensland and SA were characterised by relatively high proportions of single and multiple rural high speed crashes, and WA with SVR crashes.

Table 7.2 Number and percentage of single and multiple vehicle crashes in rural high and urban low speed zones in each State. Fatal crashes involving passenger vehicles and/or rigid trucks only.

| | Single vehicle | | | | Multiple vehicle | | | |
|---|---|---|---|---|---|---|---|---|
| | Rural high speed (SVR) | | Urban low speed (SVU) | | Rural high speed (MVR) | | Urban low speed (MVU) | |
| State/Territory | n | % | n | % | n | % | n | % |
| NSW | 131 | 26% | 94 | 43% | 84 | 36% | 79 | 34% |
| VIC | 114 | 23% | 55 | 25% | 57 | 24% | 86 | 37% |
| QLD | 115 | 23% | 32 | 15% | 45 | 19% | 26 | 11% |
| SA | 45 | 9% | 14 | 6% | 22 | 9% | 9 | 4% |
| WA | 66 | 13% | 16 | 7% | 13 | 6% | 19 | 8% |
| TAS | 11 | 2% | 4 | 2% | 6 | 3% | 5 | 2% |
| NT | 16 | 3% | 0 | 0% | 6 | 3% | 2 | 1% |
| ACT | 1 | 0% | 4 | 2% | 1 | 0% | 4 | 2% |
| Total crashes | 499(100%) | | 219(100%) | | 234(100%) | | 230(100%) | |

Almost all SVR crashes occurred mid-block (96%), whereas a considerable proportion of MVR crashes occurred within or near intersections (19%). The urban low speed crashes also showed a correspondingly high proportion of single vehicle crashes mid-block (78%) relative to only 39% of MVU crashes (Figure 7.3). The largest proportion of crashes within intersections was 54% for MVU crashes. No particular intersection was observed to be worse than any other with respect to the multiple vehicle crashes.

Land use category was similar, in general, for single and multiple urban low speed crashes, e.g. (63% residential for both groups). However, one exception was a higher percentage of S W crashes in urban parkland highways (8%) as opposed to MVU (3%).

There were proportionally more multiple vehicle crashes in low speed areas of capital cities (76%) compared with single vehicle crashes in low speed areas in capital cities (63%).

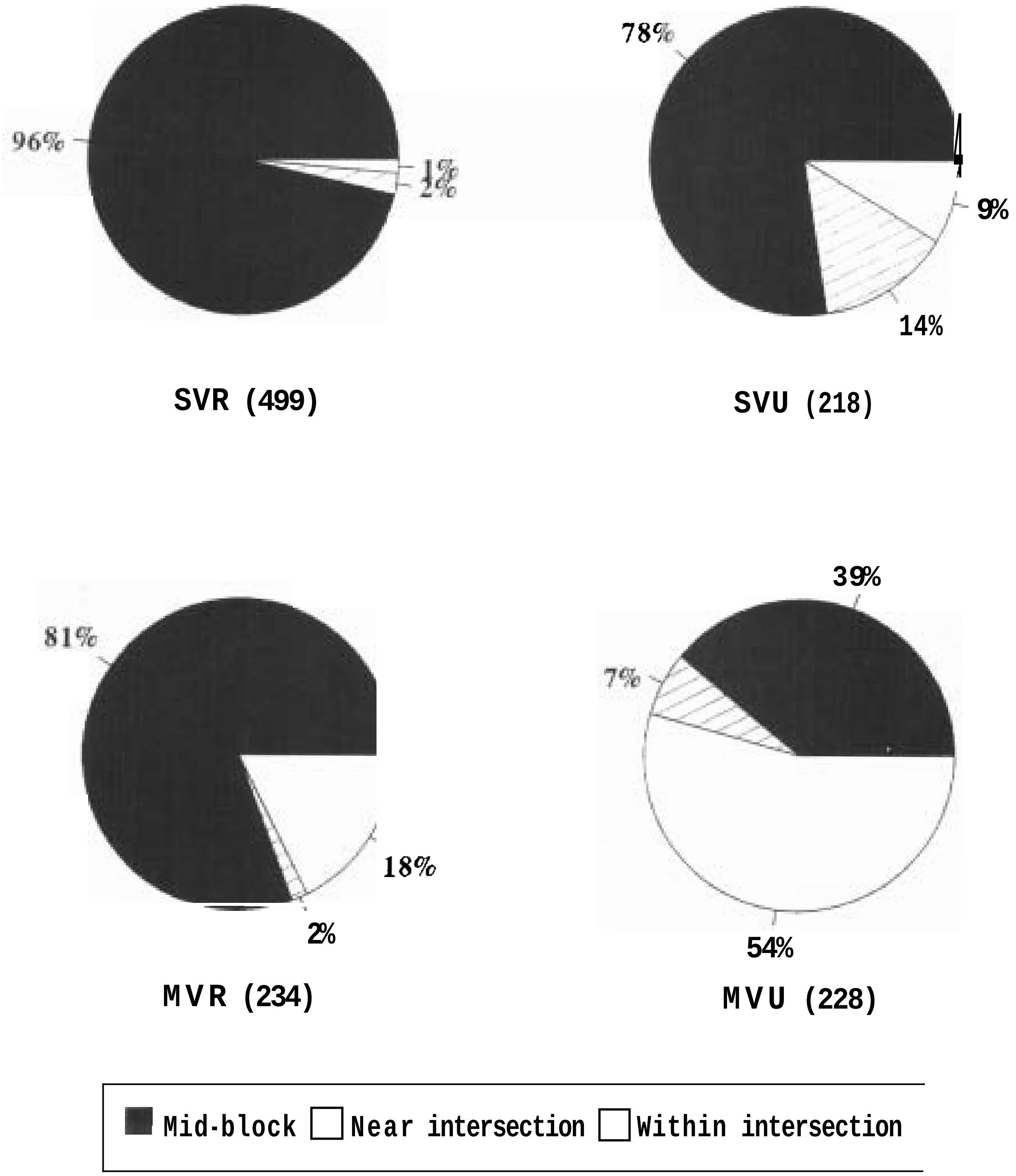
Proportionally more MVR (59%) than SVR (39%) crashes occurred on national or State highways. Twenty-two percent of the single vehicle rural crashes occurred in remote areas compared with 12% of the MVR.

Proportionally more MVU than SVR, SVU or MVR crashes occurred on straight stretches of road, as opposed to curved (Table 7.3).

Proportionally more single vehicle than multiple vehicle crashes occurred on unsealed rural roads (Table 7.3).

The distribution of single vehicle crashes in rural high speed (SVR) and urban low speed (SVU) crashes were similar in terms of vertical road alignment, and differed from multiple rural and urban crashes. The single vehicle crashes were slightly more likely to occur on level ground and proportionally fewer occurred on the crest or bottom of a hill (Table 7.3).

Figure 7.3 Single/Multiple Vehicle, Urban low/Rural high speed crashes by intersection location
(Fatal crashes involving passenger vehicles and/or rigid trucks only)




Source: FORS 1988 Fatal file

## Road and driving conditions

Of the urban crashes, proportionally more single vehicle (SW) than multiple vehicle (MVU) crashes occurred on sections of road with unsealed shoulders. Almost all the rural high speed crashes occurred on roads with loose, soft or narrow shoulders. However, for these, as well, there was a statistically higher proportion of single vehicle accidents (SVR) on these unsealed shoulders (Table 7.3).

Proportionally more single vehicle rural crashes than the other groups occurred in good surface and weather conditions (Table 7.3).

Of the urban low speed crashes occurring at night, and where information on street lighting was available, similar proportions of single and multiple vehicle accidents occurred in dark conditions.

Table 7.3 Number and percentage of single/multiple vehicle, rural/urban, passenger vehicle/rigid truck crashes with respect to road and weather conditions. Significantly high percentages are highlighted.

| | Single vehicle | | | | Multiple vehicle | | | |
|---|---|---|---|---|---|---|---|---|
| | Rural high speed (SVR) | | Urban low speed (SVU) | | Rural high speed (MVR) | | Urban low speed (MVU) | |
| | n | % | n | % | n | % | n | % |
| **Road alignment** | | | | | | | | |
| Straight | 259 | 52% | 118 | 54% | 128 | 55% | 191 | 83% |
| Curved | 238 | 48% | 101 | 46% | 106 | 45% | 39 | 17% |
| **Road horizontal alignment** | | | | | | | | |
| Level | 351 | 73% | 161 | 76% | 153 | 66% | 154 | 68% |
| Slope | 118 | 24% | 45 | 21% | 63 | 27% | 51 | 23% |
| crest | 12 | 3% | 6 | 3% | 14 | 6% | 14 | 6% |
| Bottom of hill | 3 | 1% | 1 | 0% | 2 | 1% | 6 | 3% |
| **Surface** | | | | | | | | |
| Sealed | 428 | 86% | 214 | 98% | 224 | 96% | 230 | 100% |
| Unsealed | 70 | 14% | 5 | 2% | 9 | 4% | 0 | 0% |
| **Road Shoulder** | | | | | | | | |
| Sealed | 12 | 3% | 144 | 72% | 14 | 7% | 177 | 86% |
| Loose/soft/narrow | 414 | 97% | 55 | 28% | 19:3 | 93% | 28 | 14% |
| **Surface conditions** | | | | | | | | |
| Dry | 430 | 87% | 163 | 75% | 171 | 73% | 175 | 77% |
| Wet/muddy/dusty | 63 | 13% | 53 | 25% | 63 | 27% | 53 | 23% |
| **Weather conditions** | | | | | | | | |
| Fine | 442 | 89% | 180 | 82% | 179 | 76% | 188 | 82% |
| Rain/fog/dust/wind | 57 | 11% | 39 | 18% | 55 | 24% | 42 | 18% |
| Total crashes[1] | 499 | (100%) | 219 | (100%) | 234 | (100%) | 230 | (100%) |

[1] Total refers to ell crashes. The totals used to calculate percentages for each characteristic vary due to different amounts of missing information for each.

## Vehicle characteristics

Table 7.4 gives a breakdown of the vehicles involved. There were more sedans but fewer station wagons in single vehicle urban crashes compared with the other 3 groups. There were more utilities involved in the rural high speed crashes and mare four wheel drive vehicles involved in the SVR crashes. Higher proportions of rigid trucks were involved in the multiple vehicle crashes.

Table 7.4 Number and percentage of non-stationary vehicles of different types in single/multiple vehicle, rural/urban, passenger vehicle/rigid truck crashes.

| | Single vehicle | | | | Multiple vehicle | | | |
|---|---|---|---|---|---|---|---|---|
| | Rural high speed (SVR) | | Urban low speed (SVU) | | Rural high speed (MVR) | | Urban low speed (MVU) | |
| Vehicle type | n | % | n | % | n | % | n | % |
| Sedan | 308 | 62% | 157 | 72% | 283 | 60% | 303 | 65% |
| Station wagon/hatchback | 52 | 10% | 13 | 6% | 49 | 10% | 56 | 12% |
| Utility | 68 | 14% | 17 | 8% | 55 | 12% | 21 | 4% |
| Panel van | 15 | 3% | 13 | 6% | 8 | 2% | 13 | 3% |
| 4 Wheel drive | 28 | 6% | 3 | 1% | 21 | 4% | 14 | 3% |
| Passenger van | 13 | 3% | 8 | 4% | 21 | 4% | 17 | 4% |
| Rigid truck | 15 | 3% | 8 | 4% | 38 | 8% | 45 | 10% |
| Total vehicles | 499 | (100%) | 219 | (100%) | 475 | (100%) | 469 | (100%) |

The ages of the vehicles involved in these crashes were not dissimilar; the median year of manufacture being 1980. Similar proportions of vehicles were tested for defects (approximately 39%) and the error rate was lowest for vehicles in multiple vehicle crashes in rural areas (MVR: 16% vs SVR: 30%, SVU: 32% and MVU: 28%). Not all such defects were necessarily critical. Defects contributory to the crashes are shown in Table 7.10.

## Crash description

In terms of the complexity of the crashes, the SVR crashes had the highest proportion of prior events (29%), and single vehicle crashes (SVR and SVU) included approximately twice as many with subsequent events. Almost all DCAs for the multiple vehicle crashes occurred on the carriageway, whereas most of the DCAs for the single vehicle crashes occurred off the carriageway (Table 7.5).

Table 7.5 Number and percentage of SVR, S W, *MVR* and MVU crashes which have prior events, subsequent events and the DCA occurring on the carriageway. The number of crashes with 2 subsequent events is shown in parentheses. Significantly high percentages as compared between the four groups are highlighted.

| | Prior events | | Subsequent events | | DCA on carriageway | | |
|---|---|---|---|---|---|---|---|
| Crash type | n | % | n | % | n | % | Total crashes |
| SVR | 145 | 29% | 131 | 26% | 53 | 11% | 498 (100%) |
| SVU | 31 | 14% | 66(3) | 30% | 38 | 17% | 219 (100%) |
| MVR | 43 | 18% | 27(1) | 12% | 228 | 98% | 233 (100%) |
| MVU | 24 | 10% | 32 | 14% | 230 | 100% | 230 (100%) |

The distribution of the major DCA types is shown in Figure 7.4. for each of the four crash types.

## DCA: Single vehicle crashes (SVR and S W )

The road crash patterns for the single vehicle accidents were similar, in general, *for* urban and rural regions with the 'out of control and running off the carriageway' classifications accounting for almost all the crashes. One statistically significant difference was a higher proportion of 'on path' urban crashes (8% SVU vs 2% *SVR).* This crash type involves a vehicle running into another stationary vehicle, object, animal or obstruction on the carriageway (Figure 7.4a).

Higher proportions of vehicles in S W crashes left the carriageway to the left, both on straight roads (64% S W vs *50%* SVR), and right bends (75% S W vs 53% SVR), but the proportions were similar on left bends (69% S W vs 66% SVR).

Vehicles were more likely to run into objects in urban areas (84% S W ) than rural areas (71% SVR) (Table 7.6).

Of the crashes in which the vehicle was out of control and ran off the carriageway, higher proportions of vehicles in single vehicle crashes in urban low speed zones, as opposed to rural high speed zones, ran into objects on both straight (84;97% S W vs 165;69% SVR) and curved roads (91;95% S W vs 172;79% SVR).

The objects hit varied in rural and urban areas, with trees accounting for 46% in rural regions and electricity or light poles accounting for 41% in urban areas. The other objects frequently noted to most likely to have caused the fatalities in SVR crashes were culverts or embankments (21%) and bridge/guard rails (14%) and in S W crashes; kerbs or traffic islands (21%) and trees (17%) (Table 7.6).

The kerb was mounted in 61% of SVU crashes compared to only 6% SVR and none of the MVR and MVU crashes.

Figure 7.4a Single Vehicle Rural high/Urban low speed crashes
by major crash classification (DCA)
(Fatal crashes involving passenger vehicles and/or rigid trucks only)

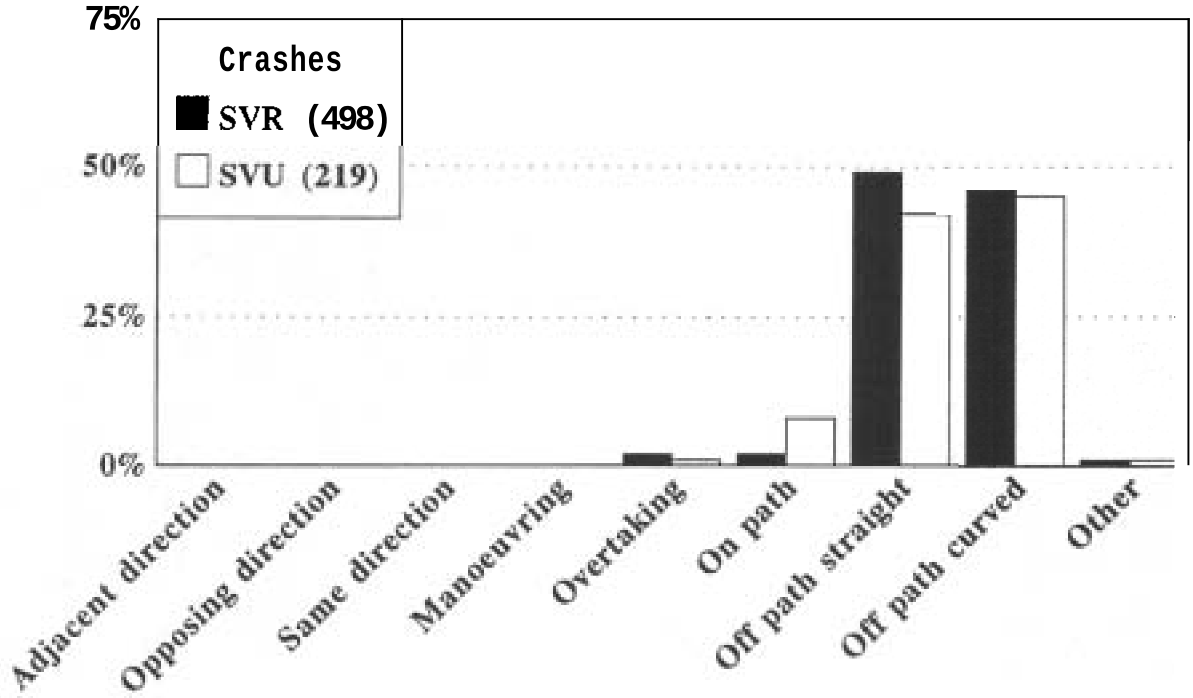
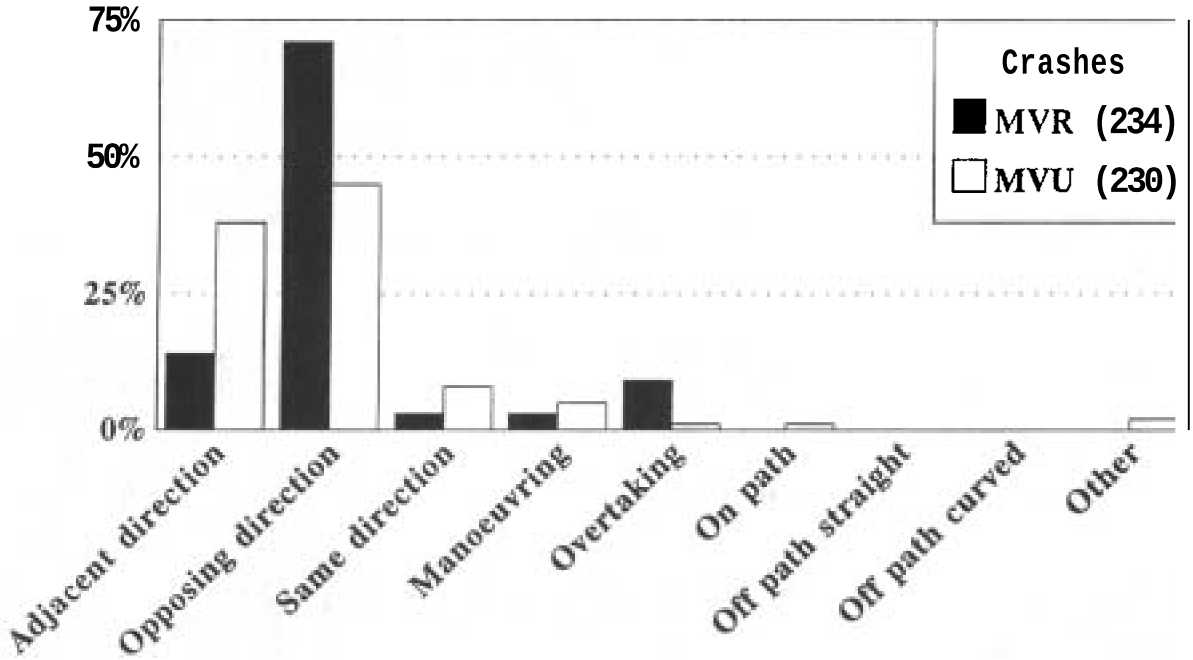



Figure 7.4b Multiple Vehicle Rural high/Urban low speed crashes
by major crash classification (DCA)
(Fatal crashes involving passenger vehicles and/or rigid trucks only)




Source: FORS 1988 Fatal file

Table 7.6 Number and proportion of single vehicle crashes in which the vehicle collides with objects of various types. The object is that considered most likely to have caused the fatality. This includes crashes with the *DCA* or subsequent event classed as 'out of control and into an object' or an 'on path' crash into an object. Significantly high percentages as compared between rural and urban regions are highlighted.

| | Single vehicle crashes | | | |
|---|---|---|---|---|
| | Rural high speed (SVR) | | Urban low speed (SVU) | |
| Object hit | n | % | n | % |
| Tree | 162 | 46% | 31 | 17% |
| Culvert/embankment | 75 | 21% | 6 | 3% |
| Bridge/guard rail | 51 | 14% | 7 | 4% |
| Fence | 17 | 5% | 6 | 3% |
| Electricity/light pole | 15 | 4% | 76 | 41% |
| Traffic pole or sign | 8 | 2% | 10 | 5% |
| water | 8 | 2% | 1 | 1% |
| Animal | 6 | 2% | 0 | 0% |
| Parked vehicle | 3 | 1% | 5 | 3% |
| Traffic island/kerb | 2 | 1% | 38 | 21% |
| Other | 7 | 2% | 4 | 2% |
| Total crashes with object hit and specified (expressed as % of total) | 354 | 100% (71%) | 184 | 100% (84%) |
| Total crashes | 499 | | 219 | |

Almost one quarter of vehicles in SVR crashes lost control on the shoulder of the road. This was much higher than any of the other groups (Table 7.7). The proportion of vehicles overturning also varied greatly among-the groups, and was highest for the SVR vehicles (Table 7.7).

For 108 SVR crashes, it was coded that the vehicle hit an object probably causing a fatality and also that the point of fatal impact was an overturn. This explains the inconsistently high percentages in Table 7.6 and Table 7.7. It most likely that the overturn occurred after the collision with the object and the fatality occurred on overturning.

Table 7.7 Number and percentage of non-stationary vehicles involved in fatal single/multiple vehicle crashes in rural high/urban low speed zones which lost control on the road shoulder and/or overturned.

| | Single vehicle | | | | Multiple vehicle | | | |
|---|---|---|---|---|---|---|---|---|
| | Rural high speed (SVR) | | Urban low speed (SW) | | Rural high speed (MVR) | | Urban low speed (MVU) | |
| | n | % | n | % | n | % | n | % |
| Lost control on shoulder | 106 | 23% | 7 | 3% | 22 | 5% | 5 | 1% |
| Overturn was fatal impact | 240 | 50% | 34 | 16% | 10 | 2% | 8 | 2% |

The major difference in point of impact between the single vehicle crashes in rural high speed and urban low speed zones was that 50% occurred during overturning for SVR crashes. The point of impact was more evenly distributed between the front and the sides for S W crash vehicles (Table 7.8).

Direction of impact, excluding overturns was similar between the two groups (Table 7.9).

Table 7.8 Point of impact for vehicles involved in fatal single and multiple vehicle crashes in rural high and urban low speed zones. Fatal crashes involving passenger vehicles and/or rigid trucks only. Significantly high percentages across *rows* are highlighted.

| | Single vehicle | | | | Multiple vehicle | | | |
|---|---|---|---|---|---|---|---|---|
| | Rural high speed (SVR) | | Urban low speed (SVU) | | Rural high speed (MVR) | | Urban low speed (MVU) | |
| Point of impact | n | % | n | % | n | % | n | % |
| Front of vehicle | 135 | 28% | 102 | 48% | 333 | 71% | 277 | 61% |
| Front centre | 124 | 26% | 81 | 38% | 303 | 65% | 246 | 54% |
| Front left | 8 | 2% | 14 | 7% | 10 | 2% | 14 | 3% |
| Front right | 3 | 1% | 7 | 3% | 20 | 4% | 17 | 4% |
| Side of vehicle | 93 | 19% | 68 | 32% | 116 | 25% | 147 | 32% |
| Left side | 46 | 10% | 32 | 15% | 59 | 13% | 73 | 16% |
| Right side | 47 | 10% | 36 | 17% | 57 | 12% | 74 | 16% |
| Rear of vehicle | 3 | 1% | 1 | 0% | 9 | 2% | 22 | 5% |
| Overturn | 240 | 50% | 34 | 16% | 10 | 2% | 8 | 2% |
| Other | 11 | 2% | 7 | 3% | 0 | 0% | 2 | 0% |
| Total | 482 | (100%) | 212 | (100%) | 468 | (100%) | 456 | (100%) |

Table 7.9 Direction of impact on vehicles involved in fatal single and multiple vehicle crashes in rural high and urban low speed zones (Not coded for overturning vehicles). Fatal crashes involving passenger vehicles and/or rigid trucks only. Significantly high percentages across rows are highlighted.

| | Single vehicle | | | | Multiple vehicle | | | |
|---|---|---|---|---|---|---|---|---|
| | Rural high speed (SVR) | | Urban low speed (SW) | | Rural high speed (MVR) | | Urban low speed (MVU) | |
| Direction of impact | n | % | n | % | n | % | n | % |
| Front of vehicle | 188 | 78% | 133 | 77% | 383 | 83% | 307 | 69% |
| Front centre | 111 | 46% | 75 | 43% | 250 | 54% | 205 | 46% |
| Front left | 38 | 16% | 34 | 20% | 36 | *8%* | 42 | 9% |
| Front right | 39 | 16% | 24 | 14% | 97 | 21% | 60 | 13% |
| Side of vehicle | 38 | 16% | 33 | 19% | 62 | 14% | 113 | 25% |
| Left side | 16 | 7% | 13 | *8%* | 39 | 8% | 56 | 13% |
| Right side | 22 | 9% | 20 | 12% | 23 | 5% | 57 | 13% |
| Rear of vehicle | 7 | 3% | 4 | 2% | 14 | 3% | 26 | 6% |
| Roof | 9 | 4% | 3 | 2% | 0 | 0% | 2 | 0% |
| Total | 242 | (100%) | 173 | (100%) | 459 | (100%) | 448 | (100%) |

## DCA: Multiple vehicle crashes (MVR and MVU)

The road crash patterns of the multiple vehicle accidents naturally differed from that of the single vehicle accidents, but they also differed according to whether they occurred in rural high speed or urban low speed areas (Figure 7.4b).

Although the majority of these were either head-on or cross traffic type crashes, the former predominated in rural areas (71% opposing directions vs 17% adjacent directions) whereas they were more equally distributed in urban regions (45% opposing directions vs 38% adjacent directions in MVU). There were also proportionally more crashes involving overtaking in rural regions (9% MVR vs 1% MVU), whereas other crashes involving vehicles travelling in the *same* direction (such as rear end collisions) were more common in urban regions (8% MVU vs 3% MVR).

These differences were also reflected in the distributed in the fatal point of impact and direction of impact for the vehicles involved in these crashes. Full frontal impacts were sustained for almost two thirds of the MVR crash vehicles, while vehicles in MVU crashes had proportionally more impacts at the sides and rear (Table 7.8).

MVR and MVU crash vehicles differed in the direction of impact in the same way, but also showed a greater percentage of MVR crash vehicles with impacts from the front right (21% vs 13%). See Table 7.9.

## Prior and subsequent events: Single vehicle accidents (SVR and SW)

The types of prior events recorded for the single vehicle crashes differed between rural and urban regions. There were more 'off path on straight road' prior events in rural regions (76; 52% SVR vs 5; 16% SW), but more avoidance manoeuvres in urban regions (11; 8% SVR vs 7; 23% SW).

Almost all subseauent events recorded for SVR and SVU involved the vehicle runninā out of control. The only difference was that the vehicles ran into objects more frequently in urban regions (51; 42% SVR vs 51; 84% SW).

## Prior and subsequent events: Multiple vehicle accidents (MVR and MVU)

There were no significant differences between the pattern of prior events among the 43 MVR crashes and the 24 MVU crashes with prior events; nor were there any significant differences in the subsequent events.

## Contributory factors

There were no significant differences in the proportions of crashes in which fault could be determined for the four groups (95% SVR, 99% SVU, 95% MVR, 98% MVU) and these were comparable with all fatal crashes (93%). Nor were there any differences in the proportions of multiple vehicle crashes in which more than one vehicle was considered at fault in urban compared with rural areas.

The proportions of crashes with at least one major factor recorded were similar for the four groups (93% SVR, 96% SVU, 89% MVR and 95% MVU) and comparable with all fatal crashes (91%). Table 7.10 shows the percentage of crashes in which at least one of the factors of various types was noted. Significantly high percentages as compared between crash groups are highlighted.

Table 7.10 Number and percentage of SVR, SVU, MVR and MVU crashes attributed to various factors. Fatal crashes involving passenger vehicles and/or rigid trucks only. Significantly high percentages across rows are highlighted.

| | Single vehicle | | | | Multiple vehicle | | | |
|---|---|---|---|---|---|---|---|---|
| | Rural high speed (SVR) | | Urban low speed (SVU) | | Rural high speed (MVR) | | Urban low speed (MVU) | |
| Factor | n | % | n | % | n | % | n | % |
| Alcohol/drugs | 196 | 42% | 117 | 56% | 42 | 20% | 46 | 21% |
| Speed | 132 | 28% | 104 | 50% | 36 | 17% | 50 | 23% |
| Driver error | 87 | 19% | 38 | 18% | 76 | 37% | 118 | 54% |
| -Dangerous manoeuvre skylarking | (15 | 3%) | (11 | 5%) | (15 | 7%) | (17 | 8%) |
| -Road rules breach | (1 | 0%) | (2 | 1%) | (39 | 19%) | (85 | 39%) |
| -Other driver error | (71 | 15%) | (25 | 12%) | (26 | 13%) | (22 | 10%) |
| Fatigue | 82 | 18% | 18 | 9% | 17 | 8% | 1 | 0% |
| Surface conditions | 39 | 8% | 15 | 7% | 25 | 12% | 12 | 6% |
| Vehicle defects | 25 | 5% | 8 | 4% | 6 | 3% | 6 | 3% |
| Visibility | 14 | 3% | 10 | 5% | 28 | 13% | 24 | 11% |
| Driver ill health | 5 | 1% | 6 | 3% | 1 | 0% | 7 | 3% |
| Passenger | 3 | 1% | 0 | 0% | 0 | 0% | 1 | 0% |
| Failure to observe other unit | 3 | 1% | 5 | 2% | 25 | 12% | 49 | 23% |
| Crashes for which at least one factor noted | 464 | | 210 | | 208 | | 217 | |

The percentages do not sum to 100% since up to 3 major factors can be recorded for each crash. The 'n' in the table is the number of crashes with at least one of the specific major factors recorded for the crash. The percentages are calculated with the denominator as the number of crashes of each type with some information on major factors.

Comparing single and multiple vehicle crashes, single vehicle crash factors were more often alcohol and/or drug related, whereas multiple vehicle crashes had proportionally more instances of driver errors (specifically road rule errors and dangerous driving), visibility problems and unintentional failure to see the other unit (partly by definition).

For the single vehicle crashes, similar proportions were attributed to alcohol/drugs in rural and urban areas. Drug use, without alcohol was considered contributory in four SVR crashes.

Speed played a greater role in urban crashes in low epeed zones, whereas fatigue figured more prominently in rural crashes in high speed zones (Table 7.10). Figure 7.5 shows that over two thirds of the vehicles in SVU crashes were possibly exceeding the speed limit. For the multiple vehicle crashes, the lower speeding percentages in Figure 7.5 compared with Table 7.10 reflect that the pie-chart shows the percentage of speeding vehicles and the table gives the percentage of crashes in which speed was a contributory factor.

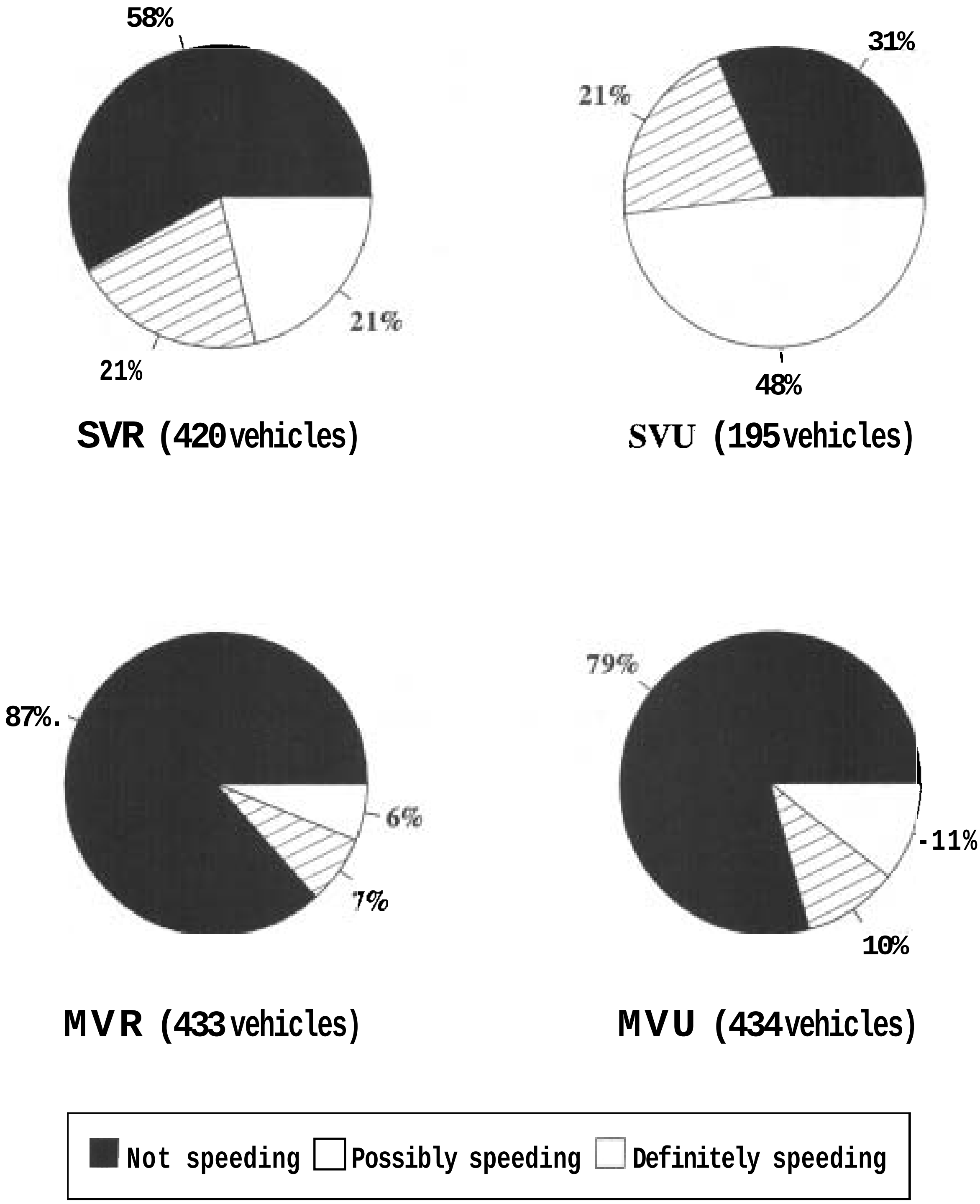
Comparisons between the multiple vehicle crash factors revealed greater proportions of 'failure to *see* the other unit' factors and road rule breaches for urban crashes and more surface condition factors for rural crashes. The most common road rule error in MVU crashes was driving through a stop sign, followed by driving through a red light, a give way sign or disobeying the give way convention. On the other hand, the road rule breaches contributing to the MVR crashes were more likely to be driving through a give way sign or crossing a double line (Table 7.11). Alcohol and drug factors were recorded for approximately 20% of both MVR and MVU crashes.

Despite the small numbers, there were significantly more driver ill health factors among both the single and multiple urban crashes as opposed to rural (3% vs 1%).

Table 7.11 Multiple vehicle crashes in urban low and rural high speed zones by road rule breach. Fatal crashes involving passenger vehicles and/or rigid trucks only.

| | Multiple vehicle | | | |
|---|---|---|---|---|
| | rural | | urban | |
| Road rule error | n | % | n | % |
| Red light | *0* | *0%* | 20 | 24% |
| Stop sign | 5 | 13% | 26 | 31% |
| Give way sign | 16 | 41% | 19 | 22% |
| Give way convention | 9 | 23% | 15 | 18% |
| Over double line | 8 | 21% | 2 | 2% |
| Other | 1 | 3% | 3 | 4% |
| Total multiple vehicle crashes attributed to road rule errors | 39(100%) | | 85(100%) | |

Figure 7.5 Single/Multiple, Urban low/Rural high speed crash vehicles by speeding
(Fatal crashes involving passenger vehicles and/or rigid trucks only)




Source: FORS 1988 Fatal file

## Persons involved: Drivers

The major distinctions between the drivers in these four types of accidents were between those involved in single and multiple vehicle accidents (Table 7.12). The drivers in single vehicle crashes were younger, less experienced, more often male or unemployed. Higher proportions were tested for alcohol and drugs and more were over the 0.05 blood alcohol limit.

There were also some differences between urban and rural drivers in these groups. Drivers in urban crashes were younger than those involved in fatal crashes in rural areas, both for single and multiple vehicle crashes. Apart from age, the major distinctions between the drivers in urban and rural crashes, were between the single vehicle crashes in these two regions. As many as 65% of the drivers tested for alcohol in single vehicle urban crashes were over the limit of 0.05 (compared with 49% for SVR).

Proportionally more of the single vehicle crash drivers were killed and more SVR drivers were ejected from their vehicles (SVR: 22% vs SVU 10%).

Though a small percentage of the total, there were proportionally more drivers disqualified from driving involved in single vehicle urban crashes (4% SVU vs 1% Other three groups combined).

Table 7.12 Characteristics of the drivers involved in single/multiple vehicle, rural/urban, passenger vehicle/rigid truck crashes. Significantly high percentages across rows are highlighted

| Driver characteristics | Single vehicle: Rural high speed (SVR) | | Single vehicle: Urban low speed (SVU) | | Multiple vehicle: Rural high speed (MVR) | | Multiple vehicle: Urban low speed (MVU) | |
|---|---|---|---|---|---|---|---|---|
| | Median | | Median | | Median | | Median | |
| Age, years | 28 | | 24 | | 36 | | 33 | |
| Driving experience, years | 6 | | 4 | | 18 | | 12 | |
| | n | % | n | % | n | % | n | % |
| Age <=25 years | 213 | 44% | 122 | 56% | 135 | 29% | 153 | 33% |
| Male drivers | 405 | 82% | 185 | 85% | 362 | 76% | 366 | 79% |
| Provisional licence | 48 | 11% | 30 | 16% | 33 | 8% | 40 | 9% |
| Learners licence | 11 | 3% | 5 | 3% | 4 | 1% | 2 | 1% |
| Licence disqualified | 7 | 2% | 7 | 4% | 5 | 1% | 4 | 1% |
| Unemployed | 42 | 12% | 13 | 9% | 10 | 3% | 12 | 4% |
| Tested for alcohol | 379 | 79% | 174 | 83% | 315 | 69% | 314 | 69% |
| Over 0.05 Blood Alcohol[1] | 182 | 49% | 112 | 65% | 39 | 13% | 54 | 17% |
| Median non-zero BAC | 0.16 | | 0.16 | | 0.15 | | 0.14 | |
| Median BAC>0.05 gm/100ml | 0.18 | | 0.17 | | 0.19 | | 0.15 | |
| Tested for drugs | 47 | 10% | 18 | 8% | 15 | 3% | 14 | 3% |
| Positive drug test[1] | 17 | 36% | 7 | 39% | 3 | 20% | 4 | 29% |
| Killed | 323 | 65% | 136 | 62% | 188 | 40% | 142 | 30% |
| Ejected from vehicle | 101 | 22% | 22 | 10% | 16 | 4% | 19 | 4% |
| Total drivers[2] | 495 | (100%) | 218 | (100%) | 474 | (100%) | 467 | (100%) |

[1] Percentage over the limit, calculated as percentage of those drivers tasted
[2] Total refers to all crashes with some driver information. The totals Used to calculate percentages for each characteristic vary due to different amounts Of missing information for each.

## Employment status

Information on employment status was available for 69% of the drivers involved in these four crash types. Approximately 70% of the drivers with these data in each of the four groups was recorded as being active in the work force. The higher proportion of unemployed in the single vehicle accidents was offset by more retired persons and persons with home duties in the multiple vehicle accidents.

The distribution of different occupations for the drivers in these four crash types and the corresponding figures for the Australian work force are given in Table 7.13.

There were proportionally fewer professionals and more labourers involved in these accidents than in the general population. Further tabulation by sex showed that the proportion of tradesmen was similar (Appendix Table A2). There were no significant differences for females. The smaller proportion of women drivers compared with the general population accounted for the relatively smaller percentage of clerical/sales/service workers in these crashes.

Among the four crash types, there were proportionally fewer professionals and more tradespersons involved in the single vehicle urban crashes. This was observed for all age groups (Appendix Table A3). Otherwise, the occupation distribution was relatively consistent.

Table 7.13 Percentage of drivers in different occupations involved in single/multiple vehicle, rural/urban, passenger vehicle/rigid truck crashes. The ABS figures for the Australian population in 1986 are also shown. Note that these figures exclude persons not in the work force such as students, unemployed and retired persons, and persons at home.

| Employment category | SVR driver | SVU driver | MVR driver | MVU driver | Total | Australian work force[1] |
|---|---|---|---|---|---|---|
| Manager/ professional | 23% | 12% | 21% | 22% | 21% | 30% |
| Trades | 19% | 26% | 21% | 21% | 21% | 15% |
| Clerical/sales/ service | 14% | 22% | 18% | 16% | 17% | 30% |
| Plant op/labourer | 37% | 31% | 30% | 35% | 34% | 23% |
| Other employed | 7% | 9% | 10% | 6% | 8% | 3% |
| Total employed | 245 (100%) | 103 (100%) | 238 (100%) | 203 (100%) | 789 (100%) | 6513547 (100%) |

[1] Source ABS ASCO 1986

## Trip details

Ninety-two percent of the drivers involved in the urban low speed crashes (SVU+MVU) were within 50 km of their homes and 94% had travelled less than 50 km before the crash; the corresponding figures for rural high speed crashes were 57% and 66%, respectively.

Table 7.14 shows the trip details for those drivers whose origin and destination were known (727; 44%). Despite the high percentage of missing information, further analysis of the available data revealed no specific biases in terms of time of day, week, time of death, sex or age.

The major differences in the origins and destinations of the persons involved in these crashes are between the single vehicle crashes and the multiple vehicle crashes. More vehicles involved in single vehicle crashes were going home and or leaving recreational activities, whereas proportionally more of the vehicles involved in multiple vehicle accidents were on work related trips.

Table 7.14 Number and percentage of vehicles involved in fatal single/multiple vehicle crashes in urban high/rural low speed zones by purpose of trip.

| | Single vehicle | | | | Multiple vehicle | | | |
|---|---|---|---|---|---|---|---|---|
| | Rural high speed (SVR) | | Urban low speed (S W ) | | Rural high speed (MVR) | | Urban low speed (MVU) | |
| Trip details | n | % | n | % | n | % | n | % |
| Recreation-> Home | 106 | 42% | 39 | 42% | 44 | 22% | 42 | 23% |
| Recreation-> Recreation | 43 | 17% | 22 | 24% | 19 | 9% | 19 | 11% |
| Home -> Recreation | 34 | 13% | 6 | 7% | 37 | 18% | 18 | 10% |
| Work -> work | 14 | 6% | 7 | 8% | 35 | 17% | 39 | 22% |
| other | 56 | 22% | 18 | 19% | 69 | 34% | 62 | 34% |
| Total | 253(100%) | | 92(100%) | | 202(100%) | | 180(100%) | |

## Passengers

The proportions of the vehicles with passengers were relatively similar for single vehicle crashes in rural areas (SVR: 60%). urban areas (SVU: 57%) and multiple vehicle crashes in rural areas (MVR: 57%). The smallest percentage of vehicles with passengers was 48% for multiple vehicle urban low speed crashes.

The passengers in the vehicles involved in these four types of crashes were in general younger than the drivers, and more likely to be female (Tables 7.12 and 7.15).

The distinctions between the passengers in different crash types were similar to the driver differences, with younger passengers, more male and alcohol affected passengers and more passengers killed and ejected in the single vehicle crashes compared with the multiple vehicle crashes (Table 7.15).

Table 7.15 Characteristics of the passengers involved in single/multiple vehicle, rural/urban, passenger vehicle/rigid truck crashes. Significantly high percentages across rows are highlighted.

| Passenger characteristics | Single vehicle: Rural high speed (SVR) | | Single vehicle: Urban low speed (SW) | | Multiple vehicle: Rural high speed (MVR) | | Multiple vehicle: Urban low speed (MVU) | |
|---|---|---|---|---|---|---|---|---|
| Age, years | Median 21 | | Median 19 | | Median 24 | | Median 22 | |
| | n | % | n | % | n | % | n | % |
| Age <=25 years | 365 | 65% | 191 | 79% | 241 | 53% | 202 | 59% |
| Male passengers | 381 | 63% | 169 | 66% | 217 | 45% | 171 | 47% |
| Unemployed | 46 | 12% | 21 | 13% | 16 | 5% | 17 | 7% |
| Tested for alcohol | 124 | 21% | 62 | 24% | 90 | 18% | 72 | 19% |
| Over 0.05 blood alcohol[1] | 50 | 41% | 33 | 56% | 22 | 25% | 13 | 18% |
| Median non-zero BAC | 0.12 | | 0.10 | | 0.15 | | 0.13 | |
| Median BAC>0.05 gm/100ml | 0.15 | | 0.14 | | 0.17 | | 0.14 | |
| Tested for drugs | 24 | 4% | 11 | 4% | 5 | 1% | 9 | 2% |
| Positive drug test[1] | 4 | 17% | 5 | 50% | 1 | 20% | 1 | 11% |
| Killed | 223 | 37% | 104 | 40% | 131 | 26% | 115 | 29% |
| Ejected from vehicle | 137 | 24% | 43 | 18% | 19 | 4% | 26 | 7% |
| Total passengers[2] | 607 (100%) | | 260 (100%) | | 500 (100%) | | 394 (100%) | |

[1] Percentage over the limit, calculated as percentage of those passengers tested
[2] Total refers to all crashes with passenger and details. The totals used to calculate percentages for each characteristic vary due to different amounts of missing information for each.

Table 7.16 shows the percentage of vehicles in each crash type according to whether the occupants were intoxicated, and whether the driver and/or at least one of the passengers were over the 0.05 BAC limit. There was higher incidence of alcohol use by both drivers and passengers in single vehicle crashes as opposed to multiple vehicle crashes.

Of the vehicles with passengers, and where at least one person was over the 0.05 alcohol limit, there was no significant difference among the crash types in the proportions of vehicles with only the driver, or only a passenger or both passengers and drivers intoxicated. Based on all such vehicles in all four crash types, only the driver (and no passengers) was over the limit in 55%, in 14% of vehicles only a passenger and not the driver was over the limit, and in 31% of vehicles both the driver and at least one passenger were over the limit.

Of the vehicles with passengers, the alcohol levels of drivers and passengers were associated as there was a greater than expected probability of both not being drunk or both being drunk.

Table 7.16 Number and percentage of vehicles involved in single/multiple, rural/urban passenger vehicle/rigid truck crashes in which the drivers and/or passengers or none were over the 0.05 blood alcohol limit.

| | Single vehicle | | | | Multiple vehicle | | | |
|---|---|---|---|---|---|---|---|---|
| | Rural high speed (SVR) | | Urban low speed (SW) | | Rural high speed (MVR) | | Urban low speed (MVU) | |
| | n | % | n | % | n | % | n | % |
| Vehicles with no passengers | 199 | 100% | 94 | 100% | 202 | 100% | 245 | 100% |
| Driver not >0.05[1] | 105 | 53% | 40 | 43% | 180 | 89% | 208 | 85% |
| Driver tested 20.05 | 94 | 47% | 54 | 57% | 22 | 11% | 37 | 15% |
| Vehicles with passengers | 297 | 100% | 125 | 100% | 272 | 100% | 224 | 100% |
| No one >0.05[1] | 196 | 66% | 60 | 48% | 249 | 92% | 203 | 91% |
| Driver only >0.05 | 58 | 20% | 37 | 30% | 9 | 3% | 11 | 5% |
| Passenger only >0.05 | 13 | 4% | 7 | 6% | 6 | 2% | 4 | 2% |
| Driver and passenger >0.05 | 30 | 10% | 21 | 17% | 8 | 3% | 6 | 3% |
| Total vehicles | 496 | | 219 | | 474 | | 469 | |

[1] Includes pereons not tested and those tested with blood alcohol content (BAC) <=0.05 gm/100 ml

## Seat belts

Information on whether seat belts were available to vehicle occupants was recorded for 86% of the persons in non-stationary vehicles involved in these four crash types. Whether they were actually worn during the crash was recorded for 77%. This information is summarised in Table 7.17 for drivers and passengers in passenger vehicles and for rigid truck occupants for the four crash types. The small number of truck occupants did not warrant further breakdown.

The major differences with respect to the 4 crash types were between the single and multiple vehicle crashes.

Some form of restraint was available for almost all drivers of passenger vehicles, but the drivers in the single vehicle crashes were less likely to wear them. Car passengers in single vehicle crashes were less likely to have seat belts available to them and also less likely to wear them compared with passengers in cars involved in multiple vehicle crashes.

The availability of seat belts was lower in rigid trucks than in passenger vehicles for all four crash types. Differences similar to the passenger vehicle occupants were evident between the groups; fewer belts available and fewer worn in the single vehicle crashes as compared to the multiple vehicle crashes.

Table 7.17 Availability and use of seat belts by occupants of non-stationary vehicles involved in single/multiple vehicle, rural/urban, passenger vehicle/rigid truck crashes. Drivers and passengers are distinguished for passenger vehicles.

| | Single vehicle | | | | Multiple vehicle | | | |
|---|---|---|---|---|---|---|---|---|
| | Rural high speed (SVR) | | Urban low speed (SVU) | | Rural high speed (MVR) | | Urban low speed (MVU) | |
| Passenger vehicle occupants involved in fatal crashes | n | % | n | % | n | % | n | % |
| Drivers | | | | | | | | |
| Seat belt available | 433 | 99% | 178 | 98% | 374 | 99% | 375 | 99% |
| Seat belt worn | 243 | 61%[1] | 105 | 70%[1] | 311 | 91%[1] | 313 | 90%[1] |
| Seat belt worn if available | | 62%[2] | | 71%[2] | | 92%[2] | | 91%[2] |
| Unknown if worn | 39 | | 30 | | 36 | | 30 | |
| Total drivers | 437 | | 181 | | 378 | | 377 | |
| Passengers | | | | | | | | |
| Seat belt available | 441 | 89% | 164 | 83% | 397 | 95% | 283 | 95% |
| Seat belt worn | 266 | 58%[1] | 82 | 47%[1] | 302 | 83%[1] | 217 | 85%[1] |
| Seat belt worn if available | | 66%[2] | | 58%[2] | | 89%[2] | | 91%[2] |
| Unknown if worn | 37 | | 23 | | 56 | | 44 | |
| Total passengers | 497 | | 197 | | 418 | | 299 | |
| Rigid truck occupants | | | | | | | | |
| Seat belt available | 15 | 30% | 5 | 45% | 16 | 52% | 25 | 64% |
| Seat belt worn | 3 | 7%[1] | 2 | 18%[1] | 11 | 41%[1] | 18 | 50%[1] |
| Seat belt worn if available | | 27%[2] | | 40%[2] | | 92%[2] | | 86%[2] |
| Unknown if worn | 4 | | 0 | | 4 | | 3 | |
| Total truck occupants | 50 | | 11 | | 31 | | 39 | |

Totals refer to the number of persons where information on seat belt availability was recorded.

[1] Overall percentage wearing seat belts
[2] Percentage wearing seat belts given that they were available and known if worn

## Fatalities

The percentage of MVR crashes resulting in multiple fatalities was high (27%) compared with approximately only 10% for the other three crash types. The highest number of fatalities in any crash was 5; one SVR crash and three MVR crashes resulted in this many deaths.

## Medical details

The timing of death differed between the four groups. This was partly due to the differences between crashes in urban and rural areas. More fatalities generally occur in rural areas before medical assistance arrives. However, even within the rural and urban crashes, there were differences between the fatalities in single and multiple crashes (Figure 7.6).

Of the crashes in rural areas, the proportion of instantaneous deaths was the same (29%) for single and multiple vehicle crash victims. However, proportionally more deaths resulting from single vehicle crashes occurred before medical assistance arrived (SVR 43% vs MVR 35%) and more of the fatalities from multiple vehicle crashes occurred in hospital (SVR 17% vs MVR 24%) (Figure 7.6a).

This *same* distinction was observed in urban areas with 30% of SVU crash fatalities in hospital compared with as many as 46% of MVU deaths occurring in hospital. Additionally, more instantaneous deaths occurred in the SVU crashes (33%) than the MVU crashes (21%). (Figure 7.6b).

Figure 7.6a Single/Multiple Vehicle Rural high speed crash victims by timing of death
(Fatal crashes involving passenger vehicles and/or rigid trucks only)

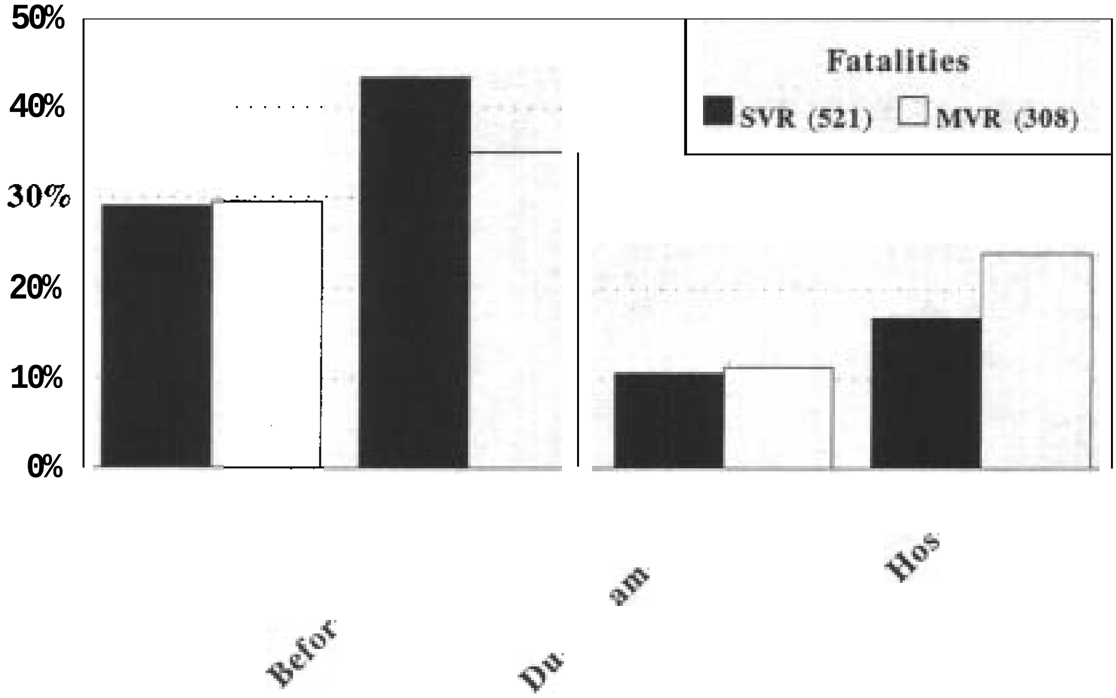
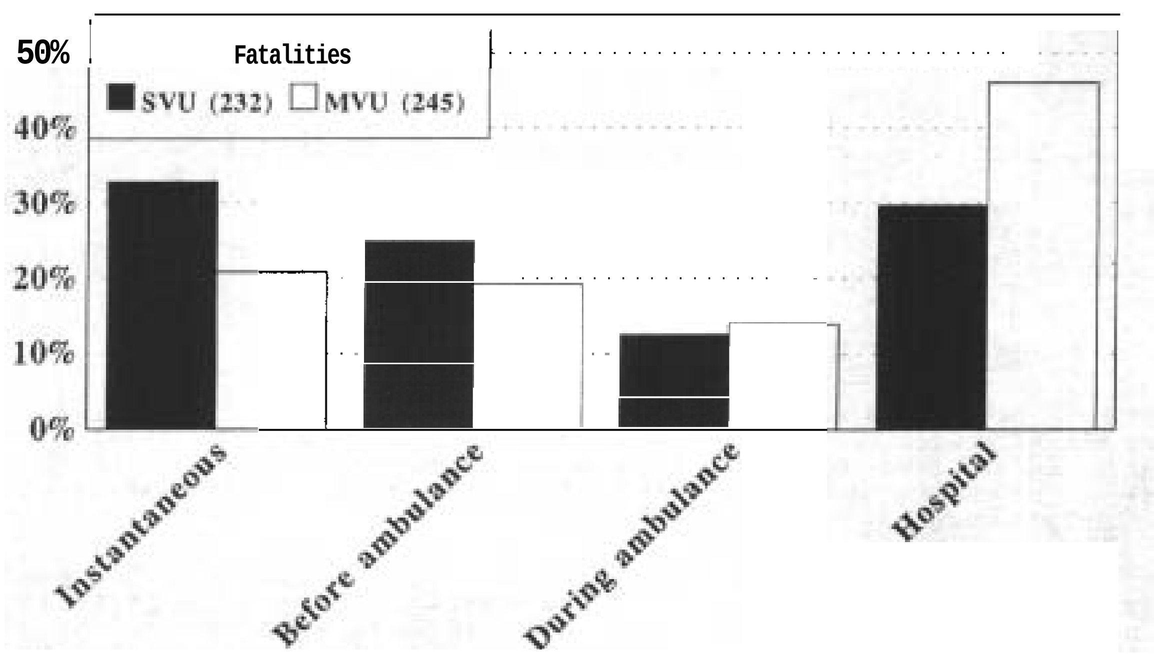



Figure 7.6b Single/Multiple Vehicle Urban low speed crash victims by timing of death
(Fatal crashes involving passenger vehicles and/or rigid trucks only)




Source: FORS 1988 Fatal file

The patterns of serious injuries and causes of death were similar for driver and passenger fatalities in the 4 crash types, so these are presented together in Tables 7.18 and 7.19. There were no significant differences between the single vehicle crash fatalities in urban and rural areas; the major injuries being to the head and chest, with head and multiple injuries as the major causes of death.

The multiple vehicle crash victims were less likely to sustain serious head and more likely to sustain chest injuries. Similar to all road accident victims. they were still most likely to die of head or multiple injuries, but a larger percentage of deaths were also due to chest injuries compared with the fatalities in the single vehicle accidents (Table 7.19). The persons killed in MVR crashes were more likely to sustain at least one serious injury to the abdomen and pelvic region, and/or to the arms and legs than any of the other three crash types. There was also a higher proportion of deaths due to spinal injuries than among the other three crash types. Deaths due to lower extremity injuries were more common among the MVU crash victims (Table 7.19).

Table 7.18 Number and percentage of persons killed sustaining at least one serious injury (AIS Abbreviated Injury Score 3-6) in different body regions for driver and passenger fatalities in single/multiple vehicle, rural/urban, passenger vehicle/rigid truck crashes. Because a person may sustain one or more serious injuries in one or more body regions, percentages do not sum to 100%.

| Fatalities with at least one serious injury to the: | Single vehicle: Rural high speed (SVR) n | % | Single vehicle: Urban low speed (SVU) n | % | Multiple vehicle: Rural high speed (MVR) n | % | Multiple vehicle: Urban low speed (MVU) n | % |
|---|---|---|---|---|---|---|---|---|
| External | 11 | 2% | 6 | 3% | 14 | 4% | 3 | 1% |
| Head | 384 | 70% | 165 | 69% | 199 | 62% | 161 | 63% |
| Face | 18 | 3% | 6 | 3% | 14 | 4% | 6 | 2% |
| Neck | 8 | 1% | 6 | 3% | 8 | 3% | 1 | 0% |
| Chest | 327 | 60% | 149 | 62% | 230 | 72% | 186 | 72% |
| Abdomen/pelvis | 138 | 25% | 62 | 26% | 125 | 39% | 74 | 29% |
| Spine | 52 | 10% | 21 | 9% | 36 | 11% | 25 | 10% |
| Upper extremity | 20 | 4% | 15 | 6% | 39 | 12% | 7 | 3% |
| Lower extremity | 108 | 20% | 50 | 21% | 129 | 40% | 59 | 23% |
| Total fatalities | 546 | | 240 | | 319 | | 257 | |

Table 7.19 Coroner's assessment of final cause of death for fatalities in single/multiple vehicle, rural/urban, passenger vehicle/rigid truck crashes.

| | Single vehicle | | | | Multiple vehicle | | | |
|---|---|---|---|---|---|---|---|---|
| | Rural high speed | | Urban low speed | | Rural high speed | | Urban low speed | |
| | SVR | | SVU | | MVR | | MVU | |
| Cause of death: body region | n | % | n | % | n | % | n | % |
| External | 5 | 1% | 5 | 2% | 11 | 3% | 1 | 0% |
| Head | 219 | 40% | 90 | 38% | 102 | 32% | 75 | 29% |
| Neck | 5 | 1% | 2 | 1% | 3 | 1% | 0 | 0% |
| Chest | 54 | 10% | 27 | 11% | 63 | 20% | 45 | 18% |
| Abdomen/pelvis | 12 | 2% | 6 | 3% | 6 | 2% | 4 | 2% |
| Spine | 21 | 4% | 11 | 5% | 22 | 7% | 8 | 3% |
| Lower extremity | 13 | 2% | 8 | 3% | 11 | 3% | 16 | 6% |
| Multiple | 167 | 31% | 73 | 30% | 88 | 28% | 85 | 33% |
| Indirect/non-crash | 50 | 9% | 18 | 8% | 12 | 4% | 22 | 9% |
| Total fatalities | 546 | | 240 | | 319 | | 257 | |

## Summary

Though each of the four crash types, SVR, SW, MVR and MVU had their own characteristics, there were many aspects of all the single vehicle crashes despite their location which were similar. Multiple vehicle crashes also had particular patterns.

Single passenger vehicle accidents accounted for more fatal crashes (28%) and more fatalities (28%) than multiple passenger vehicle accidents (18% of all fatal crashes and 20% of fatalities). Other distinguishing features were their occurrence on the weekend, in mid-block locations with the car running off a level road. The drivers were generally young males, coming home from recreational activities often affected by alcohol and not wearing seat belts. Eleven percent of the drivers were unemployed.

Multiple passenger vehicle accidents on the other hand tended to occur on week days, during daylight hours, often within intersections. Though the drivers were older and more experienced, driver errors often contributed to these accidents. Bad visibility figured more prominently than in single vehicle accidents. There was a high incidence of chest injury deaths (19%) compared with other crashes.

The distinctions between rural high speed and urban low speed crashes were mainly a consequence of the location differences with almost all rural high speed crashes occurring mid-block on roads with loose shoulders and more persons dying before medical assistance arrived. Additionally, drivers in rural high speed crashes were older, both in single and multiple vehicle accidents.

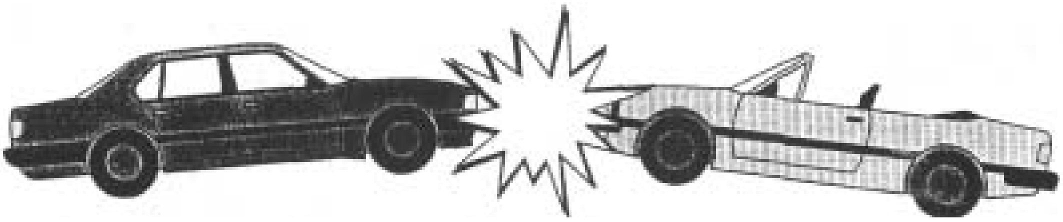
Single passenger vehicle rural high speed (SVR) crashes were the most serious of the four types in terms of the number of drivers and passengers killed (19% of all fatal crashes and fatalities). They generally occurred in good conditions, with the driver losing control on the road shoulder and overturning. Alcohol and fatigue were common contributory factors. Almost half (49%) of the drivers tested were over the 0.05 limit.

Single passenger vehicle crashes in urban low *speed* areas (SVU) accounted for 8% of fatal crashes and fatalities and were quite distinct from the other groups. Most occurred at night (73%). Speed (50%) and alcohol (65%) were often involved. One third of the victims died instantly.

Multiple passenger vehicle rural high sped (MVR) crashes contributed to 11% of all road fatalities. They were generally head-on, non-intersection crashes occurring during daylight hours on weekdays. The road surface conditions contributed to a proportionally high number of these crashes (12%) . Almost one in three of these crashes resulted in multiple fatalities. As for other multiple vehicle crash victims, 72% sustained serious chest injuries, but there were also high rates of serious injuries to the abdomen/pelvis and extremities of those killed which were not observed for other crash fatalities.

Multiple passenger vehicle urban *low* speed (MVU) crashes were of similar magnitude (9% of all fatal crashes). They were also mostly weekday, daytime crashes, but occurred, instead, within intersections as a consequence of driver errors. Almost half the victims died after the accident in hospital.

# Chapter 8: Multiple vehicle crash scenarios



Common elements of crashes involving multiple passenger vehicles derived from reading original crash documentation.

Multiple passenger vehicle rural high speed crash scenarios:

1. Daytime crash caused by one vehicle driven by an elderly driver failing to give way while entering a major road.

2. Non-intersection, head-on crash on a two-way undivided road caused by one vehicle coming onto the wrong side of the road.

Multiple passenger vehicle urban low speed crash scenarios:

1. Non-intersection, head-on crash on a two-way undivided road.

2. A vehicle turns right at an intersection in the face of oncoming traffic.

3. Two vehicles from adjacent directions and not intending to turn collide within an intersection.

## 8.1 Introduction

The crash reports of two random(*) samples of 25 multiple passenger vehicle rural high speed (MVR) crashes and 25 multiple passenger vehicle urban low speed (MVU) crashes were read in detail. See previous chapter for full definitions of these crash types. These reports form the basis of the computerised fatality file data and typically include a police accident report, coroner's report, drug analysis report, motor vehicle report, photos, diagrams, and police and witness statements.

The objectives were to identify common patterns and describe qualitatively one or more scenarios of each of these crash types. Additionally, hypotheses were to be formulated that could then be tested on the full fatal file data set.

(*) The selection was not completely random with respect to the total fatality file as crash report files were not available for fatal crashes occurring in NSW.

## 8.2 Multiple vehicle rural high speed crashes

### *MVR* crash scenarios

Despite the small subsample and the relatively specific definition of MVR crashes, there was considerable diversity in crash pattern, crash location, road conditions and the types of drivers involved in those crashes in the sample. It was thus difficult to summarise the crash information into a single typical scenario. One obvious distinction was between mid-block head-on crashes and crashes occurring within intersections.

### MVR crash scenario 1: *MVR* intersection crashes

These intersection crashes formed a small, but reasonably uniform group. They tended to occur during the day, at intersections of highways or major roads with minor roads, and the vehicle on the minor road, generally driven by an elderly driver, failed to give way.

### Validation

It was found that only 18% of *MVR* crashes in the entire database occurred within intersections. Over three quarters (76%) of these crashes occurred during the day. Drivers aged 60 years or older were considered responsible for 41% of these intersection crashes compared with only 15% of MVR non-intersection crashes.

### *MVR* crash scenario 2: MVR head-on crashes

The head-on crashes, being a much larger group, were more diverse, yet invariably occurred on two way undivided roads with one lane each way, with one vehicle coming onto the wrong side of the road causing the crash. The reasons could not always be established, as often the drivers and their passengers were killed or badly injured, and statements could not be taken at the scene of the accident.

The contributing factors were either solely driver related for crashes occurring during optimal driving conditions (i.e. speed/alcohol/fatigue/inexperience) or combinations of driver error and surface or visibility conditions (i.e. a overtaking manoeuvre resulting in a vehicle losing control in a soft road shoulder) or depended primarily on misadventure or bad road/weather conditions (i.e tyre blow-out or two vehicles meeting on a narrow crest).

The persons killed were not always those in error. Indeed, in some cases, the vehicle causing the crash did not come into contact with any other vehicles. However, it appeared that intoxicated drivers tended to be killed rather than the sober drivers in the car hit, and this could be partially explained by non-use of seat belts by the drunk drivers.

Crashes in which alcohol was a contributing factor were more typical of night time crashes. Crashes where the driver fell asleep generally tended to occur in the morning. Crashes in which surface conditions or visibility played a role occurred during the day.

### Validation

The majority (74%) of MVR crashes in the total fatality file involved vehicles travelling in opposing directions (Figure 7.4b). Bad surface or visibility in the absence of driver related factors were considered contributory for only 11% of head-on MVR crashes in fine conditions. Alcohol was a contributory factor in 53% of night time head-on MVR crashes and only 12% of daytime head-on MVR crashes, whereas surface conditions and visibility were considered contributory in 28% of day time head-on MVR crashes and only 14% of night time head-on crashes. There was a tendency for more fatigue related MVR crashes to occur in the morning (35% between 6 and 10am) than fatigue related SVR crashes (only 17% in the same time period).

A higher proportion of alcohol affected (>0.05 gm/100 ml) drivers involved in head-on MVR crashes died (70%) compared with sober drivers (38%) involved in head-on MVR crashes. This was partly due to the higher percentage of these alcohol affected drivers not wearing seat belts (50%) compared with only 10% of sober drivers not wearing seat belts and the time of the MVR head-on crashes.

## 8.3 Multiple vehicle urban low speed crashes

### MVU crash scenarios

Again there was considerable diversity in the corresponding sample of multiple passenger vehicle crashes in urban low speed locations. However, as for the MVR crashes, the most clear cut division was according to whether they occurred mid-block or within intersections.

### MVU crash scenario 1: Mid-block crashes

Though less frequent, MVU mid-block crashes were similar to MVR mid-block crashes. They were generally head-on crashes occurring on undivided two way roads with one driver coming onto the wrong side of the road colliding with oncoming traffic. Common factors were alcohol related at night or misadventure during the day.

### Validation

Only 39% of MVU crashes occurred away from intersections compared with 81% of MVR crashes. Seventy percent of these were head-on collisions involving no turning. Just over half (53%) of night time mid-block MVU crashes were alcohol related compared with only 10% during daylight hours.

## MVU crash scenario 2: Right turn intersection crashes

These crashes were characterised by a vehicle making a right hand turn and colliding with oncoming traffic within an intersection. The intersection was often controlled by lights, but not necessarily turning arrows. The turning vehicle often failed to observe the oncoming traffic or misjudged their speed. Occasionally, the other vehicle contributed to the crash by accelerating through the intersection on an amber light or, in general, exceeding the speed limit.

These crashes occurred during the day and night in dry and wet conditions.

### Validation

Twenty-nine (13%) of the MVU crashes involved a car turning right and colliding with oncoming traffic. For 50% of these crashes, the intersection was controlled by lights and a further 10% had give way signs. Information on turning arrows was not available in the fatality file. Failure to observe the other unit was a contributory factor in 68% of these crashes compared with only 16% of other MVU crashes. Speed was a contributory factor for 25% (similar to other MVU crashes).

The proportion of day/night and wet/dry crashes were similar to other MVU crashes.

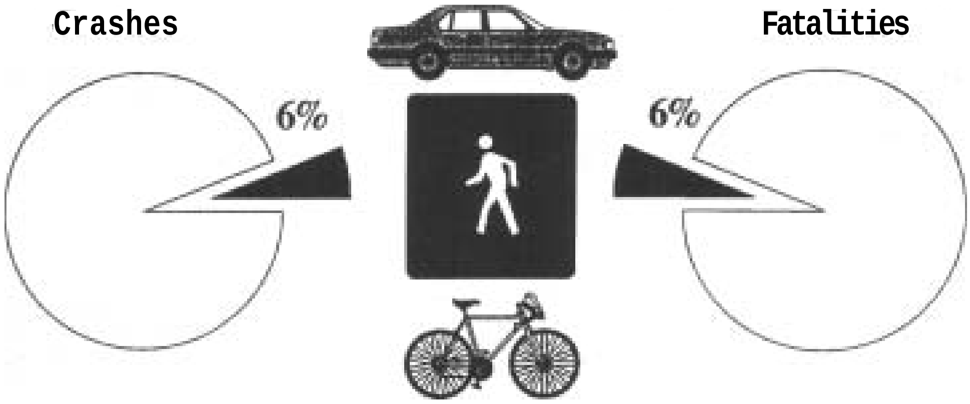
## MVU crash scenario 3: 'Straight through' intersection crashes

This type of crash typically involved two vehicles approaching an intersection from adjacent directions without intent to turn; one of the vehicles ignoring a traffic control (give way, stop sign or lights), resulting in a collision. Usually, a single vehicle was at fault. These crashes generally occurred during the day, but those occurring at night were usually caused by alcohol affected drivers.

### Validation

Twenty-nine percent of MVU crashes involved two vehicles from adjacent directions intending to proceed straight and colliding within an intersection. For 87% of these crashes, a road rule breach was considered to contribute to the collision. This was much higher than for other MVU crashes (19%). A single vehicle was at fault for 97% of these crashes. Most (73%) of these crashes occurred during the day. Alcohol was more often a contributory factor at night (29%) than during the day (9%).

# Chapter 9: Fatal crashes involving children




Children aged up to 12 years accounted for 6% of road fatalities.
22% of bicycle fatalities.
13% of pedestrian fatalities.
10% of passenger fatalities.

**Timing**

- Most fatal crashes involving children (78%) occurred during the day.
- A high proportion (42%) of weekday fatal crashes involving children occurred between 3 and 6 pm (after school).
- A relatively high proportion (32%) of weekend crashes involving children occurred between 12 noon and 3 pm.

**Crash description**

- 28% of child pedestrians were killed emerging from behind a parked vehicle.
- 47% of child cyclists were killed emerging from a footpath or driveway.

**Contributory factors**

- Most of the child pedestrians killed (81%) were judged to be responsible for the crash in which they were killed.
- Most of the child cyclists killed (94%) were judged to be responsible for the crash in which they were killed.

**Children**

- 61% of children killed were boys, 39% were girls.
- Girl fatalities were more likely to be aged 6-9 (52% vs 30%).

**Medical details**

- Children killed in road crashes were more likely to die of head injuries, than other, older road crash victims.
- 54% of child pedestrians died of head injuries, 32% of multiple injuries.
- 58% of child cyclists died of head injuries, 37% of multiple injuries.
- 53% of child passengers died of head injuries, 27% of multiple injuries.
- Only 7% of child pedestrian fatalities died instantaneously.
- Child pedestrians killed were more likely to sustain at least one serious injury to the head, abdomen and/or spine than adult pedestrian fatalities.
- Child passengers killed were less likely to sustain serious injuries to the chest than other, older passenger fatalities.
- Most child passenger fatalities (70%) were in the rear of the vehicle and the most common seating position compared with any other was the rear centre seat.
- 73% of children in passenger vehicles involved in fatal accidents were wearing seat belts or in child restraints.

**Drivers**

- Most of drivers of vehicles in which children were killed(71%) were aged 26-49.
- 43% of drivers of passenger vehicles in which children were killed were female.

## Definition

Crashes involving children were defined as crashes in which at least one child was killed or died within 30 days of the crash. A child was defined as aged 12 years or younger.

## Frequency

A total of 160 such crashes occurred in 1988, 6% of all fatal crashes. As a result of these crashes, 170 children were killed, 6% of all road fatalities. A total of 41 other, older persons (teenagers and adults) were also killed in these crashes.

Of the children who died, 79 (47%) were passengers in motor vehicles, 72 (42%) were pedestrians and 19 (11%) were riding bicycles.

Expressed as percentages of these road user fatality groups, children account for 10% of passenger fatalities, 13% of pedestrian fatalities and 22% of bicycle fatalities.

## Contrast groups

Crashes involving children were compared with all other crashes, and among the fatalities, children were compared with other persons. Where appropriate, comparisons were made within crash types or road user categories, e.g. pedestrian crashes, crashes involving bicycles, crashes involving only motor vehicles and neither pedestrians, bicycles nor motor cycles.

## Timing

The distribution throughout the year of crashes involving children did not differ significantly from other fatal crashes. There were no distinct seasonal variations.

Approximately one third of the crashes involving children occurred during the weekend (31%); a figure similar to other fatal crashes. The number of crashes involving children did not show the increasing trend through the weekdays up to Friday, as did other crashes (Figure 9.1).

Most (78%) fatal crashes involving children occurred during the day, compared with only 49% of other fatal crashes.

The pattern differed according to weekdays and weekends, with the peak 3 hour period being 3-6pm on weekdays (42% weekday crashes), and earlier (12-3pm) on weekends (32% weekend crashes) (Figure 9.2).

Figure 9.1 Crashes with child (<13 years) fatalities and other fatal crashes by day of week

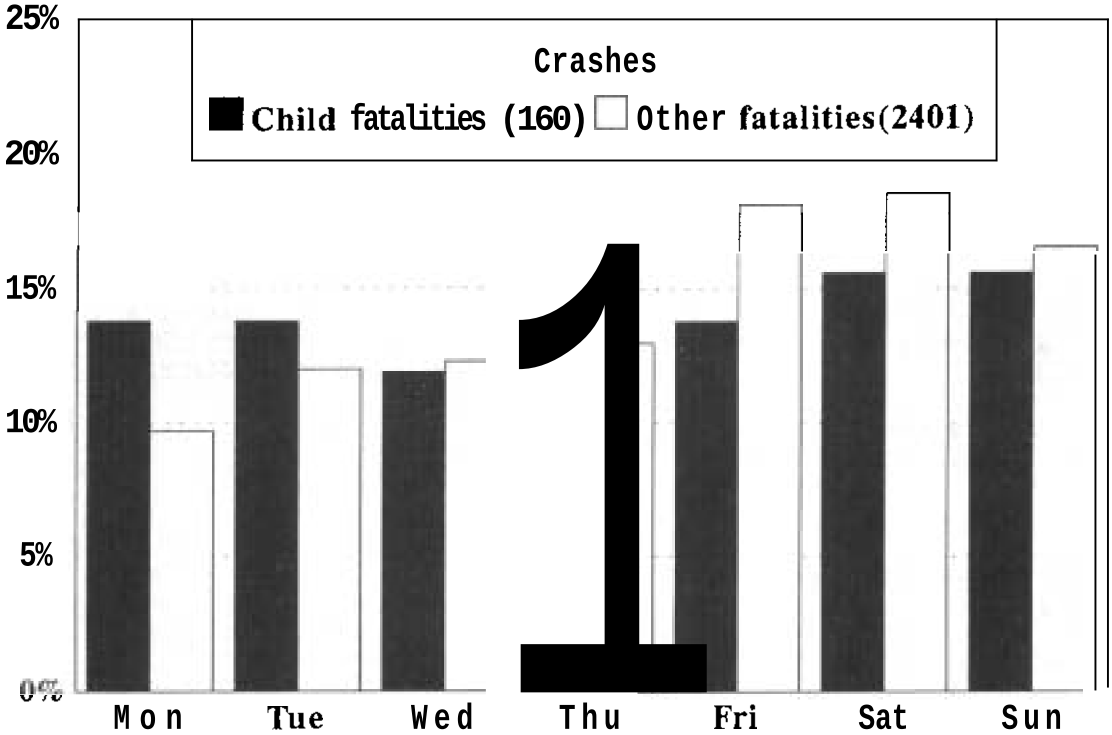
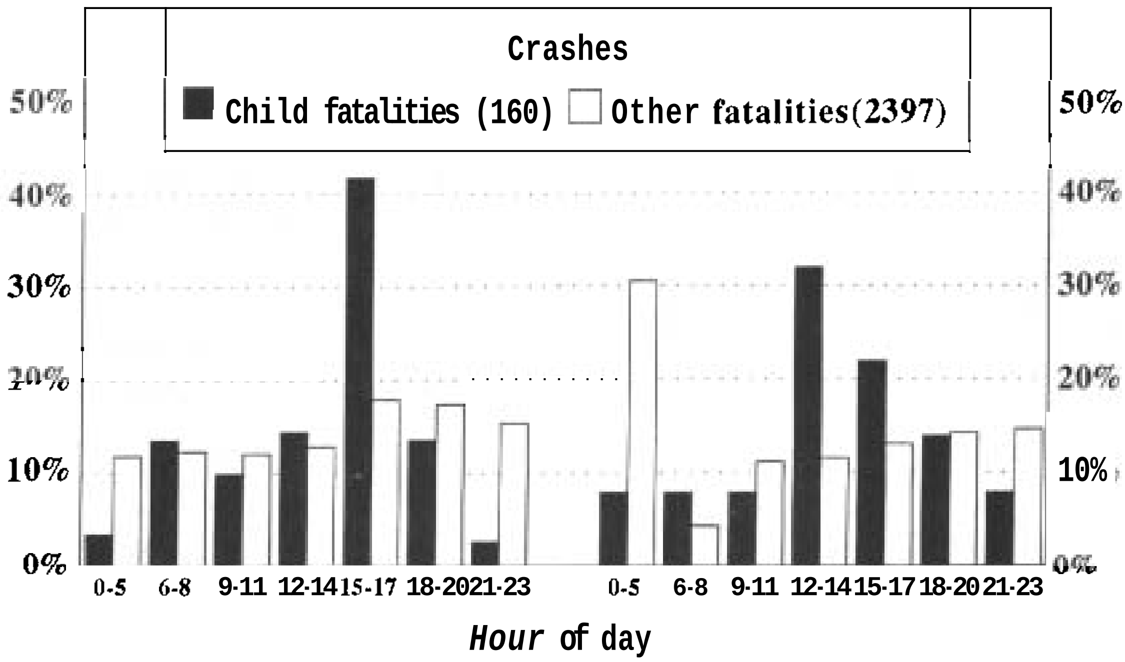



Figure 9.2 Crashes with child (<13 years) fatalities by time of day on weekdays and weekends




Source: *FORS* 1988 Fatal file

## Location

Crashes involving children did not differ from other fatal crashes with respect to the distribution in the different States.

There was a higher proportion of urban fatal crashes in which children were killed compared with other fatal crashes (63% vs 53%). The distinction was slightly more pronounced in urban low speed zones (57% vs 46%) or areas with a residential or part residential land use classification (56% vs 40%). The largest excesses relative to other fatal crashes were observed in urban areas of towns with populations from 1000-100000 (23% vs 11%).

Of the urban crashes, there were proportionally more crashes occurring mid-block involving children compared with those in which other persons were killed (74% vs 61%). Proportionally fewer crashes involving children occurred within intersections (11% vs 26%).

Of the rural crashes, the distribution with respect to intersections did not differ significantly from other crashes.

## Road and driving conditions

Fatal accidents involving children did not differ significantly from other fatal crashes with respect to weather or driving conditions.

## Vehicle characteristics

Of the 72 pedestrian crashes in which a child was killed, 62 involved cars, 4 involved buses, 3 involved trucks, 2 involved motorcycles and for one, the vehicle was of unknown type.

Of the 19 bicycle crashes in which a child was killed, 15 involved cars and 4 involved trucks.

Of the 69 vehicles in which a child passenger was killed, 60 were passenger vehicles, 6 were trucks (3 rigid and 3 articulated), 2 were buses and one was of unknown type.

A higher proportion of vehicles in which children were killed were tested for defects (52% vs 36%), but the defect rate was the same as for other vehicles.

## Crash description

There were similar numbers of prior events (13% vs 14%), but fewer subsequent events (9% vs 19%) and the DCA was more often fatal (90% vs 82%) for crashes involving children compared with other fatal crashes.

Relative to other fatal crashes, there were high proportions of pedestrian (45% vs 19%) and bicycle crashes (12% vs 3%) involving children. Thus, in terms of the ten major DCA types, pedestrian crashes predominated.

Compared with other (older) pedestrians, children were more likely to be killed as they emerged from behind a parked or stationary vehicle (28% vs 5%).

Figure 9.3 shows the major crash patterns for bicycle accidents involving children and older cyclists. It shows that children were more often killed while manoeuvring (emerging from footpath or driveway), overtaking or crossing the path of oncoming traffic, whereas the older cyclists were killed in rear end crashes, or where their bicycle was out of control on the carriageway.

Excluding all pedestrian, bicycle and motorcycle crashes, the crashes involving children killed as passengers were compared with other fatal motor vehicle crashes involving cars, buses and trucks. The distribution of the major DCA types is given in Figure 9.4. There were fewer crashes with vehicles from adjacent directions in which child passengers were killed (3% vs 11%), and more crashes with vehicles from opposing directions (33% vs 27%) or overtaking (7% vs 3%). The total number crashes in which the vehicle was out of control were approximately the same (46% vs 48%). The proportions of these crashes with prior and/or subsequent events were similar.

For vehicles in which child passengers were killed, the point of primary impact was less often the front (35% vs 53%) and more often the left hand side of the vehicle (27% vs 12%) as compared with other motor vehicles involved in other fatal crashes. Though this appears to partly contradict the DCA comparison, further investigation showed that many of the crashes in which the point of primary impact was the left hand side involved vehicles originally from opposing directions and not necessarily from adjacent directions (e.g. starting to turn right).

## Contributory factors

In 7 (4%) of the crashes where children were killed, either fault could not be determined or no one was considered at fault. This percentage was the same for other crashes. In 73 (48%) of the remainder, the child or the vehicle in which he or she was travelling was considered to be at fault.

For pedestrian crashes, 81% of the child pedestrian fatalities were considered at fault, compared with 67% of other (older) pedestrians killed. Similarly, a much higher proportion of child cyclists was considered at fault (94%) than other bicycle riders (59%).

For 82% of the motor vehicle accidents in which child passengers were killed, the vehicle they were travelling in was deemed at fault. This percentage was the Same for male and female drivers.

Major factors were noted for all but two of the crashes involving children. The following tables show the percentage of crashes in which at least one of the factors of various types was noted. Significantly high percentages are highlighted. Separate tables are given for pedestrian, bicycle and motor vehicle crashes (excluding motor cycles).

Figure 9.3 Bicycle crashes with child (<13 years) and other fatalities by major crash classification (DCA)

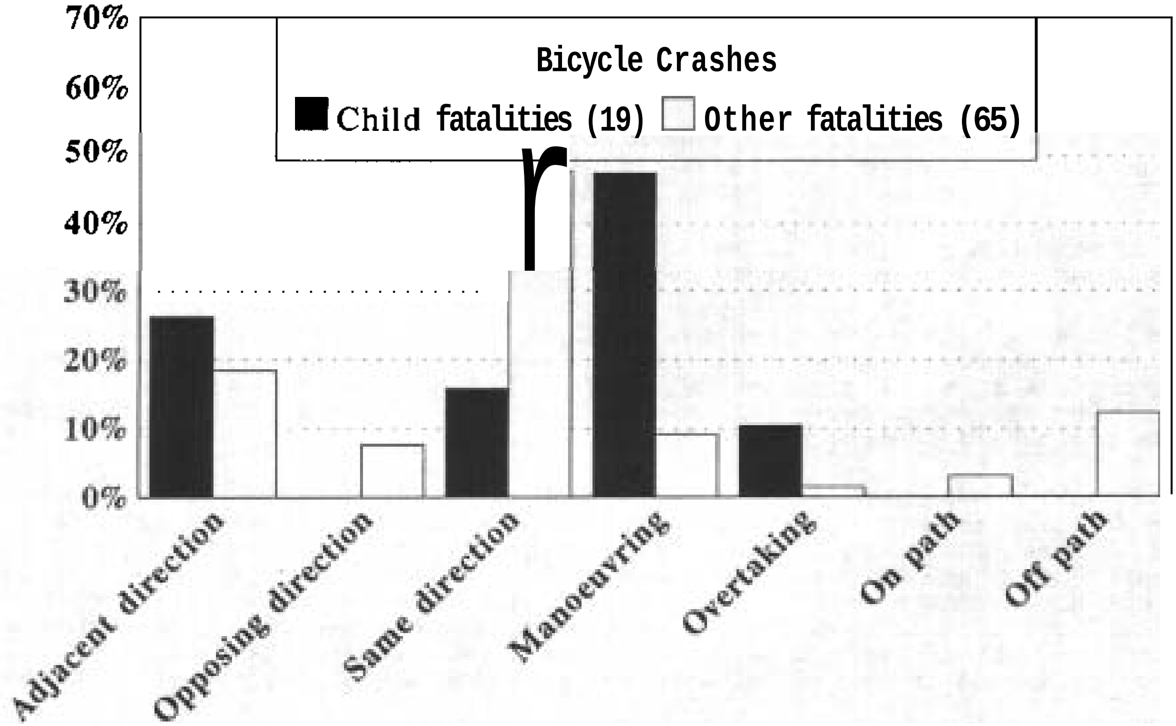
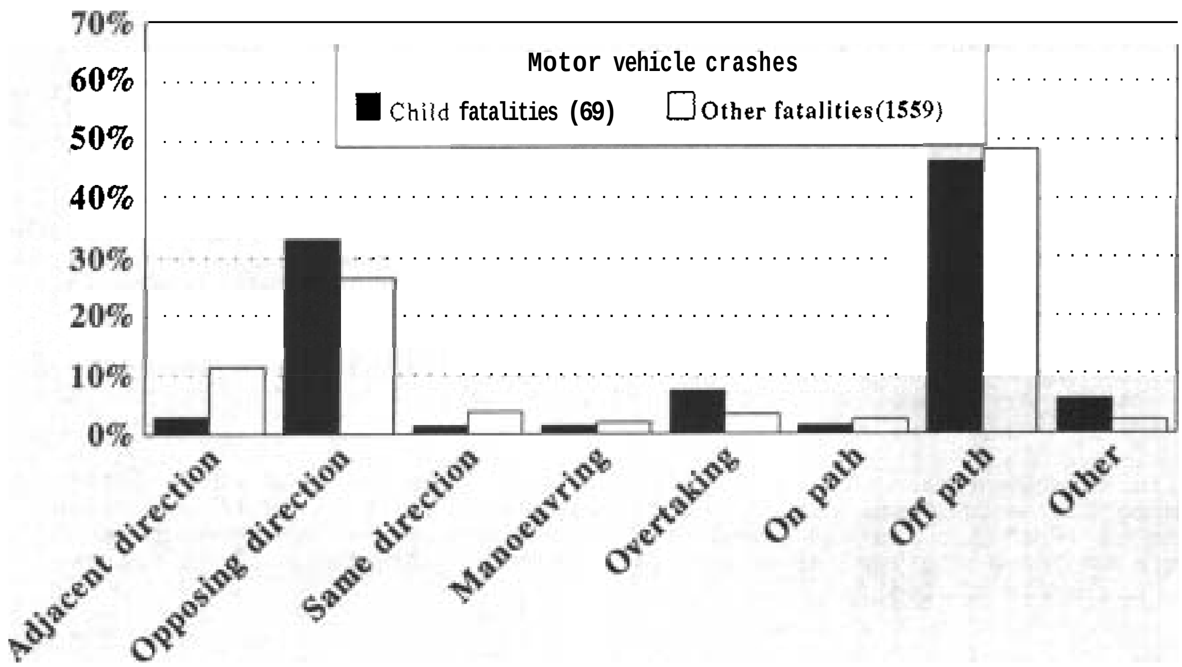



Figure 9.4 Motor vehicle crashes with child (<13 years) passenger & other fatalities by major classification (DCA)
(Excluding crashes involving pedestrians, bicycles and motorcycles)




Source: FORS 1988 Fatal file

For pedestrian crashes, children were more likely to step from behind obstructions, whereas older pedestrians were more often indecisive, slow and/or alcohol affected (Table 9.1).

Table 9.1 Number and percentage of pedestrian crashes attributed to various factors. Crashes in which children aged 12 or younger were killed are compared with other fatal pedestrian crashes. Significantly high percentages are highlighted.

| | Child pedestrian | | Other pedestrian | |
|---|---|---|---|---|
| Factor | n | % | n | % |
| Pedestrian factor | 59 | 82% | 358 | 79% |
| -Pedestrian misjudgment | 45 | 63% | 228 | 50% |
| -Pedestrian obscured | 21 | 29% | 35 | 8% |
| -Pedestrian walks against light | 3 | 4% | 33 | 7% |
| -Pedestrian confused, indecisive, slow | 1 | 1% | 47 | 10% |
| -Pedestrian skylarking | 1 | 1% | 8 | 2% |
| -Pedestrian jaywalking | 1 | 1% | 8 | 2% |
| -Pedestrian alcohol/drug affected | 0 | 0% | 146 | 32% |
| Failure to observe other unit | 7 | 10% | 64 | 14% |
| Visibility | 7 | 10% | 39 | 9% |
| Speed | 2 | 3% | 25 | 6% |
| Alcohol/drug use by driver | 1 | 1% | 34 | 7% |
| Surface conditions | 1 | 1% | 5 | 1% |
| Fatigue | *0* | *0%* | 4 | 1% |
| Vehicle defects | *0* | *0%* | 5 | 1% |
| Pedestrian crashes for which at least one factor noted | 72 | | | 454 |

The percentages do not sum to 100% since up to 3 major factors can be recorded for each crash. The 'n' in the table is the number of crashes with at least one of the specific major factors recorded for the crash. The percentage is calculated with the denominator as the number of crashes with some information on major factors.

For bicycle crashes, the major distinction was that child cyclists more often rode dangerously, thus contributing to their deaths (Table 9.2).

Surface conditions contributed more often and alcohol and speed less often in motor vehicle accidents in which child passengers were killed (Table 9.3).

Table 9.2 Number and percentage of bicycle crashes attributed to various factors. Crashes in which cyclists aged 12 or younger were killed are compared with other fatal bicycle crashes. Significantly high percentages are highlighted.

| Factor | Child cyclist | | Other cyclist | |
|---|---|---|---|---|
| | n | % | n | % |
| Cyclist factor | 12 | 63% | 27 | 45% |
| -Cyclist made dangerous manoeuvre | 10 | 53% | 12 | 20% |
| -Cyclist against traffic control | 4 | 21% | 9 | 15% |
| -Cyclist unstable/fell | 3 | 16% | 9 | 15% |
| -Cyclist intoxicated | 0 | 0% | 5 | 8% |
| Failure to observe other unit | 7 | 37% | 19 | 32% |
| Visibility | 2 | 11% | 4 | 7% |
| Vehicle defects | 1 | 5% | 4 | 7% |
| Alcohol/drug use by driver | 0 | 0% | 8 | 13% |
| Other driver factor/error | 0 | 0% | 8 | 13% |
| Speed | 0 | 0% | 2 | 3% |
| Fatigue | 0 | 0% | 1 | 2% |
| Bicycle crashes for which at least one factor noted | 19 | | 60 | |

Table 9.3 Number and percentage of motor vehicle crashes attributed to various factors. Crashes in which children aged 12 or younger who were passengers were killed (denoted 'Child passenger') are compared with other fatal crashes involving neither pedestrians, bicycles nor motorcycles (denoted 'Other'). Significantly high percentages are highlighted.

| Factor | Child passenger killed | | Other fatal crash | |
|---|---|---|---|---|
| | n | % | n | % |
| Driver error | 23 | 34% | 429 | 30% |
| -Road rules | 11 | 16% | 203 | 14% |
| Surface conditions | 11 | 16% | 102 | 7% |
| Alcohol/drug use by driver/rider | 9 | 13% | 488 | 34% |
| Speed | 7 | 10% | 380 | 26% |
| Fatigue | 7 | 10% | 155 | 11% |
| Failure to observe other unit | 6 | 9% | 138 | 10% |
| Visibility | 5 | 7% | 99 | 7% |
| Vehicle defects | 4 | 6% | 61 | 4% |
| Motor vehicle crashes for which at least one factor noted | 67 | | 1444 | |

## Persons involved

### Children: age and sex

There was no marked increasing trend in the number of child fatalities with age. An increase in the number of fatalities occurs later in the teenage years. (Figure 9.5) shows the number and percentage of child pedestrian, cyclist and passengers killed of various ages.

Almost twice as many boys died compared with girls. There were 104 boys (61%) and 66 girls (39%) killed. The percentage of girls, however, was higher than the corresponding percentage of other females (aged 13 and over) killed in other fatal crashes (28%).

Table 9.4 shows the age composition for boys and girls. There were relatively more boys in the younger (0-5) and older (10-12) age groups, whereas there were more girls than boys in the age group 6-9 both in terms of the percentage and the number of deaths.

Table 9.4 Age distribution of children aged 12 years or younger killed in fatal road accidents. Girls and boys shown separately.

| | Boys | | Girls | |
|---|---|---|---|---|
| Age | n | % | n | % |
| 0-5 | 49 | 47% | 26 | 39% |
| 6-9 | 31 | 30% | 34 | 52% |
| 10-12 | 24 | 23% | 6 | 9% |
| Total children | 104 | (100%) | 66 | (100%) |

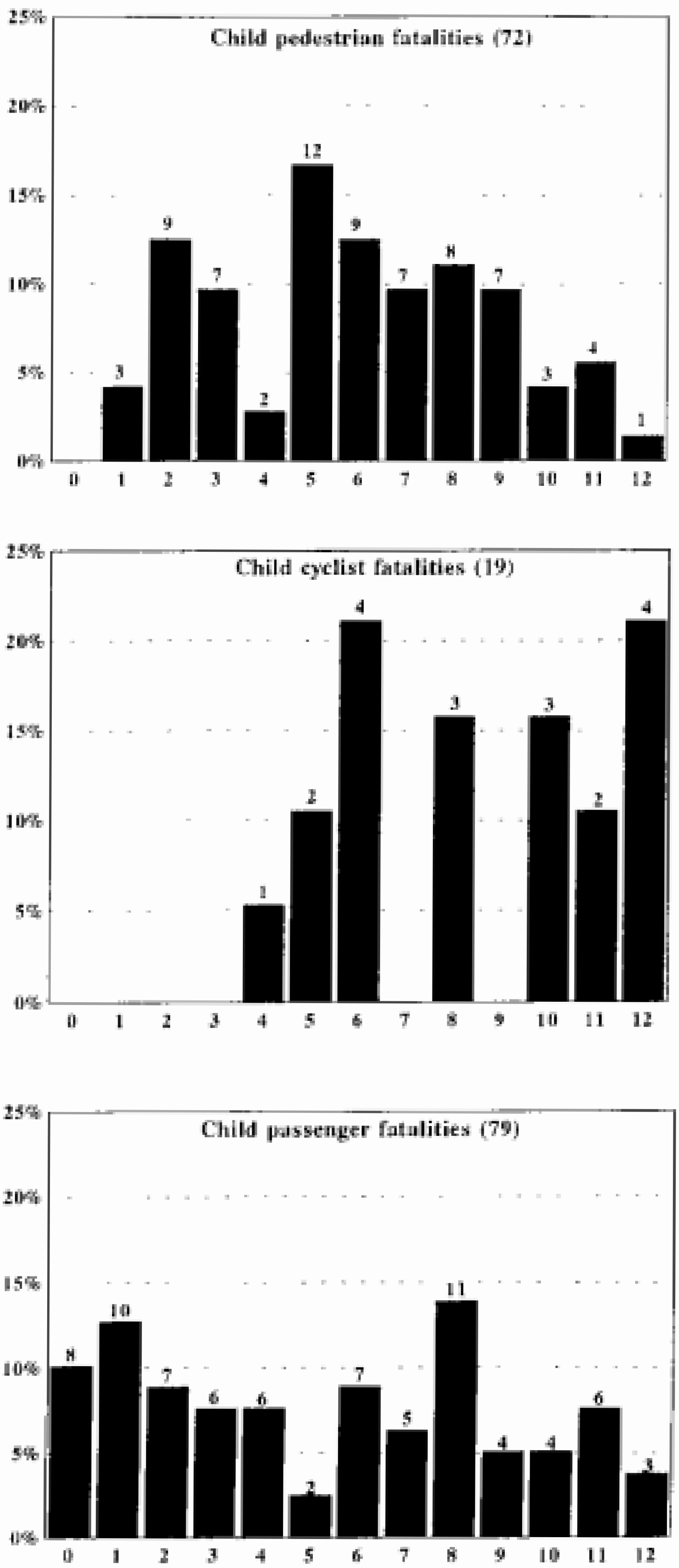
### Children: road user groups

The child fatalities were of three major road user categories; 79 (47%) passengers in motor vehicles: 72 (42%) pedestrians and 19 (11%) cyclists. Of the 79 children killed in motor vehicles, 2 were bus passengers. Table 9.5 shows that boys predominated among the child cyclists killed. Figure 9.5 shows their age distribution.

Table 9.5 Girls and boys killed in pedestrian, bicycle and other motor vehicle crashes.

| | | | Girls | |
|---|---|---|---|---|
| Child | n | % | n | % |
| Passengers | 48 | 46% | 31 | 47% |
| Cyclists | 16 | 15% | 3 | 5% |
| Pedestrians | 40 | 38% | 32 | 48% |
| Total children | 104 | (100%) | 66 | (100%) |

## Figure 9.5 Age distribution of child (<13 years) accident victims




Source: FORS 1988 Fatal file

Information on seating position with respect to the front and the rear of the vehicle was available for 93% of the passenger fatalities in passenger vehicles. Children were more likely than other, older passengers to sit in the rear of the vehicle (70% vs 34%) or on someone's lap (5;8% vs 1;0.2%) (Table 9.6).

Information on exact placement in the vehicle was available for 87% of the passengers in passenger vehicles. The front centre, back centre and standing or lying positions were more frequent for child passenger fatalities.

More children were killed in the rear centre seat than any other position. Of those 12 killed sitting in the rear centre seat, six were unrestrained, four were in a capsule or child seat, one was wearing a lap belt and for the other child, the restraint type was not specified.

Table 9.6 Position in passenger vehicle of child and other passengers killed in fatal crashes.

| | Child passenger <13 years | | Other passenger 13+ years | |
|---|---|---|---|---|
| Position in passenger vehicle | n | % | n | % |
| Front | 14 | 22% | 395 | 66% |
| Front centre | 2 | 15%[1] | 4 | 1%[1] |
| Front left | 11 | 85%[1] | 384 | 99%[1] |
| Front (unknown) | 1 | | 7 | |
| Rear | 45 | 70% | 205 | 34% |
| Rear centre | 12 | 32%[2] | 14 | 8%[2] |
| Rear left | 8 | 22%[2] | 70 | 38%[2] |
| Rear right | 9 | 24%[2] | 71 | 39%[2] |
| Sitting rear, other | 2 | 5%[2] | 12 | 7%[2] |
| Lying/standing in rear | 6 | 16%[2] | 17 | 9%[2] |
| Rear (unknown) | 8 | | 21 | |
| On lap | 5 | 8% | 1 | 0% |
| Total passengers killed | 64 | (100%) | 601 | (100%) |

[1] Percentage of front excluding front placement unknown.
[2] Percentage of rear excluding rear placement unknown.

## Drivers

The 69 drivers of the vehicles in which child passengers were killed were compared with drivers of other motor vehicles involved in other fatal crashes involving motor vehicles.

Though the median age of the drivers in these two groups was the same (34), the drivers of vehicles in which child passengers were killed were more likely to be aged between 26 and 50 (71% vs 47%).

There was a higher proportion of women driving the passenger vehicles in which children were killed compared with other passenger vehicles in fatal crashes (43% vs 22%). The nine trucks and buses in which child passengers were killed were driven by men.

## Seat belts and child restraints

Information concerning availability of seat belts existed for 84% of occupants of motor vehicles involved in fatal accidents. Whether they were actually worn during the crash was recorded for 89% of the cases where the seat belts were noted as being available. The availability and use of seat belts or child restraints is summarised in Table 9.7 for occupants of passenger and other vehicles (buses, trucks).

Children were less likely than other (older) occupants to have a seat belt or restraint available to them (78% vs 89%). This was the case in passenger vehicles (85% vs 96%) where seat belts were, in general, available. The same tendency was observed in other vehicles (22% vs 36%) (Table 9.7). The children's positioning in the vehicles contributed to this with 12 of the children sitting on either the driver's or a passenger's lap. Sixteen were lying down.

The use of seat belts and restraints was slightly, but not significantly, higher for children compared with other occupants of passenger vehicles (87% vs 82%). AS noted for articulated trucks (Table 6.7), occupants (of all ages) of bus and trucks were less likely to wear seat belts even when available (65%).

The lower availability combined with the slightly higher use when available led to an overall seat belt/restraint use of 73% for children which was not significantly different from other, older occupants of passenger vehicles involved in fatal crashes (79%) (Table 9.7).

Table 9.7 Number and percentage of motor vehicle occupants involved in fatal crashes with respect to availability and use of seat belts or child restraints, subdivided by age and type of vehicle.

| | Passenger vehicle occupants | | | | Bus/truck occupants | | | |
|---|---|---|---|---|---|---|---|---|
| | Child <13 yrs | | Other 13+ yrs | | Child <13 yrs | | Other 13+ yrs | |
| Seat belts/restraints | n | % | n | % | n | % | n | % |
| None available | 38 | 15% | 154 | 4% | 29 | 78% | 383 | 64% |
| Available | 233 | 85% | 3636 | 96% | 8 | 22% | 218 | 36% |
| Not worn | 26 | | 569 | | 3 | | 67 | |
| Worn | 177 | 73%[1] | 2663 | 79%[1] | 5 | 14%[1] | 124 | 22%[1] |
| Worn, if available | | 87%[2] | | 82%[2] | | 63%[2] | | 65%[2] |
| Unknown if worn | 20 | | 404 | | 0 | | 27 | |
| Total motor vehicle occupants | 261 | | 3790 | | 37 | | 601 | |

[1] Overall percentage wearing seat belts
[2] Percentage wearing seat belts given that they were available

Among the passenger vehicle fatalities, the overall use of seat belts and restraints was also not significantly different between children and adults with 55% of child passenger fatalities restrained compared with 66% of other, older passenger vehicle occupant fatalities wearing seat belts at the time of the crash.

The protective effect of seat belts in passenger vehicles was observed for both children and adults with higher proportions of both age groups dying if unrestrained (children 45% died unrestrained vs 20% died restrained; persons >12 years 62% vs 32%) (Table 9.8).

Table 9.8 Number and percentage of child and other, older passenger vehicle occupants who died or survived a fatal crash according to whether or not they were wearing a seat belt or restraint.

| | Passenger vehicle occupants in fatal crashes | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Child (<13 years) | | | | | Other (13+ yrs) | | | | |
| | Died | | Survived | | Total | Died | | Survived | | Total |
| Seat belt use | n | % | n | % | n(100%) | n | % | n | % | n(100%) |
| Unrestrained[1] | 29 | 45% | 35 | 55% | 64 | 450 | 62% | 273 | 38% | 723 |
| Restrained | 36 | 20% | 141 | 80% | 177 | 857 | 32% | 1806 | 68% | 2663 |
| Total persons | 65 | | 176 | | 241 | 1307 | | 1989 | | 3386 |

[1] seat belt or restraint not available or not worn.

The proportion of children restrained was similar among children of different ages (Table 9.9). Information on the type of restraint available was recorded for 77% of the passengers in passenger vehicles and is summarised in Table 9.10 for passengers of different ages. Three quarters of the children in the 4-10 year old age group wore lap/shoulder type belts.

Table 9.9 Seat belt and child restraint use for passengers in passenger vehicles involved in fatal crashes; shown for various age groups.

| | Unrestrained[1] | | Restrained | |
|---|---|---|---|---|
| Passenger age | n | % | n | % |
| 0- 1 | 9 | 24% | 28 | 76% |
| 2- 3 | 10 | 26% | 29 | 74% |
| 4-10 | 37 | 28% | 96 | 72% |
| 11-12 | 8 | 27% | 22 | 73% |
| 13+ | 394 | 28% | 992 | 72% |

[1] Seat belt or restraint not available or not worn.

Table 9.10 Restraint type used by passengers of different ages in passenger vehicles.

| | Restraint type | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Age | Capsule/ bassinette | | Child seat | | Booster seat | | Special belt | | Lap belt only | | Lap/ shoulder | | Total | |
| 0- 1 | 9 | 38% | 12 | 50% | 0 | 0% | 2 | 8% | 0 | 0% | 1 | 4% | 24 | 100% |
| 2- 3 | 0 | 0% | 17 | 61% | 3 | 11% | 3 | 11% | 0 | 0% | 5 | 18% | 28 | 100% |
| 4-10 | 0 | 0% | 1 | 2% | 5 | 9% | 5 | 9% | 4 | 7% | 42 | 74% | 57 | 100% |
| 11-12 | 0 | 0% | 0 | 0% | 0 | 0% | 0 | 0% | 2 | 15% | 11 | 85% | 13 | 100% |
| 13+ | 0 | 0% | 0 | % | 0 | 0% | 0 | 0% | 18 | 2% | 756 | 98% | 774 | 100% |

## Medical details: Fatalities

The location of serious injuries suffered by child and other fatalities are shown within the various road user groups in Table 9.11. As the pattern of injury varies according to the road user category, children were compared with other fatalities within each of the three groups, pedestrians, cyclists and motor vehicle occupants.

For the pedestrian fatalities, children were more likely to suffer at least one serious injury to the head, abdomen/pelvis or spine. The cause of death was more often considered to be due to injuries to the head (54% vs 41%; $p=0.06$) and less likely chest injuries (1% vs 8%). Death due to multiple injuries was approximately one third in both age groups (32% children and 33% others) (Table 9.12).

There were no significant differences in injury or cause of death observed for the relatively small groups of cyclist fatalities (Table 9.11). Serious head and chest injuries were common in both age groups. Head injuries (58%) and multiple injuries (37%) were the major causes of death for the child cyclist fatalities (Table 9.12).

For the motor vehicle occupants, proportionally more children killed had serious head injuries and fewer had chest injuries than other, older occupants killed. This was also reflected in that head injuries were a more common cause of death for the children (53% vs 35%). The pattern was also similar in this respect for passengers in the front and rear of the vehicle.

Although death from head injuries was significantly higher only for child passengers, the same tendency was observed for child pedestrians and cyclists.

Table 9.11 Number and percentage of persons killed sustaining at least one serious injury (AIS 3-6) in different body regions for child (<13 years) and other, older fatalities within pedestrian, cyclist and motor vehicle occupant road user categories. Because a person may sustain one or more serious injuries in one or in one or more body region, percentages do not sum to 100%. Significantly high percentages when comparing child and other fatalities within road user subgroups are highlighted.

| Fatalities with at least one serious injury to the: | Road user fatality group: Pedestrian | | | | Cyclist | | | | Motor vehicle occupant | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Child | | Other | | Child | | Other | | Child | | Other | |
| | n | % | n | % | n | % | n | % | n | % | n | % |
| External | 1 | 1% | *0* | *0%* | *0* | *0%* | 0 | 0% | 4 | 5% | 47 | 3% |
| Head | **69** | **96%** | 355 | 76% | 16 | 84% | 53 | 79% | **69** | 87% | 1223 | 67% |
| Face | 1 | 1% | 7 | 1% | 1 | 5% | *0* | *0%* | 1 | 1% | 58 | 3% |
| Neck | 1 | 1% | 4 | 1% | *0* | *0%* | 2 | 3% | 3 | 4% | 27 | 1% |
| Chest | 41 | 57% | 282 | 60% | 14 | 74% | 40 | 60% | 37 | 47% | **1228** | **67%** |
| Abdomen/pelvis | **26** | 36% | 109 | 23% | 7 | 37% | 16 | 24% | 22 | 28% | 576 | 31% |
| Spine | 20 | 28% | 55 | 12% | 2 | 11% | 5 | 7% | 7 | 9% | 201 | 11% |
| Upper extremity | 1 | 1% | 30 | 6% | 1 | 5% | 1 | 1% | 3 | 4% | 137 | 7% |
| Lower extremity | 30 | 42% | 179 | 38% | 4 | 21% | 14 | 21% | 18 | 23% | 496 | 27% |
| Total fatalities | 72 | | 469 | | 19 | | 67 | | 79 | | 1831 | |

Table 9.12 Coroner's assessment of final cause of death for children (<13 years) and other, older fatalities in different road user groups. Significantly high percentages when comparing child and other fatalities within road user subgroups are highlighted.

| Cause of death: body region | Road user fatality group: Pedestrian Child n | % | Pedestrian Other n | % | Cyclist Child n | % | Cyclist Other n | % | Motor vehicle occupant Child n | % | Motor vehicle occupant Other n | % |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Head | 39 | 54% | 194 | 41% | 11 | 58% | 29 | 43% | 42 | 53% | 646 | 35% |
| Chest | 1 | 1% | 36 | 8% | 0 | 0% | 4 | 6% | 6 | 8% | 235 | 13% |
| Abdomen/pelvis | 1 | 1% | 5 | 1% | 1 | 5% | 1 | 1% | 0 | 0% | 44 | 2% |
| Spine | 7 | 10% | 19 | 4% | 0 | 0% | 2 | 3% | 3 | 4% | 88 | 5% |
| Lower extremity | 1 | 1% | 26 | 6% | 0 | 0% | 3 | 4% | 1 | 1% | 74 | 4% |
| Other | 0 | 0% | 0 | 0% | 0 | 0% | 0 | 0% | 3 | 4% | 38 | 2% |
| Multiple | 23 | 32% | 156 | 33% | 7 | 37% | 23 | 34% | 21 | 27% | 579 | 32% |
| Indirect/non-crash | 0 | 0% | 33 | 7% | 0 | 0% | 5 | 7% | 3 | 4% | 127 | 7% |
| Total fatalities | 72 | (100%) | 469 | (100%) | 19 | (100%) | 67 | (100%) | 79 | (100%) | 1831 | (100%) |

Of the pedestrian fatalities, a smaller proportion of children were killed instantaneously compared with older persons (7% vs 21%). This was observed both in urban and rural areas. There were no significant differences between the two age groups concerning timing of death for the cyclist and motor vehicle passenger fatalities.

## summary

Children up to 12 years of age, though constituting only 6% of road fatalities overall (170 deaths), accounted for a significant proportion of bicycle fatalities (22%), 13% of pedestrian fatalities and 10% of passenger fatalities.

These crashes tended to occur during the day, especially after school on weekdays and in the early afternoon on weekends.

The children's inexperience was often a contributory factor with both child pedestrians and cyclists often killed in coming out from behind a parked vehicle or entering the road from the footpath or driveway. Eighty-one percent of the child pedestrians and 94% of the child cyclists were considered responsible for the crashes.

Compared with older pedestrians killed, children were more likely to sustain a serious injury to the head, abdomen or spine.

The drivers of the cars in which children were killed were more likely to be aged 26-49 and female than other drivers involved in fatal crashes. Children were more likely to be in the rear of the vehicle, particularly the centre back seat. Children were less likely to have a seat belt (or some form of restraint) available to them than adults due to their positioning in the vehicles, but the overall percentage belted was effectively the same as adults (73%).

Child passengers were more likely to die of head injuries than other occupants, and less likely to sustain serious chest injuries.

## Appendix Tables

A1. Percentage of road fatalities in different occupations by age group and sex. ABS data for the Australian population in 1986 are also shown. Note that these figures exclude persons not in the work force such as students, unemployed and retired persons, and persons at home.

| Males | Road fatalities Age groups | | | Total road fatalities | Australian work force[1] |
|---|---|---|---|---|---|
| Employment category | 15-24 | 25-59 | 60+ | | |
| Manager/ professional | 6% | 18% | 23% | 13% | 32% |
| Trades | 35% | 21% | 21% | 27% | 23% |
| Clerical/sales/ service | 10% | 12% | 5% | 11% | 15% |
| Plant op/labourer | 44% | 42% | 33% | 42% | 27% |
| Other employed | 5% | 7% | 19% | 7% | 3% |
| Total males | 414 (100%) | 587 (100%) | 43 (100%) | 1044 (100%) | 3951924 (100%) |
| % of males in the work force | 72% | 84% | 16% | 67% | |

| Females | Road fatalities Age groups | | | Total road Fatalities | Australian work force[1] |
|---|---|---|---|---|---|
| Employment category | 15-24 | 25-59 | 60+ | | |
| Manager/ professional | 12% | 28% | 50% | 22% | 27% |
| Trades | 4% | 1% | 50% | 3% | 4% |
| Clerical/sales/ service | 69% | 44% | 0% | 54% | 51% |
| Plant op/labourer | 11% | 20% | 0% | 16% | 16% |
| Other employed | 3% | 7% | 0% | 5% | 2% |
| Total females | 89 (100%) | 120 (100%) | 2 (100%) | 211 (100%) | 2561623 (100%) |
| % of females in the work force | 51% | 51% | 1% | 35% | |

| | | | | | |
|---|---|---|---|---|---|
| Total employed | 503 | 707 | 45 | 1255 | 6513547 |
| % of road fatalities in work force[2] | 67% | 75% | 10% | 58% | |

[1] *Source* ABS ASCO 1986

[2] Percentage of road fatalities with information on employment status who were in the work force

A2. Percentage of drivers in different occupations involved in single/multiple vehicle, rural/urban, passenger vehicle/rigid truck crashes by sex. The ABS figures for the Australian population in 1986 are also shown. Note that these figures exclude persons not in the work force such as students, unemployed and retired persons, and persons at home.

**Male**

| Employment category | SVR driver | SVU driver | MVR driver | MVU driver | Total driver | Australian work force[1] |
|---|---|---|---|---|---|---|
| Manager/ professional | 21% | 14% | 22% | 22% | 20% | 32% |
| Trades | 21% | 31% | 25% | 23% | 24% | 23% |
| Clerical/sales/ service | 11% | 13% | 9% | 11% | 10% | 15% |
| Plant op/labourer | 40% | 34% | 34% | 38% | 31% | 27% |
| Other employed | 7% | 9% | 11% | 7% | 8% | 3% |
| Total males (100%) | 214 | 88 | 199 | 178 | 679 | 3951924 |
| % of males in the work force | 72% | 77% | 76% | 74% | 74% | |

**Female**

| Employment category | SVR driver | S W driver | MVR driver | MVU driver | Total driver | Australian work force[1] |
|---|---|---|---|---|---|---|
| Manager/ professional | 42% | 0% | 18% | 24% | 24% | 27% |
| Trades | 0% | 0% | 3% | 4% | 2% | 4% |
| Clerical/sales/ service | 32% | 80% | 64% | 52% | 55% | 51% |
| Plant op/labourer | 16% | 13% | 10% | 16% | 14% | 16% |
| Other employed | 10% | 7% | 5% | 4% | 6% | 2% |
| Total females (100%) | 31 | 15 | 39 | 25 | 110 | 2561623 |
| % of females in the work force | 47% | 62% | 51% | 38% | 47% | |

| | | | | | | |
|---|---|---|---|---|---|---|
| Total employed | 245 | 103 | 238 | 203 | 789 | 6513547 |
| % of drivers in the work force | 68% | 75% | 70% | 66% | 69% | |

[1] Source ABS ASCO 1986

A3. Percentage of drivers in different occupations involved in single/multiple vehicle, rural/urban, passenger vehicle/rigid truck crashes by age group. The ABS figures for the Australian population in 1986 are also shown. Note that these figures exclude persons not in the work force such as students, unemployed and retired persons, and persons at home.

15-24 years

| Employment category | SVR driver | S W driver | MVR driver | MVU driver | Total driver | Australian work force |
|---|---|---|---|---|---|---|
| Manager/ professional | 10% | 4% | 13% | 14% | 11% | 14% |
| Trades | 31% | 33% | 28% | 31% | 30% | 20% |
| Clerical/sales/ service | 16% | 24% | 28% | 17% | 21% | 41% |
| Plant op/labourer | 38% | 33% | 24% | 34% | 32% | 22% |
| Other employed | 6% | 7% | 8% | 5% | 6% | 2% |
| Total 15-24 (100%) | 90 | 46 | 72 | 65 | 273 | 1442136 |
| % in the work force | 67% | 74% | 87% | 78% | 75% | |

25-59 years

| Employment category | SVR driver | S W driver | MVR driver | MVU driver | Total driver | Australian work force |
|---|---|---|---|---|---|---|
| Manager/ professional | 31% | 18% | 24% | 26% | 26% | 34% |
| Trades | 13% | 20% | 18% | 15% | 16% | 14% |
| Clerical/sales/ service | 14% | 20% | 15% | 15% | 15% | 26% |
| Plant op/labourer | 36% | 31% | 34% | 36% | 35% | 23% |
| Other employed | 7% | 11% | 9% | 8% | 8% | 3% |
| Total 25-59 (100%) | 144 | 55 | 147 | 131 | 477 | 4793194 |
| % in the work force | 75% | 85% | 79% | 78% | 78% | |

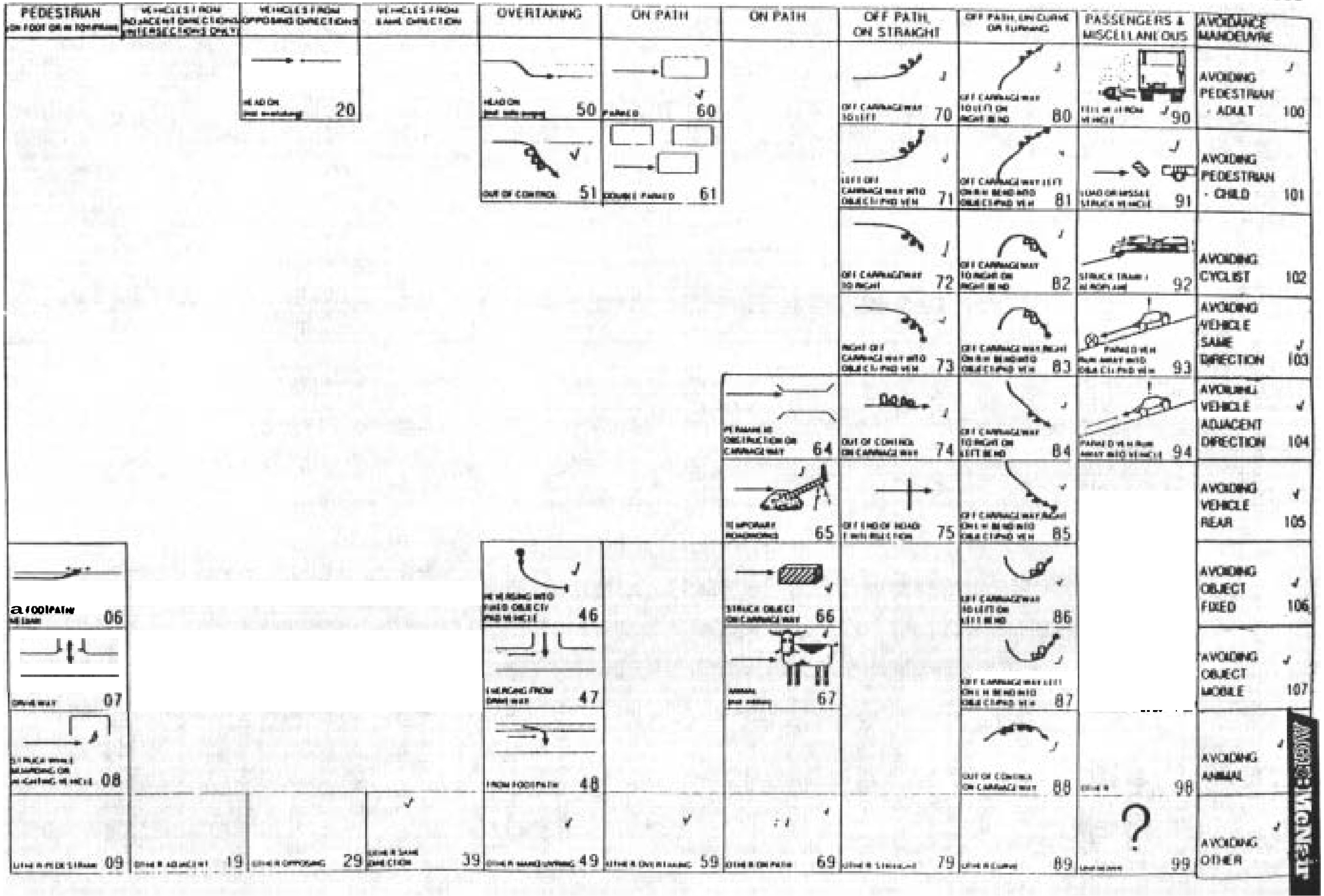
60+ years

| Employment category | SVR driver | S W driver | MVR driver | MVU driver | Total driver | Australian work force |
|---|---|---|---|---|---|---|
| Total 60+ (100%) | 9 | 2 | 15 | 3 | 29 | 278217 |
| % in the work force | 29% | 20% | 23% | 6% | 19% | |

| | | | | | | |
|---|---|---|---|---|---|---|
| Total drivers employed | 243 | 103 | 234 | 199 | 779 | 6513547 |
| % in the work force | 68% | 75% | 70% | 66% | 69% | |

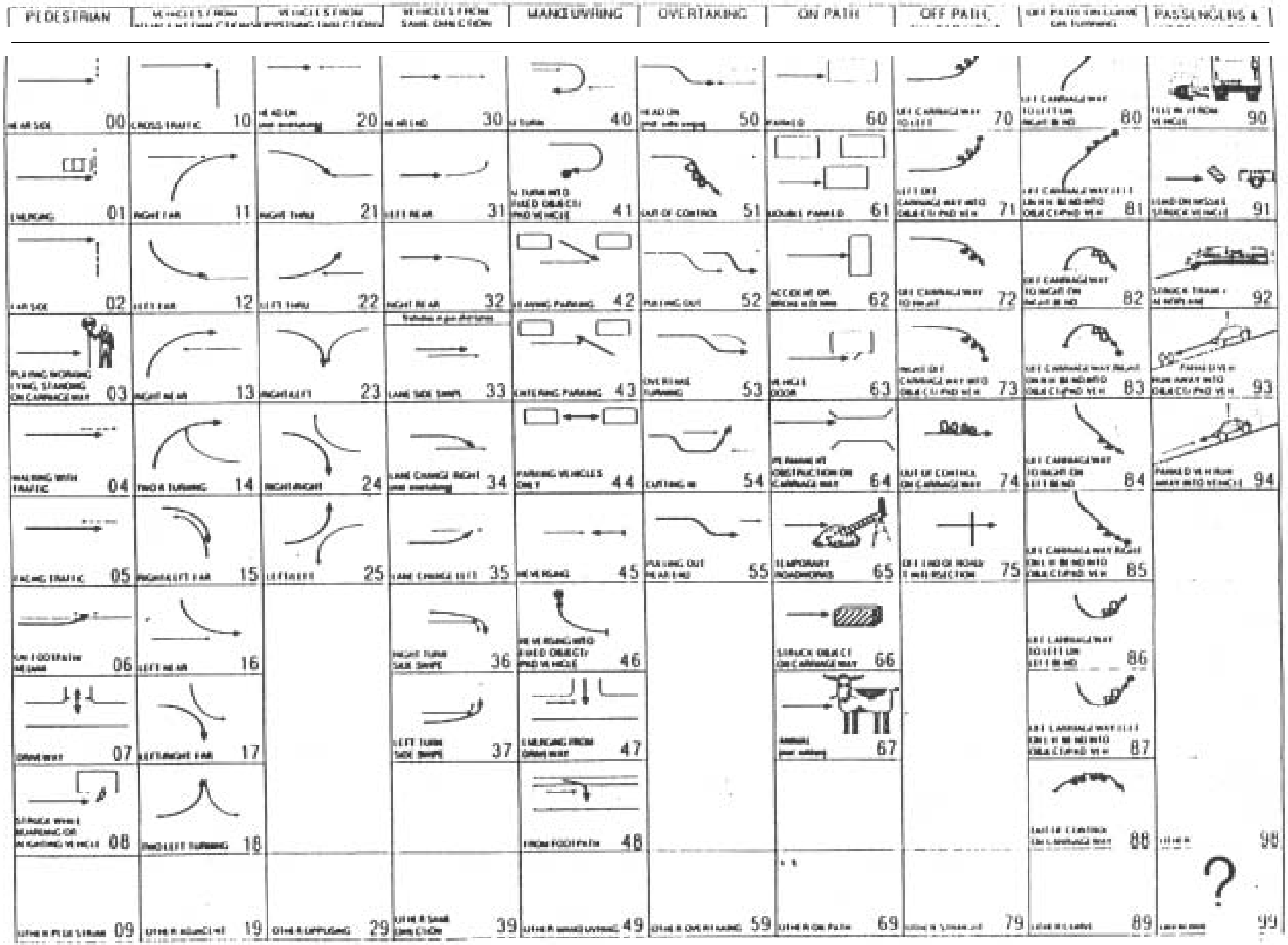
**PRIOR EVENTS - CLASSIFICATION DIAGRAM**

**FORS FATAL FILE COLLECTION 1988**



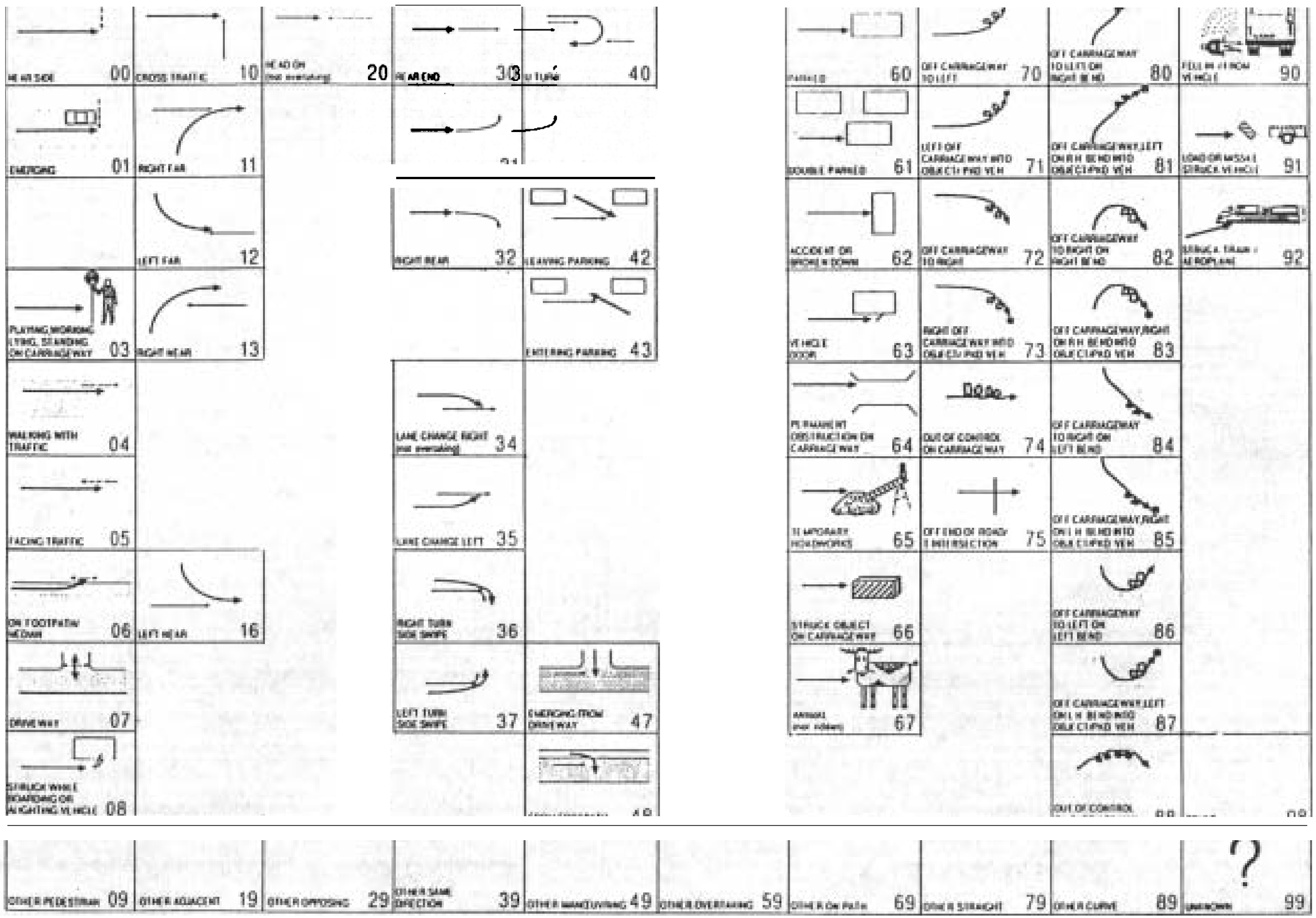
DEFINITIONS FOR CLASSIFIYING ACCIDENTS - DCA'S

FORS FATAL FILE COLLECTION 1988



## SUBSEQUENT EVENTS - CLASSIFICATION DIAGRAM

FORS FATAL FILE COLLECTION 1988



## Glossary of terms/definitions

All terms in CAPITALS below are consistent with the variable names and coding used in the fatal files and referenced in the Documentation of File Structure (Federal Office of Road Safety Fatal File, 1988).

| | |
|---|---|
| AIS | Abbreviated Injury Scale, 1985 version. American Association for Automative Medicine |
| AIS severity codes | 1-Minor 2-Moderate 3-Serious 4-Severe 5-Critical 6-Virtually unsurvivable |
| articulated truck | Truck with detachable cabin (VBODY=30-40) |
| AT | Articulated truck |
| BAC | Blood alcohol content |
| bicycle | Bicycle or tricycle (VBODY=11) |
| bus | Motor vehicle with more than 9 seats (VTYPE=8,9) |
| carriageway | That part of the road which normally carries traffic; does not include median strips |
| child | Person aged 12 or younger |
| crash | Fatal crash |
| cross traffic crash | Crash type involving vehicles from adjacent approaches at an intersection (DCA=10-19) |
| cyclist | Bicyclist |
| DCA | Definition for Classifying Accidents, 3 digit code. |
| DCA event | The central crash event, often the first collision on the carriageway; >100 possible codes. See diagrams in Appendix. |
| bead-on crash | Crash type involving vehicles from opposing directions at an intersection or mid-block (DCA=20-29) |
| manoeuvring | Major crash type including vehicles making U turns, parking reversing, emerging from a driveway/laneway/footpath/median, but excluding overtaking (DCA=40-49) |
| MC | Motorcycle |
| mid-block | More than 10m from an intersection |
| motorcycle | Motorcycle, motor scooter, trail bike or moped (VBODY 8-10) |
| motorcyclist | Person in control of motor cycle (PERLOC=2) |
| multiple motor vehicle crash | A fatal crash involving at least two non-stationary motor vehicles |
| multiple vehicle rural (MVR) crash | A multiple motor vehicle crash involving at least two non-stationary passenger vehicles or rigid trucks or combinations of these occurring in a rural high speed zone, excluding all crashes involving any pedestrians, bicycles or non -stationary motorcycles, buses or articulated trucks |

**multiple vehicle urban (MVU) crash**
A multiple motor vehicle crash involving at least two non-stationary passenger vehicles or rigid trucks or combinations of these occurring in an urban low speed zone, excluding all crashes involving any pedestrians, bicycles or non-stationary motorcycles, buses or articulated trucks

**near intersection** Less than 10m from intersection but not within intersection

**non-stationary** Not parked (PRIORMOV<>12,13,14)

**off path crash** A crash in which the vehicle loses control and leaves the carriageway; also includes crashes with the vehicle out of control on the carriageway and not hitting an object (DCA=70-89)

**on path crash** A crash in which the vehicle collides with a stationary object on the carriageway (DCA=60-69)

**pedestrian** Person other than a driver, passenger, cyclist or motorcyclist PERLOC=4 (and 2 cases with PERLOC=26 -external to vehicle)

**pedestrian crash** A crash in which at least one pedestrian dies. Effectively, PEDS>0, although PEDS is the number of pedestrians killed or injured. However, in the 1988 fatal file, for all fatal crashes involving one or more pedestrians, at least one of these died. Also included are 2 crashes where PEDS=0, but DCA=8 (boarding/alighting) and vehicle was stationary (PRIORMOV=12,13,14) and PERLOC=26 (external to the vehicle).

**passenger vehicle** Motor vehicle with up to 9 seats and/or not exceeding 3.5 tonnes:cars, station wagons, utilities, passenger vans and 4 wheel drive vehicles (VBODY=1-7,20 and VTYPE=5,6,7,10)

**prior event** Event prior to DCA event. Generally involves vehicle leaving the carriageway or loss of control due to avoidance manoeuvre.

**rear end crashes** Vehicle colliding with rear of another vehicle in the same lane (DCA=30)

**remote** Rural land classification; West of 151° longitude and between 11.5 and 31° latitude. (LANDCLS=11 and (11.5<LAT<31) and LONG<151.0); also included LAT=999 and long=9999 in NT outback (1 crash).

**rigid truck** A truck with a non-detachable cabin. This includes vans over 3.5 tonnes, table top trucks, tip trucks and other non-articulated trucks (VBODY=20-26).

**rural** Includes a) Rural, b) small towns 1-200 people and c) town/city boundaries (LANDCLS=2,4,6,8,10,11)

**rural high speed** Road with a speed limit of at least 80 km/h in a rural area, small town (1-200 people) or rural boundary land classification.

**rural low speed** Road with speed limit of less than 80 km/h in a rural area, small town (1-200 people) or rural boundary land classification

***same* direction crash**
Crash involving vehicles travelling in the same direction (DCA 30-39)

**school age** Age 16 or younger

**single motor vehicle crash**
A fatal crash involving a single moving/non-stationary motor vehicle; crashes involving one vehicle hitting a <u>parked</u> vehicle are <u>included</u>, but collisions with bicycles or pedestrians are <u>excluded</u>

**single vehicle rural (SVR) crash**
A single motor vehicle crash involving either a non-stationary passenger vehicle or rigid truck occurring in a rural high speed zone, excluding all crashes involving any pedestrians, bicycles or non-stationary motorcycles, buses or articulated trucks

**single vehicle urban (SVU) crash**
A single motor vehicle crash involving either a non-stationary passenger vehicle or rigid truck occurring in an urban low speed zone, excluding all crashes involving any pedestrians, bicycles or non-stationary motorcycles, buses or articulated trucks.

**stationary** Parked (PRIORMOV=12,13,14)

**subsequent event** Fatal event occurring after the DCA event which was clearly caused directly or indirectly by the DCA or prior event. Generally involves the vehicle losing control and leaving the carriageway after the DCA collision.

**urban** City, town population >200, not urban/rural boundaries (LANDCLS=1,3,5,7,9)

**urban high speed** Road with a speed limit of at least 80 km/h in an urban or rural boundary land classification; see additional text under rural high speed

**urban low speed** Road with a speed limit of less than 80 km/h in an urban or rural boundary land classification: see additional text under rural high speed

## References


1. Federal Office of Road Safety Fatal File 1988. Documentation of file structure.
2. Documentation of the structure of SPSS files for FATAL FILE 1988. Derived from ASCII files.
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4. Standard tables 1988 road fatality file. Statistics and Analysis Section, FORS Oct 1991.
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